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## 2015 Technical Advisory Committee Members

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EMPLOYEES AND CONSULTANTS
The Riley-Purgatory-Bluff Creek Watershed District (District) employs three full-time employees. The administrator oversees daily operations of the District and represents the District on numerous state-wide committees. A Water Quality & Outreach Coordinator, and a District Technician & Compliance Officer were hired in spring of 2014. The District retains the services of an engineering consultant, a legal advisor and an accountant to assist with District activities. The District contracts with another accounting firm to perform its annual financial audit.

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INTRODUCTION

The Riley-Purgatory-Bluff Creek Watershed District was established on July 31, 1969, by the Minnesota Water Resources Board acting under the authority of the Watershed Law. The District is located in the southwestern portion of the Twin Cities metropolitan area consisting of a largely developed urban landscape. It encompasses portions of Bloomington, Chanhassen, Chaska, Deephaven, Eden Prairie, Minnetonka and Shorewood (Figure 1). It is an area close to 50 square miles and includes three watersheds: Riley Creek, Purgatory Creek and Bluff Creek. Approximately 32.8 square miles of the District lies within Hennepin County and 14.5 square miles lies within Carver County. Four Managers are appointed by the Hennepin County Commissioners and one Manager is appointed by the Carver County Commissioners. Each of the District’s five Managers serves a three-year term.

Pursuant to Minnesota Statutes Section §103D.351 and Minnesota Rules §8410.0150, the Board of Managers has prepared this Annual Report of the Riley-Purgatory-Bluff Creek Watershed District’s financial status, its yearly activities, its 2015 permitting and enforcement, and its 2015 goal and objectives. The Managers invite comments and suggestions concerning this report. The 2015 Annual Report is available on the Riley-Purgatory-Bluff Creek Watershed District website – www.rpbcwd.org. Copies are also available by contacting Claire Bleser, District Administrator, Riley-Purgatory-Bluff Creek Watershed District, 14500 Martin Drive, Suite 1500, Eden Prairie, MN 55344, (952) 607-6512
2015 HIGHLIGHTS

2015 was a very busy year for the Riley-Purgatory-Bluff Creek Watershed District (District). Two of our programs were finalists for the Minnesota Association of Watershed Districts (MAWD) Program of the Year Award: Adopt-A-Dock and the Creek Restoration Action Strategy (CRAS) programs. The CRAS won the award. The CRAS was a staff and engineer led effort to evaluate the overall health of the creeks and determine where sites in most need of restoration were located.

The District was also awarded two Clean Water Legacy grants. The Clean Water Legacy grants focused on studying downtown Chanhassen to determine where best management practices could be implemented as well as grant funds to retrofit a stormwater pond to reduce phosphorus loads discharging to Lake Susan and reusing pond water to irrigate ball fields adjacent to the pond. Department of Natural Resources grant tied to our effort on Lake Riley to manage the invasive curlyleaf pondweed as part of the District’s effort to restore the ecological balance in the lake after reducing the carp population.

2015 also marked our first full year implementing our new rules. We received 62 permit applications in total.

Other 2015 highlights include:

- First Cycle the Creek outreach event (first Saturday in October).
- Engaged residents at the 2nd Shallow Lakes Forum
- Annual Watershed Tour

Riley-Purgatory-Bluff Creek Watershed District receiving Minnesota Association of Watershed District Program of the Year Award

[From left to right – Manager Chadwick, Manager Bisek, Manager Yetka, RPBCWD Staff Maxwell, Manager Crafton, RPBCWD Staff Jordan and Bleser, Chair Forster and MAWD Board Member Gerald Van Amburg]
2015 Work Plan with Goals and Objectives

The 2015 overall goal for the District was to implement projects to improve water resources consistent with its 10-year plan and at the same time prioritize creek restoration sites. The District also ran a dynamic monitoring program that helped guide managers in their decision-making. Specific objectives for 2015 are as follows:

District-Wide

Implement Watershed District Rules and Regulatory Program
In 2015, the District reinstated its permitting authority. It worked with agencies and other local government units to make this transition as smooth as possible. In addition, the District developed a user-friendly web guide that helped potential permittees understand what rules might apply to them, and what exhibits are required. Furthermore, the District developed a permit database linked to our inspection program. More on the permitting program can be found under the permitting activities section.

Aquatic Invasive Species

Inspections
The District continued to support the City of Eden Prairie and the City of Chanhassen via Carver County Parks in their efforts to inspect boats to prevent the spread of aquatic invasive species (AIS).

In Chanhassen, official data from the DNR showed 5,216 inspections over 3,609.75 service hours were conducted at lakes Ann, Lotus and Susan. 4,250 inspections were conducted on Lotus, 571 on Lake Susan, and 395 inspections on Lake Ann. Of the 5,216 conducted, one inspection on Lotus Lake reported finding a confirmed zebra mussel sample. 117 watercraft inspections indicated that the watercraft were non-compliant and could potentially be contaminated with an aquatic invasive species. 81 of the inspections reported plants/vegetation was found and removable by hand. 30 of the 2,906 inspections of entering watercraft arrived at the access with the drain plug in, which could have contained contaminated water in the watercraft.

In Eden Prairie, there were 3,785 inspections over 2,412.5 service hours. Throughout the summer, City of Eden Prairie inspectors educated boaters, family and friends about invasive species and their threat to our waters. There were two sightings of zebra mussel on boat trailers entering Lake Riley. Both watercraft turned around and did not enter the lake.

Early Detection and Rapid Response

Adopt A Dock
Adopt A Dock is a volunteer lake monitoring program, developed in response to growing concern about the potential spread of invasive mussels, and a call from the community to be part of the solution. The Riley-Purgatory-Bluff Creek Watershed District includes many lakes with public and private accesses. Monitoring all of these locations to detect the presence of invasive mussels is a big task, and through the Adopt A Dock program community members can help expand the monitoring capacity of the District. Volunteers receive a kit that includes monitoring plates, a field notebook, and instructions. They hang the plates from the end of their dock, and check them twice monthly for the presence of mussels. If a suspicious mussel is found, a District staff member makes a site visit to confirm. If it is an invasive, it is reported to the Department of Natural Resources. Participants receive monthly “team emails”, that remind them to check their
plates, and also include interesting information about District resources and events, and any reports made by other participants. At the end of the season, plates are returned to the District, cleaned and stored for next year. Observational data from the field notebooks are entered into a database and summarized for an article. [Monitoring plate design came from the Wisconsin Department of Natural Resources].

Program goals were to:

1) Contribute to the assessment of District waters by increasing the breadth of monitoring for invasive mussels.

2) Contribute to a multi-strategy system (outlined in the District AIS Goals and Strategies 2 year plan) to detect infestations early and respond rapidly, improving the probability of successful management.

3) Engage community members in District activities that facilitate learning more about individual lakes, the rest of the District, and actions they can take to keep our water healthy.

The program had a successful first year with a high participation rate: 75% of District lakes with residential shorelines were represented (Figure 1). In its first year, the Adopt a Dock program had 14 volunteers from 7 lakes and no invasive mussels were detected. At the same time, there was a report of invasive snails, which was passed on to the DNR. Volunteers also noted the presence of the native Giant Floater Mussel. Observations of floating green algae inspired a newsletter piece on seasonal blooms of filamentous green algae. These observations, and comments made by participants indicate that the program is also encouraging residents to engage more with their lakes. Most participants have expressed an interest in continuing next year. The District also has placed monitoring plates off public landings and have inspected these as part of their monitoring protocols, for more information please check the Lakes and Creek Report – Appendix B

Staring Lake
Eurasian Watermilfoil (EWM) was found in Staring Lake. This would be its first sighting. The District hired Freshwater Scientific to delineate the extent of milfoil present. Three infestation zones were identified. After discussion with DNR, Freshwater Scientific, and Administrator developed a quick action plan was developed similar to what was performed on Weaver Lake. The action plan was to pull the plants and then follow with a herbicide treatment. This plan was performed on Weaver Lake and no EWM was found the subsequent year. On October 2, staff, Freshwater Scientific and U of M volunteers were in Staring pulling EWM. Herbicide Treatment followed after the pulling. A plant survey will be performed in 2016 to determined effectiveness of this rapid response plan.
Monitoring
The District revised all of its monitoring protocols to minimize spread of AIS. Furthermore, in 2015, the District retrofitted its pick-up truck with a portable decontamination unit. The decontamination unit was used for the District’s monitoring program and also as an education tool to encourage boaters to follow best practices in helping reduce the spread of AIS. The District also continued to develop communications in regards to AIS through their education and outreach programs.

CITIZEN ADVISORY COMMITTEE
The Riley-Purgatory-Bluff Creek Watershed District has an active Citizen Advisory Committee (CAC). In 2015, the District will welcome both returning and new members. In addition, the District hosted a board-CAC workshop at the start of the year. The board has directed the CAC to provide feedback to the District’s 2015 Aquatic Invasive Species Goals and Strategies as well as wanting input for the Creek Restoration Action Strategies study. The CAC also provided feedbacks on the Cost-Share Program.

CREEK RESTORATION ACTION STRATEGIES
In 2015, the District developed the Creek Restoration Action Strategy (CRAS) in order to prioritize creek reaches, sub-reaches, or sites, in need of stabilization and/or restoration. RPBCWD has identified eight categories of importance for project prioritization including: infrastructure risk, erosion and channel stability, public education, ecological benefits, water quality, project cost, partnerships, and watershed benefits. These categories were scored using methods developed for each category based on a combination of published studies and reports, erosion inventories, field visits, and scoring sheets from specific methodologies. Final tallies of scores for each category using a two-tiered ranking system was used to prioritize sites for restoration/remediation. The report can be found on our website www.rpbcwd.org and a summary of the study can be found on the Lakes and Creeks Report in Appendix B.

COST-SHARE PROGRAM
2015 saw an increase in interest in the cost-share program. Staff conducted 25 site-visits for homeowners and five for home/lake associations and non-profits. The District funded five single-family home projects (two raingardens and three shoreline buffers), one homeowner’s association project (lakeshore buffer), and one city project (creek bank stabilization).
Much of the interest was in shoreline restorations (60%), including buffer plantings and bank stabilizations. Some of the site visits did not result in a cost-share application, because the technical assistance provided was sufficient for the individual to complete their project on their own. Some (~6) of the 2015 site visits will likely result in 2016 applications. The District awarded $39,691.77 in grants in 2015. Together, the projects removed an estimated 4.99 pounds of phosphorous and 22,235 pounds of sediment.

Installation of a new shoreline stabilization technology at a 2015 residential cost share site.

**Grants**

The District applied for two grants in 2014 from Clean Water Legacy Funds and was awarded both grants in 2015. The downtown Chanhassen stormwater best management retrofit (BMP) assessment project is identifying BMPs to reduce phosphorus loads to Rice Marsh Lake and improve water quality in downstream Lake Riley, impaired for excess nutrients. This project identifies innovative BMP retrofit opportunities that target soluble phosphorus and promote infiltration and groundwater recharge within this highly developed area. This project is performed in partnership with the City of Chanhassen and will be completed in 2016. The Grant is for $48,000 with an additional District match of $12,000.

The second grant was a joint grant application from the District and the City of Chanhassen. In 2010, the Minnesota Pollution Control Agency listed Lake Susan as a shallow lake impaired for excess nutrients. TMDL-equivalent allocations were developed and published in an update to the Lake Susan Use Attainability Analysis report in 2013. In this report, Project #2 located at the park pond immediately northwest of Lake Susan was recommended as the most cost-effective watershed implementation project. The project calls for an outlet control structure at a higher elevation that will provide increased dead pool storage and the installation of a filter to treat dissolved phosphorus. It also represents a high priority site because it has the long-term potential to treat nutrient loading entering the lake from the channel that drains the north and west watershed areas and its proximity to the athletic facility and irrigated parkland will allow for stormwater reuse. Stormwater that is not used for irrigation will receive final polishing with a woodchip bioreactor. This grant project, alone, would allow the City of Chanhassen and the District to achieve more than half of the watershed load reduction goal for Lake Susan. The District was awarded a grant of $233,400. This project is a multi-year project expected to be completed in 2017.

In addition, the District applied for one grant from the Department of Natural Resources for the treatment of curlyleaf pondweed on Lake Riley and was awarded a grant of $3,500.
HYDRAULICS AND HYDROLOGY MODEL

In 2015, the District updated the Bluff Creek and Riley Creek Hydraulics and Hydrology Models using Atlas 14 – the most recent hydrometeorological study for Midwestern States. The models provided valuable information in regards to floodplains, flood control and water quality to name a few. A Technical Memo was submitted at the end of 2015 with formal adoption of new floodplain profiles to be expected in early 2016. These are important also as it can help define the types of projects that can be implemented in the watershed.

PLAN UPDATES

The District put forward one major plan amendment for two projects. The amendments were for the Lake Riley Alum Treatment as well as for the Riley Creek Water Quality Improvement project. After the public process, the District modified the scope of the Riley Creek Water Improvement Project to refine the scope of the work to two severe sections located in Lower Riley Creek. The amendment was sent for second round of comments at the end of 2015. The Board of Water and Soil Resources will be discussing the approval of this amendment in early 2016.

TECHNICAL ADVISORY COMMITTEE

The District continued to work with its Technical Advisory Committee in 2015. It held three meetings to receive technical input on our Creek Restoration Action Strategy study as well as present and discuss hydraulics and hydrology models using Atlas 14.

EDUCATION AND OUTREACH

In 2015, the District participated in local community and environment fairs. Those included the Everything Spring Expo in Eden Prairie and the Native Plant Market in Minnetonka. The District also will seek opportunities to partner with local groups and give presentations about our water resources and water quality in the Riley-Purgatory-Bluff Creek Watershed District.

Adopt a Curb

Keeping pollutants off our streets, and subsequently out of our stormdrains, lakes and creeks, is an important part of protecting our lakes and creeks. Staff reached out to local elementary and middle schools about cleaning the curbs around their stormdrains to improve water quality. Schools in the District were provided educational materials including: a picture book, workbooks, and stickers. They were also invited to contact the District for additional materials. A campaign by the Watershed Partners, starting 2016, aims to create a systematic and track-able method of engaging the community in adopting storm drains. The District will be partnering with Watershed Partners on this effort.

AIS Jr Inspector

The boat launch sheet (to be used at launches by participating inspectors), has been finalized. Staff will be reaching out to the cities, counties, and DNR staff to participate.

The use of the AIS Jr Inspector toy boat activity at the Carver County Fair was a success. Approximately 300 children (and their guardians) were engaged in the activity (see photo). Preserved samples of zebra mussels were borrowed from Minnehaha Creek Watershed District to show as examples and these were again popular. The AIS Jr Inspector life-size boat activity was used at the Metro Children’s Water Festival on September 30th. The activity was very busy the entire day and staff engaged with nearly 250 students about why and how to inspect a boat for aquatic invasive species. While at the fair, staff was approached by several representatives from other organizations that were interested in the program. An employee of the Crow River
Organization of Water also stopped by to talk and mentioned that the CROW had been utilizing the Jr Inspector activity in their AIS programming and had printed over 1000 booklets.

**Chanhassen Celebrate Water Day**
In partnership with Carver County, and the City of Chanhassen, the District put on a Celebrate Water Day at Chanhassen Elementary on May 13th. The District led two stations at the event: AIS Jr Inspector and the Incredible Journey from Project WET. This was a one-day event at focused on water. Other activities were led by Carver County and the city. Over 500 students were engaged in this water celebration day.

![Image of Chanhassen Celebrate Water Day](image)

**Congregation Outreach**
Staff in partnership with the Nine Mile Creek Watershed District and the Alliance for Sustainability held multiple outreach events to increase connections with local spiritual centers in order to educate on and promote best management practices for water quality improvement. The District engaged with over a dozen spiritual centers.

**Cycle the Creek Tour**
Cycle the Creek was a fun and successful event. The weather was pleasant and guests had many questions at the educational stops. There were close to 20 attendees including residents of the Bluff Creek watershed, CAC members, and a member of the Eden Prairie Environmental Commission. We received positive feedback and look forward to evolving it into an annual event, highlighting a different resource each year.

**Master Design Plan**
In 2015, the District went through a rebranding effort. An updated District logo, and icons were developed. Templates were also developed for business cards, letterhead, envelopes, simple signage template, power point and posters. The website has been updated to include the new design elements, and staff are incorporating these into their written materials.
**Master Water Stewards Program**
We worked with the Freshwater Society in an effort to expand the Master Water Stewards Program in our District. Our first cohort will be in 2016.

**Nonpoint Education for Municipal Officials (NEMO)**
The District co-hosted two NEMO programs in 2015. The first was the NEMO Workshop on the Water. Over 80 local leaders attended for an evening of education on “Building knowledge and skills in plans, practices, and policies for clean water.” Preliminary review of the evaluations indicate the program was an effective learning environment and that participants gained new knowledge and information. The workshop covered many topics including:

1. Characteristics of our community's lakes and streams including how they function and how they work.
2. The current health of our lakes and streams including:
   - what do we know,
   - how do we monitor, and
   - where local leaders can get more lake and stream specific information.
3. Threats and concerns to our community's lakes and stream and the practices and policies leaders can use to minimize and prevent impact including:
   - stormwater runoff, with an emphasis on impervious surface and pollutants,
   - aquatic invasive species, with highlights on zebra mussels and curly leaf pondweed, and
   - apathy and lack of public knowledge in water resources accentuating the need for continued support of education and outreach efforts.

The second event was held October 7th and was a Winter Roads Management program. This program had the aim of increasing use of best management practices for winter road maintenance in order to reduce salt pollution to our lakes and creeks.

**Open House**
The District held an Open House on Jan 21 to celebrate the move to a new space and share updates with the public. An estimated 65 guests attended, with both new and old faces. The Open House also offered the opportunity to finalize some of the set-up of the office, including creation of an aerial wall map educational display, which was well received at the event.

**Press releases**
This year, the District began writing and submitting a larger number of press releases and had success in having them picked up by local papers. Some examples of successful topics included the District response to detecting eurasian watermilfoil in Staring Lake, recruitment for Master Water Stewards and Citizens Advisory Committee members, and the District’s MAWD award.

**Project Wet**
The District planned a Project WET and Project Learning Tree Workshop for Spanish Immersion teachers, in partnership with the Nine Mile Creek Watershed District to be held in March. It was to include hands-on activities tailored for Spanish Immersion teachers. The workshop will help these teachers to incorporate environmental education and science into existing curriculum. The District, in partnership with the Nine Mile Creek Watershed District also planned to host a Project WET/ PLT workshop for teachers in the District. However, due to unforeseen events, the event was cancelled. The District is planning on scheduling a training in 2016.
Scenic Heights School Forest
Staff conducted a visit to Scenic Heights Elementary School in response to a request from one of the teachers. The school has a DNR School Forest they are working to manage. The forest has a stormwater pond within it, which outlets to Purgatory Creek. The teacher is having a challenging time managing extensive buckthorn and other invasive plants. She was also concerned about some possible erosion issues, and interested in restoring native plants to the shore around the pond. Staff has investigated possible grants that might be applicable for this project and will continue this effort in 2016.

Shallow Lakes Forum
Staff was involved in preparing the 2nd Annual Shallow Lakes Forum on April 25th 2015. This year’s title and focus was: Shallow Lakes Forum - The Role of Plants in Shallow Lake Management. The event was held again at the Minnesota Landscape Arboretum. Speakers included industry experts with presentation topics such as: Shallow Lake Basics - Understanding How a Shallow Lake Works; Why Is My Lake Green? Shallow Lakes and the Watershed; Exploring the Inside - Managing Aquatic Plants; Exploring the Outside - Gardening at the Water's Edge; Community Involvement - How To Get Help. It was a successful event, with approximately 60 attendees. In 2016, the scope of the forum will expand beyond shallow lakes to focus on all urban waters and the steps community members can take to protect them.

Shoreline Restoration & Maintenance Workshop
A shoreline restoration and maintenance workshop was held on June 24 at the District office. The workshop covered some common problems for shoreline residents (fluctuation in water level, erosion, geese), showed how to assess current conditions, walked through planning and maintaining a project, and gave resources for next steps. 14 people attended and had good questions for the presenter, Seth Bossert (Carver Soil Water Conservation District). This event was a partnership with Carver County Soil Water Conservation District, Nine Mile Creek Watershed District, Minnehaha Creek Watershed District, and The City of Eden Prairie. A representative of Minnehaha Creek Watershed District also attended (Darren Lochner).

Social media
In 2015, the District investigated the potential use of social media as a method to communicate with the community. An engagement was developed and is currently being implemented.
St. Hubert’s School
The District conducted an educational presentation at St. Hubert’s School on October 1st. They educated over 70 students on the concept of a watershed and how water and pollutants move through one. They also conducted a demonstration of testing a stormwater pond for chloride pollution. The District is also sponsoring a study of the stormwater pond adjacent to the school. The students will be testing for phosphorous, chloride, and other indicators of water quality throughout the year to learn more about the health of their pond and how their actions might be impacting it. Six students, two from each class, have been selected to participate in an after-school pond study. They will be sampling again in the winter, early spring, and late spring. They are planning to create a powerpoint presentation of their findings.

Summer Watershed Tour
The annual Summer Watershed Tour was held July 27th. There were over 40 attendees including board members, state representatives, local decision makers, community members and CAC members.

Turfgrass Maintenance Workshop
Nine Mile Creek Watershed District and the District offered a training on turfgrass maintenance to help professionals save money, time and protect the environment. The March 26th training was geared toward property managers, private maintenance companies, schools, parks departments, churches and other individuals who are involved in turfgrass maintenance. Over 30 professionals participated. The District and Nine Mile Creek Watershed District, also developed an abbreviated training for seasonal employees on turfgrass management. A workshop was held on June 10th in Minnetonka (14 attendees) and a “train the trainer” event with other watershed Districts and cities was held at the Nine Mile Creek Watershed District offices (12 attendees).

Community Outreach
Lake and Neighborhood Association
District staff presented to several lake and neighborhood associations. Staff was able to provide updates on their neighboring water resources and also provide water resources management updates.

Community events
The District participated in several community events such as the Eden Prairie Arbor Day and Eco Palooza event. The District educated on stormdrain cleaning and other best practices to increase water stewardship in the District.

Website
The District website was updated with the new logo and branding elements.

Winter maintenance workshops
The District with partners sponsored 3 winter maintenance trainings in 2015. These trainings offered information on best practices for managing snow and ice on parking lots & sidewalks, and on roadways. They are crafted with city, county, and state winter maintenance professionals in mind, as well as private contractors. The goals are to help these professionals save money, improve safety, protect water quality through proactive plowing and anti-icing measures, and the
smart and conservative use of road salt. There was excellent attendance for all workshops; registration filled up early and the cap on number was increased to accommodate interested parties. Evaluations for all workshops held (winter roads, winter parking lots & sidewalks) were positive with the majority of attendees finding them to be very useful. The District has held the same workshops for several years now, and will be exploring options for new material in 2016.

**Bluff Creek One Water**

The District continues to work with the City of Chanhassen, Lower Minnesota River Watershed District and the Hennepin County Railroad authority to stabilize streambanks and implement a fish passage at Bluff Creek south of the regional trail and west of County 101. The District was awarded a Clean Water Fund grant in 2014. The District and the City of Chanhassen have been engaged with the private property owner to secure access and easement where the restoration will take place. The District is planning on implementing this project in 2016.

**Riley Creek One Water**

**Chanhasen Town Center**

The District was awarded a Clean Water Grant from the Board Water and Soil Resources for the downtown Chanhassen stormwater best management retrofit (BMP) assessment project. The project is identifying BMPs to reduce phosphorus loads to Rice Marsh Lake and improve water quality in downstream Lake Riley, impaired for excess nutrients. The project began in 2015 and will be completed in 2016. This project is performed in partnership with the City of Chanhassen.

**Use Attainability Analysis Updates and Management Plans**

A Use Attainability Analysis (UAA) is a scientific assessment that uses an outcome-based evaluation and planning process to obtain or maintain water quality conditions and achieve beneficial uses in a water body, such as swimming, fishing, or wildlife habitat. The District originally developed UAAs for Rice Marsh Lake in 1999 and Lake Riley in 2002. The UAAs include a water quality analysis and prescription of protective measures for the lakes and their respective watersheds, based on historical water quality data, the results of intensive lake water quality monitoring, and computer simulations of land use impacts on water quality. Since the original studies, the District has implemented improvement projects in the tributary watersheds and has monitored the water quality of Rice Marsh Lake and Lake Riley.

The goal of the study was to assess the water quality in Rice Marsh Lake and Lake Riley based on more recent physical, chemical, and biological data. The overarching purpose of the UAA update was to identify and evaluate watershed and in-lake best management practices (BMPs) that can be implemented to improve and/or preserve water quality in both lakes. Best Management Practices identified in the study included stormwater pond retrofit to remove more phosphorus out of the water entering the pond, adding stormwater facilities in areas that are undertreated as well as Alum treatment in both lakes to name a few. The study which was completed in 2015, can be found on our website www.rpbcwd.org.

**Lake Lucy Spent Lime**

The District board put the Lake Lucy spent lime treatment system design (in Wetland LU-A3.4 at Utica Terrace in Chanhassen) on-hold indefinitely after the March 4, 2015 meeting in response
to concerns of the adjacent residents expressed to the Administrator and Engineer at a 2/5/2015 meeting with the homeowners and follow-up discussion.

**Lake Susan Spent Lime**
The Riley Purgatory Bluff Creek Watershed District, together with the City of Chanhassen, began building a structure to treat stormwater in Lake Susan Hills West Park. The structure will clean stormwater by removing phosphorus. This nutrient is contributing to poor water quality in Lake Susan and can cause cloudy water and algae blooms.

The structure being built is called a “spent-lime treatment system.” It is one of several treatment methods that were considered. A spent-lime system was picked because it would have the smallest impact on the surrounding land and wetlands, and remove a large amount of phosphorous for the cost.

The site for the spent-lime system was identified in 2013 through a UAA study (can be found on our website www.rpbcwd.org) that looked at different actions that could be taken to clean Lake Susan water. It is located near the pedestrian trail off of Lake Susan Hills Drive. The District conducted the feasibility study and ordered the project in 2015. The District expects completion of the project in Spring 2016 and estimates that the spent lime treatment will remove 45lbs of phosphorus per year.

**Lake Susan Plant Management**
Following successful carp removal in 2009, aquatic plant transplanting experiments began in the summer of 2009 and ended in the summer of 2011. Lake Susan was treated with the herbicide endothall to control curlyleaf in May 2013 and 2014. No treatment occurred in 2015 to determine response of the natives and curlyleaf. The District will assess the need of treatment in 2016 to promote ecological restoration within the lake.

**Rice Marsh Lake Paleolimnological Study**
Rice Marsh Lake sits on the border between the Cities of Chanhassen and Eden Prairie, MN, within the Riley Purgatory Bluff Creek Watershed District. It is part of the Riley Creek chain of lakes and is downstream of Lake Susan and upstream of Lake Riley. There is a long history of changes to Rice Marsh Lake and its watershed including post-settlement agriculture, transition of the watershed to suburban development, the introduction of carp, and the use of the lake and creek as a receiving water body for a wastewater treatment plant. The wastewater treatment plant began operation in 1959, and stopped operating in 1972 when wastewater was diverted to the Blue Lake treatment plant in Shakopee (Minnesota Department of Health 1964; J. Mulcahy, Metropolitan Council, personal communication). Rice Marsh Lake is currently
impaired for total phosphorus (TP); the 2013 growing-season mean TP measurement was 110 µg/l, almost twice the state standard of 60 µg/l for lakes in the North Central Hardwood Forest ecoregion. This impairment has led to questions about whether the productivity of the lake has changed over time, and how best to set management goals.

Overall, the study identified multiple lines of evidence that suggest that Rice March Lake was a nutrient-enriched lake during the late 1800s through the mid-1900s; however, the lake became increasingly eutrophic at the time the wastewater treatment plant began operation. The change in the diatom community at the core top and decline in cyanobacteria production, coupled with a decrease in the sedimentation rate, suggest that recent management efforts on Rice Marsh Lake and Lake Susan are having positive effects. Full study results can be found on our website www.rpbcwd.org.

LAKE RILEY PLANT MANAGEMENT
Lake Riley is a eutrophic lake located about 2 km downstream of Lake Susan along the Chanhassen and Eden Prairie city boundary. Carp were removed from Lake Riley in March 2010 and 2011. A Lake Vegetation Management Plan was developed in winter 2013 and approved by the Riley Lake Association and the Minnesota DNR. To control curlyleaf pondweed, Lake Riley was treated with the herbicide endothall on May 2013, 2014, and 2015 after water temperatures rose to between 10-15°C. Curlyleaf was delineated prior to treatment and herbicide was applied to approximately 20 acres in 2013, 32 acres in 2014, and 20.1 acres in 2015. To control for Eurasian watermilfoil a 2, 4-D herbicide treatment occurred in June 2015, it was applied to 35 acres after a delineation took place. The treatment of Eurasian watermilfoil was performed as the District is looking ahead to applying an alum treatment on Lake Riley and thus, wanting to ensure that the native plant population has a good opportunity to establish themselves.

LAKE RILEY ALUM FEASIBILITY
The District completed a study to determine Alum Feasibility for Lake Riley. The District is looking at implementing and alum treatment application in 2016.

PURGATORY CREEK ONE WATER
PURGATORY CREEK LAKES USE ATTAINABILITY ANALYSIS
In 2015, Barr Engineering began working with District staff to complete a restoration and protection study for the Purgatory Creek watershed. This study will 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 major lakes in the watershed. It will include statistical analysis which will be used to evaluate and recommend the optimum restoration measures based on the potential water quality benefits and estimated life-cycle costs (i.e., a prioritized implementation plan). This study will align with the District’s “One Waters” strategy of resource management and will be completed in 2016.
RED ROCK LAKE PLANT MANAGEMENT
Red Rock Lake is classified as a shallow lake by the Minnesota Pollution Control Agency. In 2015, the District with the City of Eden Prairie completed a public engagement process to develop a plant management plan for Red Rock Lake. Part of the plan identified the need for managing curlyleaf pondweed and as such the District has taken leadership in managing for this invasive plant. Thirteen acres were treated in May for curlyleaf pondweed. In addition, the District hired Freshwater Scientific to further study and analyze the aquatic plant community in Red Rock Lake. Part of the study was to look at turion densities to determine potential localized curlyleaf impairments. It was determined that some sites had substantially higher turion abundance that could lead to a localized severe impairment. The District will be surveying the aquatic plant community to determine if there is a need to treat in 2016.

MITCHELL LAKE PLANT MANAGEMENT
Mitchell Lake is classified as a “Natural Environment Lake” by the Minnesota Department of Natural Resources, which restricts how the land adjacent to the lake can be utilized. Surveys conducted on Mitchell Lake in 2013 and 2014 were used as a reference for a Master’s research project conducted by Jonathan JaKa, a University of Minnesota graduate student. Mitchell Lake was chosen as a reference lake because there were no curlyleaf pondweed treatments planned for 2013 or 2014 and curlyleaf had been present at high frequencies and densities. The District with the City of Eden Prairie engaged residents living on and near Mitchell Lake in the development of a plant management plan. Based on the plan, the need to treat for curlyleaf pondweed was identified. In 2015, Mitchell Lake was treated with an early season endothall herbicide treatment. Afterward, the University of Minnesota conducted aquatic vegetation surveys and water quality monitoring to monitor the effects of treatment on the aquatic plant community. Mitchell Lake will be surveyed again in Spring of 2016 to determine treatment needs.

RED ROCK DELISTING
In 2014, the District put forward a request to the Minnesota Pollution Control Agency to delist Red Rock Lake. Delisting should be occurring in 2016.

SILVER LAKE PALEOLIMNOLOGY
The paleolimnological study on Silver Lake is still ongoing. The objective of the study is to reconstruct Silver Lake’s ecological history using geochemistry, sediment accumulation, diatom-inferred total phosphorus, and diatoms as biological indicators. Results from this study will provide a management foundation through the determination of the natural reference condition of this lake and the reconstruction of ecological changes that have occurred in the lake during the last 150-200 years.
ANNUAL COMMUNICATION TO THE PUBLIC

As required by Minnesota Rule §8410.0100, subp4, the District prepared and disseminated its annual communication. This year’s Annual Communication was a 12-month calendar. Copies of the written communication are included in Appendix A.

EVALUATION OF CAPITAL IMPROVEMENT PROGRAM

The RPBCWD’s 2011 Watershed Management Plan did not include a capital improvement program. In 2015, RPBCWD adopted several major plan amendments to initiate development of the District’s capital improvement program. First, the District adopted the Lake Riley Alum Treatment amendment, planning an alum treatment program for Lake Riley at an estimated cost of $50,000 for dosing study, project oversight, and monitoring, and $500,000 for the alum application. Second, the District forwarded a plan amendment for the Lower Riley Creek Stabilization Project and the Riley Creek Water Quality Improvement Project. The second amendment was sent for a second round of comments at the end of 2015. The District will engage in more capital improvement program planning in 2016.

PERMITTING ACTIVITIES

The District received 62 permit applications in 2015. Fifty-eight permits were approved in 2015 and none were denied. It is estimated that over 27,000 lbs of Total Suspended Solids (TSS) and close to 200 lbs of Total Phosphorus were prevented from entering our stormwater sewers and ultimately our water resources.

<table>
<thead>
<tr>
<th>Summary</th>
<th>Estimated</th>
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<tbody>
<tr>
<td>Permit Type</td>
<td>Number</td>
</tr>
<tr>
<td>Governmental</td>
<td>26</td>
</tr>
<tr>
<td>Private Property</td>
<td>23</td>
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<tr>
<td>Ex. Single Family</td>
<td>9</td>
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</table>

There were a total of 12 variances on 9 applications – 5 from Rule D-Buffers, 4 for Rule J-Stormwater and 3 for Rule F - Streambank.

SUMMARY OF WATER QUALITY MONITORING DATA

The District continues to monitor the lakes and creeks in the Riley, Purgatory and Bluff Creek watersheds. Please read appendix B for the District’s 2015 Lakes and Creeks Data Report. As part of the report, the Lake & Creek Water Quality Fact Sheets were updated to help residents understand the health of our water bodies, the actions the District has taken to improve these, and how they can help protect our resources.
STATUS OF LOCAL PLAN ADOPTION AND IMPLEMENTATION

The District reviewed and approved the City of Chaska’s Local Surface Water Management Plan. The District also reviewed the City of Eden Prairie’s Local Surface Water Management Plan but it was returned to the city for modification.

FINANCIAL STATUS

The District’s fund balances and financial status are included in the District’s Annual Audit. The Annual Audit is included as Appendix D to this report. The District’s audited financial report was prepared by Redpath and Company, a certified public accounting firm. As required by Minnesota Rules §8410.0150, subp. 2, the Audited Financial Report includes classification and reporting of revenues and expenditures, a balance sheet, an analysis of changes in final balances, and all additional statements necessary for full financial disclosures. The 2015 Audited Financial Report may be found in Appendix D.

BIENNIAL SOLICITATION OF INTEREST PROPOSALS

Under Minnesota Statutes §103B.227, subd 5, the District must issue a biennial solicitation for legal, technical, and other professional services. The District has issued a formal solicitation for accounting, engineering, and legal service in 2015. The District retained JMSC Futurity as its accountant and Smith Partners, PLLP as its legal counsel. BARR Engineering was selected as District Engineer in June 2015. Redpath and Company conducted the District’s annual financial audit.

2015 ANNUAL BUDGET

The District adopted its 2015 Annual Budget in September 2014 and amended it in December of 2015. The 2015 Budget can be found in Appendix C of this Annual Report.

2016 WORK PLAN

The 2016 overall goal for the District is to implement projects to improve water resources consistent with its 10-year plan and look ahead to the next 10 years. The District will also run a dynamic monitoring program that will help guide managers in their decision-making.

<table>
<thead>
<tr>
<th>District-Wide</th>
<th>Manage the regulatory program</th>
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<tbody>
<tr>
<td>Regulatory Program</td>
<td>Implement district permit program</td>
</tr>
<tr>
<td></td>
<td>Inspect active permit sites for compliance</td>
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<td></td>
<td>Inspect completed permit projects for compliance</td>
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<tr>
<td><strong>Aquatic Invasive Species</strong></td>
<td>Implement AIS monitoring plan</td>
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<tr>
<td></td>
<td>Develop Rapid Response Plan as appropriate</td>
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<td></td>
<td>Engage audiences on best stewardship practices</td>
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<tr>
<td><strong>Citizen Advisory Committee</strong></td>
<td>Develop a communication process between the CAC and the Board of Managers</td>
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<td></td>
<td>Engage the CAC on the Cost-share Program</td>
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<tr>
<td></td>
<td>Engage the CAC with the 10 year plan and other key issues that might arise</td>
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<tr>
<td><strong>Cost-Share</strong></td>
<td>Administer, promote and grow Cost-share Program</td>
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<td></td>
<td>Provide technical assistance for potential cost-share applicants</td>
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<td></td>
<td>Analyze and Report on the Cost-share Program</td>
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<tr>
<td><strong>Creek Restoration Action Strategy</strong></td>
<td>Update creek assessment based on survey rotations</td>
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<tr>
<td><strong>Data Collection</strong></td>
<td>Monitor Creeks and Lakes as per monitoring plan</td>
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<tr>
<td></td>
<td>Monitor Carp populations as identified in the Riley Chain of Lakes and Purgatory Creek Carp Management Plans</td>
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<td></td>
<td>Monitor Spent Lime Treatment on Lake Susan</td>
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<td></td>
<td>Monitor potential project sites</td>
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<td></td>
<td>Analyze and report on the data collected</td>
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<tr>
<td><strong>District Hydrology and Hydraulics Model</strong></td>
<td>Maintain Hydrology and Hydraulics Model</td>
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<tr>
<td></td>
<td>Update model if additional information is collected</td>
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<tr>
<td><strong>District Floodplain Vulnerability Evaluation</strong></td>
<td>Evaluate potential variation in 100-year flood profile estimates</td>
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<td></td>
<td>Evaluate of watershed resiliency to flooding and identification of flood prone areas</td>
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<td></td>
<td>Develop Flood-risk figures</td>
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<td></td>
<td>Work with Local Government Units</td>
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<tr>
<td>Education and Outreach</td>
<td>Support and manage Master Water Steward Candidates</td>
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<tr>
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<td>Develop, coordinate and/or provide:</td>
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<td></td>
<td>• training and support for traditional and non-</td>
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<td></td>
<td>traditional educators</td>
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<td></td>
<td>• training for turf and winter maintenance</td>
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<td>professionals to implement best practices</td>
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<td></td>
<td>• educational opportunities for local decision</td>
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<td>makers</td>
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<td>• educational opportunities for the general</td>
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<td>community</td>
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<td></td>
<td>• materials in support of projects and programs</td>
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<td></td>
<td>Increase social media presence</td>
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<td></td>
<td>Revise website to improve user experience</td>
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<tr>
<td></td>
<td>Work with cities and regional partners to increase capacity</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Maximum Daily Load</th>
<th>Work with Minnesota Pollution Control Agency on the Watershed Restoration And Protection Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Engage the Technical Advisory Committee</td>
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<table>
<thead>
<tr>
<th>Watershed Plan</th>
<th>Begin the 10-year plan refresh</th>
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<tbody>
<tr>
<td></td>
<td>Engage CAC and TAC</td>
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<tr>
<td></td>
<td>Engage the public via a survey and public meetings</td>
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<thead>
<tr>
<th>Bluff Creek One Water</th>
<th>Work with partners and implement project</th>
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<tbody>
<tr>
<td></td>
<td>Report Clean Water Grants Expenditures to BWSR</td>
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<table>
<thead>
<tr>
<th>Riley Creek One Water</th>
<th>Complete study identifying potential sites that could be retrofitted with Best Management Practices to reduce the phosphorus loads to Rice Marsh Lake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Report Clean Water Grants Expenditures to BWSR</td>
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<table>
<thead>
<tr>
<th>Chanhassen Town Center</th>
<th>Engage neighborhood association in the use of outlot to retrofit stormwater pond</th>
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<tbody>
<tr>
<td></td>
<td>Work with the City of Chanhassen</td>
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<td></td>
<td>Construct iron enhanced retrofit along Lake Lucy</td>
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<table>
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<tr>
<th>Lake Lucy Iron Enhanced</th>
<th>Engage neighborhood association in the use of outlot to retrofit stormwater pond</th>
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<tbody>
<tr>
<td></td>
<td>Work with the City of Chanhassen</td>
</tr>
<tr>
<td></td>
<td>Construct iron enhanced retrofit along Lake Lucy</td>
</tr>
</tbody>
</table>
| **Lake Susan Improvement** | Complete construction of the spent lime treatment  
Complete evaluation of Lake Susan Park Pond  
Report on project  
Design and construct pond retrofit  
Work in partnership with the City of Chanhassen |
| **Lake Susan Improvement Phase 2** | Work with the University of Minnesota, Cities of Chanhassen and Eden Prairie, lake association, and residents as well the Minnesota Department of Natural Resources on potential treatment  
Implement herbicide treatment as needed |
| **Lake Riley Curlyleaf Pondweed** | Work with the University of Minnesota, Cities of Chanhassen and Eden Prairie, lake association, and residents as well the Minnesota Department of Natural Resources on potential treatment  
Implement herbicide treatment as needed |
| **Lake Riley Eurasian Watermilfoil** | Work with the University of Minnesota, Cities of Chanhassen and Eden Prairie, lake association, and residents as well the Minnesota Department of Natural Resources on potential treatment  
Implement herbicide treatment as needed |
| **Lake Riley Alum Treatment** | Implement alum treatment |
| **Lake Susan Curlyleaf Pondweed** | Work with the University of Minnesota, Cities of Chanhassen and Eden Prairie, and residents, as well the Minnesota Department of Natural Resources on potential treatment  
Implement herbicide treatment as needed |
<p>| <strong>Lake Susan Alum Treatment</strong> | Conduct feasibility study |
| <strong>Rice Marsh Lake Aeration</strong> | Manage and maintain the aeration system as per the Riley Chain of Lakes Carp Management Plan |
| <strong>Rice Marsh Lake Alum Treatment</strong> | Conduct feasibility study |
| <strong>Lower Riley Creek Stabilization</strong> | Conduct feasibility study for Lower Riley Creek reach D3 and E |
| <strong>Purgatory Creek One Water</strong> | Implement restoration project on Purgatory Creek near 101 |
| <strong>Purgatory Creek Restoration</strong> | Complete Use Attainability Analysis for the Purgatory Creek Chain of Lakes |</p>
<table>
<thead>
<tr>
<th><strong>Silver Lake Paleolimnology</strong></th>
<th>Complete Silver Lake Paleolimnology Study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitchell Lake Plant Management</strong></td>
<td>Work with the University of Minnesota, City of Eden Prairie, lake association, and residents as well the Minnesota Department of Natural Resources on potential treatment</td>
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<td></td>
<td>Implement herbicide treatment as needed</td>
</tr>
<tr>
<td><strong>Red Rock Lake Plant Management</strong></td>
<td>Work with the City of Eden Prairie, lake association, residents and the Minnesota Department of Natural Resources on potential treatment</td>
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<td></td>
<td>Implement herbicide treatment as needed</td>
</tr>
</tbody>
</table>
APPENDIX

A - Annual Written Communication to the Public
B - Lakes and Creeks Report
C - 2015 Annual Budget
The Riley Purgatory Bluff Creek Watershed District was established on July 31, 1969. Watershed districts are local governments charged with protecting and improving the water resources in our communities.

The Riley Purgatory Bluff Creek Watershed District encompasses all the land that drains into any of the three creeks in its name. At approximately 50 square miles, it includes parts of seven cities (Bloomington, Chanhassen, Chaska, Deephaven, Eden Prairie, Minnetonka, and Shorewood), and two counties (Carver and Hennepin).

After 9 years of service, Ken Wencl retired from the board of managers. Under Ken’s leadership, the District revised it’s 10-year plan, became leaders in carp management and implemented restoration and water quality improvement projects. The District would like to thank Ken for his years of service. He will be missed.

Carver County Commissioners welcome Richard Chadwick to the board of managers. From a young age, Richard has enjoyed being on the water. He has lived for over 30 years in our District and has worked with public entities as a litigator for the League of Minnesota Cities. Manager Chadwick began his 3-year term last August. The District looks forward to continuing to work with him.
Volunteers monitor for AIS

A new district program launched in 2015 enlisted community members to help monitor for invasive mussels. Fourteen lake shore residents volunteered for the Adopt a Dock program in its first season. Volunteers hung monitoring plates off of their docks, and checked them monthly for possible mussel growth. The district is happy to report that no mussels were detected. This fits with monitoring efforts by staff at public boat ramps and in water samples, which also did not detect mussels. Interested in volunteering in 2016? Contact the district: mjordan@rpbcwd.org; 952-607-6481

Creek assessment tool gives insights

Prioritizing creek restoration projects can be challenging, especially when the sites in need of help are located in multiple creeks. The Creek Restoration Action Strategy (CRAS) is a tool for identifying stream reaches in greatest need of restoration, beginning with consistent assessment of creek conditions. In developing the CRAS, eight important prioritization categories were identified and grouped into two tiers: infrastructure risk, channel stability, public education, ecological benefits, water quality, project cost, partnerships, and watershed benefits.

This tool developed by the district and Barr Engineering, is being implemented across the three creeks within the district. The CRAS study has allowed the district to focus efforts on high-benefit projects in a cost-effective manner. This tool is a living document that is updated as the district continues to assess changes in the creeks over time.

Raingarden grant helps Bluff Creek

Family of Christ Lutheran Church in Chanhassen received a cost share grant from the watershed district to construct a rain garden on their property. The garden captures and filters runoff from the church’s 1.41-acre parking lot. It removes pollutants like phosphorous and sediment before they can enter nearby Bluff Creek.

The project was a partnership of the church, the district, the City of Chanhassen, and the Carver County Soil and Water Conservation District. It was funded in part by a Clean Water Land and Legacy Fund Grant.

Interested in a cost share? Contact the district: mjordan@rpbcwd.org
“What I like best about being part of this watershed district is the opportunity to learn in my role as a responsible water steward, and contribute to restoring healthy creeks and lakes.”

—Jill Crafton, Manager at RPBCWD
Use salt sparingly on your sidewalk and driveway. When ice and snow melt, they carry the salt to storm drains, and into our lakes and creeks, polluting them. Always shovel first, and start early before the snow has been walked on. If you need to use salt, one pound (a heaping 12 ounce coffee mug) is enough for two average parking spaces.
“What I like about this district is the diversity in having three watersheds. It also offers the challenge of understanding each and developing a plan to solve their respective problems.”

—Perry Forster, Manager at RPBCWD
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**Water Tip**

In the photo above, an aeration unit on Rice Marsh Lake helps keep blue gill fish alive. Blue gills eat carp eggs, helping to control the carp population and creating cleaner water.

The aeration unit also makes a thin spot in the ice. Be careful here, and on any lake this winter. Wait for at least four inches of clear solid ice before walking on a frozen lake. ATVs need at least 5 inches, and trucks need 12. Never drive on ice at night or when it is snowing. Tell someone your plans when venturing on the ice and carry a pair of ice picks.
“One of my favorite parts of working in this district is watching the seasons change. From early spring to late fall, we are on the water every week and you begin to see patterns in the water and the landscape.”

—Michelle Jordan, Water Quality and Outreach Coordinator at RPBCWD
**Water Tip**

As you think about spring and getting out in the yard, consider planning a project to help keep our lakes and creeks clean. The district offers cost share grants to help with projects like rain gardens and shoreline buffer plantings. Find out more about the program on our website: rpbcwd.org.
“I really like the diversity of water resources in the district, and the ease of access to them. This district offers a vast array of recreational opportunities that are just a walk, bike, or swim away.”

—Josh Maxwell, Conservation Technician at RPBCWD
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<td>Water Tip</td>
<td>Have your soil tested before you fertilize. It is crucial to only add the nutrients your soil really needs because fertilizer poses a serious threat to water quality. Rainwater runoff carries it into streams and lakes, where it promotes the growth of harmful algae. Excess nitrogen in fertilizer can also seep into groundwater, which is the primary source of drinking water in our district. The University of Minnesota offers inexpensive soil testing services (<a href="http://soiltest.cfans.umn.edu">http://soiltest.cfans.umn.edu</a>).</td>
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“When I kayak, I can see beaver, heron, ducks, geese, eagles, muskrat, and turtles all in a 35 minute loop. You almost feel like you are “Up North”.”

—Sharon McCotter, Citizens Advisory Committee Member at RPBCWD
Aquatic invasive species pose a threat to local lakes and creeks. They reduce game fish populations, degrade the ecosystem, and can make lakes and streams unusable by boaters and swimmers. Protect our waters by removing aquatic plants and water from your boat and trailer whenever you leave a lake. Make sure to pull the boat plug and dispose of unused bait in the trash. Find out more at: www.dnr.state.mn.us.
“I enjoy exploring the trails and boardwalks that traverse through the parks adjacent to Purgatory Creek.”

—Paul Bulger, Citizens Advisory Committee Member at RPBCWD
**Water Tip**

Smart lawn care is also good for water. Only water during dry weather, and then only 1 inch per week. Keep your grass at three inches or higher, and when you cut it, leave the clippings on your lawn. Longer grass has longer roots and needs less water. Grass clippings add natural fertilizer to your lawn. Sweep up any clippings that fall on your driveway or the road, so they do not end up in our lakes and creeks, where they can promote the growth of harmful algae.
“Our watershed district is filled with a wide variety of quality natural resources to enjoy from woods and wetlands to birds, bees and butterflies.”

—Mary Bisek, Manager at RPBCWD
### Water Tip

Before you reach for a pesticide, try these tips to control pest insects and reduce the amount of pesticide reaching our waters. Use native plants, they are the most resistant to local pests. Water in the morning. This allows plants to dry for the cool evening, making them less susceptible to disease and insects that feed at night. Plant shrubs and trees with fruits near your garden to encourage birds which feed on pest insects.

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- **Independence Day**
- **RPBCWD Board Meeting 7 pm - District Office**
- **Watershed Tour**
“I enjoy the visits we get from eagles after ice-out on Lake Riley. We also have loons that visit on their migration north, and some years a couple of them decide to stay for the summer.”

—Bob Adomaitis, Citizens Advisory Committee at RPBCWD
### Water Tip

Most of the water we use in our homes and yards in the district comes from groundwater. This water can be hundreds or even thousands of years old and is being pumped at increasing rates. Help conserve water by installing faucet aerators and low-flow shower heads and toilets in your home, and rain sensors and rain barrels in your yard.
“What I like about my watershed is being able to sit at night and watch the skies while hearing crickets and frogs, and every so often even an owl.”

—Claire Bleser, Administrator at RPBCWD
**Water Tip**

September is a beautiful time to wander in the outdoors. With fifteen lakes, three creeks, and abundant wetlands, there is much to explore in our district. Check with your city for a trail map, and take your next lunch break outside. Check the watershed website, or join the mailing list to find out about events the district is hosting.

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“I have fond memories as a child of flying kites high above the Minnesota River, along the bluffs of the watershed. I marveled at how the wind would blow our kites sky high, while far below the river flowed to the mighty Mississippi. I would realize later in life how incredibly important the landscapes of the watershed were to protecting that great river, as well as all of the lakes and creeks that flow towards it.”

—Leslie Yetka, Manager at RPBCWD
### Water Tip

Vegetation along streams is important for keeping streams healthy. Trees, grasses, and other plants help to hold the soil in place, preventing erosion. They also shade and cool the water, slowing algae growth and improving the conditions for fishes and insects. Overhanging vegetation creates additional habitat for aquatic animals. Stream vegetation can also help filter pollutants from stormwater before it reaches the creek.

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- **Rosh Hashana**
- **Columbus Day**
- **Yom Kippur**
- **Full moon**
- **New moon**
- **Halloween**
“What I like about living in the watershed district is all the birds: eagles, loons, wood ducks, hummers, orioles, pileated woodpeckers. And, getting to have a 300 acre “water feature in my back yard.”

—Laurie Hable, Citizens Advisory Committee at RPBCWD
### Water Tip

Prepare your home and garden for winter. Clear gutters and downspouts to prevent ice dams and roof damage. Inspect shovels and snowblowers to make sure they are ready for that first snow. Plant a cover crop in your garden. They help maintain nutrients, decrease erosion, and add organic matter to the soil.
“I love my watershed. I love it for numerous reasons. Looking at the watershed I see blue color: blue habitat, blue space, blue bike trails, blue parks, and blue minded people. It is part of why I am happy to have my family here.

—Matt Lindon, Citizens Advisory Committee Members at RPBCWD
Below 15 degrees F, salt is no longer effective to melt ice and snow. Adding more salt will not make a difference. At this temperature, add a small amount of sand to provide traction. Check the weather, and when a cold snap is approaching, get out and remove as much snow and ice as you can.
Lakes and Creeks
2015 Annual Report
Executive Summary

The Riley-Purgatory-Bluff Creek Watershed District had a successful water quality sampling season in 2015, completing a full year of sample collection and data analysis. This effort was made possible through multiple partnerships with municipalities and organizations based within the watershed. The results from the 2015 sampling effort are presented in this report.

Lake monitoring
During the 2015 monitoring season, thirteen lakes were monitored across the District. In addition to the lakes sampled, Lake Idlewild was monitored and was included in this analysis even though it was classified in 2015 as a high value wetland instead of the previous shallow lake classification. As part of the sampling protocol, a multi-probe sonde was used to measure water chemistry and a secchi disk to measure clarity. Water samples were collected for nutrient and chloride analysis (regular lake sampling). Chlorophyll-a and Total Phosphorus concentrations, along with Secchi Disk depths, were compared to standards set by the Minnesota Pollution Control Agency (MPCA). Regular lake sampling was conducted on each lake approximately every two weeks throughout the growing season (May-September). In addition to regular lake sampling, the District monitored water levels of fourteen waterbodies and zooplankton populations in three lakes. The District also monitored public access points and analyzed water samples for the presence of zebra mussels in the fourteen waterbodies. No zebra mussel (adults or juveniles) or invasive zooplankton were found in any District lake.

Figure 0-1 displays lakes sampled in 2015 that met or exceeded the Minnesota Pollution Control Agency (MPCA) lake water quality standards for Chlorophyll-a, Total Phosphorus, and Secchi Disk depth during the growing season (May-September). The MPCA has specific standards for both ‘deep’ lakes or lakes >15 ft deep and < 80% littoral area (Lake Ann, Lotus Lake, Lake Riley, and Round Lake) and ‘shallow’ lakes or lakes <15 ft deep and >80% littoral area (Duck Lake, Hyland Lake, Lake Lucy, Mitchell Lake, Red Rock Lake, Rice Marsh Lake, Staring Lake, Lake Susan, and Silver Lake). For specific information regarding MPCA lake standards see section 3. Lake Ann, Duck Lake, Red Rock Lake, and Round Lake met all three MPCA standards in 2015. Mitchell Lake slightly exceeded both the Chlorophyll-a and Total Phosphorous standards in 2015 which it met in 2014. Lake Idlewild slightly exceeded the Total Phosphorous standard in 2015 which it met in 2014, however it is now classified as a high value wetland. Hyland Lake and Silver Lake failed to meet any of the three MPCA standards in 2015. Both lakes were the only lakes to not meet the secchi disk standard for their lake classification. More specific information regarding each lake can be found in section 4.1 and in the Lake Fact Sheets in Exhibit D.
Figure 0-1 2015 Lake Water Quality

Minnesota Pollution Control Agency (MPCA) Water Quality Standards compared to water quality data collected from lake monitoring locations within the Riley-Purgatory-Bluff Creek Watershed District in 2015. Chlorophyll-a (green), Total Phosphorus (orange), and Secchi Disk depth (black) was assessed during the growing season (May-September) for both ‘deep’ lakes or lakes >15 ft deep and < 80% littoral area (Lake Ann, Lotus Lake, Lake Riley, and Round Lake) and ‘shallow’ lakes or lakes <15 ft deep and >80% littoral area (Duck Lake, Hyland Lake, Lake Lucy, Mitchell Lake, Red Rock Lake, Rice Marsh Lake, Staring Lake, Lake Susan, and Silver Lake). The corresponding dots next each lake indicate which water quality standard was violated in 2015. The grey lines represent major roadways within the Riley-Purgatory-Bluff Creek Watershed District. The lakes surrounded by blue met all MPCA water quality standards.

Creek monitoring

In 2015, the District also collected water quality samples and performed data analysis at 18 different sampling sites along Riley Creek (5 sites), Bluff Creek (5 sites), and Purgatory Creek (8 sites). For the 2015 creek monitoring season (April through September) a multi-probe sonde was used to measure water chemistry and a transparency tube to measure clarity. Water samples were collected for nutrient and suspended sediment analysis (total phosphorus, chlorophyll-a, total suspended sediment). In 2015, the District began monitoring Chlorophyll-a concentrations at sampling locations in order to compare results with the new MPCA water quality standards adopted in 2014. Creek flow was calculated from velocity measurements taken at consistent cross sections at each water quality monitoring location. Various sections across all three creeks were also walked and assessed using the District’s Creek Restoration Action Strategy evaluation which identifies stream reaches in the most need of restoration.

The summary for all three creeks is based on new water quality parameters developed by the MPCA in 2014 for Eutrophication and Total Suspended Solids. The new standards include some parameters the District has not yet incorporated into monitoring procedures and therefore is the evaluation of the stream reaches that did not meet MPCA
water quality standards using the current parameters measured by the District. The parameters measured during the
summer growing season (April-September) and the associated MPCA water quality limits for streams located in the
Central River Region include: Dissolved Oxygen (DO) daily minimum > 4 mg/L, summer season average Total
Phosphorous (TP) < 0.1 mg/L, Total Suspended Solids (TSS) < 10% exceedance of 30 mg/L limit during the summer
season, summer season average Chlorophyll-a <18 ug/L summer season average pH < 9 su.

All stream water quality sites monitored during the 2015 field season had at least one violation except for site R2
which has gone two consecutive years without a violation (Figure 0-2). This may not be an accurate assessment of the
reach as there is a limited sample size due to this location being dry for a large portion of the year. All streams within
the District had a similar number of violations in 2015 (Riley-6, Purgatory-10, and Bluff Creek-7) and have overall
shown improvement since 2014. The increased number of violations seen in 2014 may have been caused by the large
spring rain event which resulted in considerable in-stream degradation and increased erosion/sedimentation. Rainfall
events recorded in 2015 were relatively mild and spread out in comparison to the 2014 season which had an extremely
wet spring and then remained fairly dry for the remainder of the year. Overall, lower Bluff Creek (B4 and B5) and
lower Riley Creek have increased violations due to steep ravines and fine soil types located in these reaches, and
because of their position at the bottom of the watershed. Both these sites were identified in the Creek Restoration
Action Strategy as being excellent candidates for stream restoration projects. Exceedance of the MPCA total
phosphorous standard (summer average <0.1mg/L) was the water quality parameter most violated in 2015 with 15 out
of the 18 sites failing to meet the standard. More information pertaining to each individual creek can be found in the
Creek Fact Sheets located in Exhibit D.

Figure 0-2. 2015 Stream Water Quality

Minnesota Pollution Control Agency (MPCA) Water Quality Standards compared to water quality data collected from all monitoring locations
in 2015 on Bluff Creek, Riley Creek, and Purgatory Creek. Creeks are broken into sections by water monitoring locations (orange circles) and
information gathered from the individual sites are applied upstream to the next monitoring location. Water quality standards used are part of the
2014 Eutrophication and Total Suspended Solids standards developed by the MPCA include: Dissolved Oxygen (DO) daily minimum > 4 mg/L,
summer season average Total Phosphorous (TP) < 0.1 mg/L, Total Suspended Solids (TSS) < 10% exceedance of 30 mg/L limit during the
summer season, summer season average Chlorophyll-a <18 ug/L, summer season average pH < 9 su and > 6 su. The corresponding labels next
each stream section indicate which water quality standard is being violated. The grey lines represent major roadways within the Riley-
Purgatory-Bluff Creek Watershed District.
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1 Introduction and Overview

1.1 2015 Summary

The Riley-Purgatory-Bluff Creek Watershed District was established on July 31st, 1969, by the Minnesota Water Resources Board acting under the authority of the watershed law. The District is located in the southwestern portion of the Twin Cities Metropolitan Area consisting of a largely developed urban landscape and encompassing portions of Bloomington, Chanhassen, Chaska, Deephaven, Eden Prairie, Minnetonka, and Shorewood (Figure 1-1). This total area for the watershed is close to 50 square miles in both Hennepin and Carver Counties and includes three smaller subwatersheds: Riley Creek Watershed, Purgatory Creek Watershed, and Bluff Creek Watershed.

The task of data collection and reporting is the foundation for the Riley-Purgatory-Bluff Creek Watershed District’s work. Regular, detailed water quality monitoring provides the District with scientifically reliable information that is needed to decide if water improvement projects are needed and how effective they are in the watershed. Data collection remains a key component of the District’s work as they strive to de-list, protect, and improve the water bodies within the watershed.

Table 1.1-1 District Water Resource Sampling Partnerships

<table>
<thead>
<tr>
<th>Water Resource</th>
<th>RPBCWD</th>
<th>Eden Prairie</th>
<th>University of Minnesota</th>
<th>Three Rivers Park District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duck Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyland Lake</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Ann</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Idlewild</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Lucy</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lake Riley</td>
<td></td>
<td></td>
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<tr>
<td>Lake Susan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lotus Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Rock Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rice Marsh Lake</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Round Lake</td>
<td></td>
<td></td>
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<tr>
<td>Silver Lake</td>
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<td></td>
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<tr>
<td>Staring Lake</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bluff Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purgatory Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riley Creek</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Through partnerships with the City of Chanhassen and Eden Prairie, Three Rivers Park District, and the University of Minnesota (RPBCWD grant), water quality data was collected on thirteen lakes and one high value wetland (Lake Idlewild) in the District. Lake McCoy has not been part of the District’s sampling regime. Each partner was responsible for monitoring certain parameters of their respective lakes and reporting their findings, allowing for more time and attention to be given to each individual water resource (Table 1.1-1).

In 2015, the District monitored 18 creek locations including 5 on Bluff Creek, 5 on Riley Creek, and 8 on Purgatory Creek. Each creek was monitored during the field season (April through September) approximately twice a month. Both water quality samples and flow monitoring activities were performed in the same reach section of the creek during each sampling event. If a creek site was dry or stagnant only images and climate data were recorded. In addition to water quality monitoring, creek walks were
conducted on 2 of the lower reaches of Riley Creek (R1 and R2), 5 reaches of Purgatory Creek (P1, P2, P3, P4, and P5), and all but reach 1 of the reaches on Bluff Creek. The creek walks were conducted to gather more information about the current stream conditions in the District. This information is to be included in the Creek Restoration Action Strategy (CRAS) program which was developed by the District to identify and prioritize future stream restoration sites. As part of the CRAS, the District also installed bank pins near each of the water quality monitoring sites in order to measure generalized sedimentation and erosion rates across all three streams. A fish bioassessment was also conducted on Bluff Creek to assess the overall health of the fish community and stream.

Winter monitoring occurred on the Riley Chain of Lakes (Lucy, Ann, Susan, Rice Marsh, and Riley) and on 4 separate storm water ponds. Extending the monitoring activities into the winter months can provide key insights into ways to improve water quality during the summer months. Winter monitoring also allows us to evaluate the influence of chloride levels in our lakes. Lakes are monitored at the same location on each sampling trip, typically at the deepest part of the lake. Lake monitoring took place approximately every two weeks in the summer season and once a month during the winter season, and the data collection and reporting events are tracked throughout the year (Table 1.1-2). Water samples were also collected and analyzed in early summer for the presence of zebra mussel veligers. Additionally, during every sampling event the boat launch area and zebra mussel monitoring plate was scanned for adult zebra mussels. Data was not collected in March, November, and December due to unsafe ice conditions. The District did not collect data in October due to time constraints and because of the final push to finalize the CRAS. The City of Eden Prairie and Three Rivers Park District did collect water quality data in October on Mitchell Lake, Red Rock Lake, Round Lake, and Hyland Lake.

<table>
<thead>
<tr>
<th>Table 1.1-2 2015 Monthly District Field Data Collection Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Resource</td>
</tr>
<tr>
<td>Lake Ann</td>
</tr>
<tr>
<td>Duck Lake</td>
</tr>
<tr>
<td>Lake Idlewild</td>
</tr>
<tr>
<td>Lotus Lake</td>
</tr>
<tr>
<td>Lake Lucy</td>
</tr>
<tr>
<td>Mitchell Lake*</td>
</tr>
<tr>
<td>Red Rock Lake*</td>
</tr>
<tr>
<td>Rice Marsh Lake</td>
</tr>
<tr>
<td>Lake Riley</td>
</tr>
<tr>
<td>Staring Lake</td>
</tr>
<tr>
<td>Lake Susan</td>
</tr>
<tr>
<td>Silver Lake</td>
</tr>
<tr>
<td>Bluff Creek</td>
</tr>
<tr>
<td>(all sites)</td>
</tr>
<tr>
<td>Purgatory Creek</td>
</tr>
<tr>
<td>(all sites)</td>
</tr>
<tr>
<td>Riley Creek</td>
</tr>
<tr>
<td>(all sites)</td>
</tr>
</tbody>
</table>

*Only zooplankton samples were collected on Mitchell Lake and Red Rock Lake by RPBCWD.
2 Methods

Water quality and quantity monitoring entails the collection of multi-probe sonde data readings, water samples, zooplankton samples, zebra mussel veliger samples, and physical readings, as well as recording the general site conditions at the time of sampling. Listed below are the methods and materials, for both lake and stream monitoring, used to gather the water quality and quantity data during the 2015 field monitoring season.

2.1 Monitoring and Sampling

2.1.1 Water Quality Monitoring

Multi-probe sondes (Lakes DS-5/ Streams MS-5) were used for collecting water quality measurements. Sonde readings measured include: temperature, pH, dissolved oxygen, conductivity, and other technical parameters. Secchi disk depth readings were recorded at the same time as sonde readings were collected at all lake sampling locations. When monitoring stream locations, transparency and flow measurements were collected as well as the sonde readings. General site conditions related to weather and other observations were recorded as well while out in the field. A list of the variety of parameters monitored during each sampling event can be seen in Table 2.1-1.

Table 2.1-1 Sampling Parameters Monitored during the 2015 Field Season

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sonde or Wet Chemistry</th>
<th>Summer Lakes</th>
<th>Winter Lakes</th>
<th>Streams</th>
<th>Reason for Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus (TP)</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Nutrient, phosphorus (P) controls algae growth</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Nutrient, form of P most useful to algae</td>
</tr>
<tr>
<td>Chlorophyll-a, pheophytin</td>
<td>Wet</td>
<td></td>
<td>Surface</td>
<td>Surface</td>
<td>Measure of algae concentration</td>
</tr>
<tr>
<td>Ammonia as N</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Nutrient, form of nitrogen (N) most useful to algae</td>
</tr>
<tr>
<td>Nitrate + Nitrite as N</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Nutrient, also oxygen substitute for bacteria</td>
</tr>
<tr>
<td>Total Alkalinity, adjusted</td>
<td>Wet</td>
<td>Surface</td>
<td>Surface</td>
<td></td>
<td>Measure of ability to resist drop in pH</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Measure of the solids in water (block light)</td>
</tr>
<tr>
<td>Chloride</td>
<td>Wet</td>
<td></td>
<td></td>
<td></td>
<td>Measure of chloride ions, salts in water</td>
</tr>
<tr>
<td>Temperature</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Impacts biological and chemical activity in water</td>
</tr>
<tr>
<td>pH</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Impact chemical reactions (acidic or basic)</td>
</tr>
<tr>
<td>Conductivity</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Ability to carry an electrical current (tss &amp; chloride)</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Oxygen for aquatic organisms to live</td>
</tr>
<tr>
<td>Oxidation Reduction Potential (ORP)</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Tracks chemistry in low or no oxygen conditions</td>
</tr>
<tr>
<td>Phycocyanin</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Pigment, measures cyanobacteria concentration</td>
</tr>
<tr>
<td>Photosynthetic Active Radiation (PAR)</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Measure of light available for photosynthesis</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Sonde</td>
<td></td>
<td></td>
<td></td>
<td>Measure of light penetration in shallow water</td>
</tr>
<tr>
<td>Secchi disk depth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measure of light penetration in deeper water</td>
</tr>
<tr>
<td>Transparency Tube</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measure of light penetration into shallow water</td>
</tr>
<tr>
<td>Zooplankton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Organisms fluctuate due to environmental variables</td>
</tr>
<tr>
<td>Zebra Mussel Veligers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Microscopic larval form of zebra mussels (AIS)</td>
</tr>
</tbody>
</table>
The monitoring program supports the District’s 10-year water management plan to delist lakes from the Minnesota Pollution Control Agency’s (MPCA) 303d Impaired Waters list and to improve stream water quality. The parameters monitored during the field season help determine the sources of water quality impairments and provide supporting data that is necessary to design and install water quality improvement projects.

### 2.1.2 Water Quality Sampling

At each lake monitoring location, multiple water samples were collected using a Van Dorn, or depth integration sampler, for analytical laboratory analysis. For Rice Marsh, Silver, and Staring Lakes water samples were collected at the surface and bottom due to shallow depths (2-3 m). For all other lakes within the District, water samples were collected at the surface, middle, and bottom of the lake. All samples are collected from whole meter depths except for the bottom sample, which is collected 0.5 meters from the lake bottom to prevent disrupting the sediment. The surface sample is a composite sample of the top 2 meters of the water column. The middle sample is collected from the approximate midpoint of the temperature/dissolved oxygen change or thermocline. Water quality information collected in the winter is collected using the same procedures as in the summer.

Zooplankton samples were collected using a 63 micrometer Wisconsin style zooplankton net on Lake Mitchell, Lake Riley, and Red Rock Lake. The net was lowered to a depth of 0.5 meters from the bottom at the deepest point in the lake and raised slowly. A Zeiss Primo Star microscope with a Zeiss Axiocam 100 digital camera was used to monitor zooplankton populations, scan for invasive zooplankton, and to calculate Cladoceran grazing rates on algae.

Water quality samples collected during stream monitoring events were collected from the approximate middle (width and depth) of the stream flow in ideal conditions or from along the bank when necessary. Stream velocity was calculated at 0.5 to 1 feet increments using the FloTracker Velocity Meter at each sampling location. Secchi tube measurements were also taken at these locations. If no water or flow was recorded only pictures and climatic data was collected.

The activities associated with the monitoring program are described in Table 2.1-2.

<table>
<thead>
<tr>
<th>Pre-Field Work Activities</th>
<th>Calibrate Water Quality Sensors (sonde)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obtain Water Sample Bottles and Labels from RMB Environmental Laboratories</td>
</tr>
<tr>
<td></td>
<td>Prepare Other Equipment and Perform Safety Checks</td>
</tr>
<tr>
<td></td>
<td>Coordinate Events with Other Projects and Other Entities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Lake – Physical and Chemical</th>
<th>Navigate to Monitoring Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Read Secchi Disk Depth and Record Climatic Data</td>
</tr>
<tr>
<td></td>
<td>Record Water Quality Sonde Readings at 1 Meter Intervals</td>
</tr>
<tr>
<td></td>
<td>Collect Water Samples from top, middle, and bottom</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Lake – Biological</th>
<th>Collect Zooplankton Tow (pulling a net) from Lake Bottom to Top</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Collect Zebra Mussel Veliger Tow (pulling a net) from Lake Bottom to Top at Multiple Sites</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter Lakes</th>
<th>Navigate to Monitoring Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Record Ice Thickness</td>
</tr>
<tr>
<td></td>
<td>Read Secchi Disk Depth and Record Climatic Data</td>
</tr>
<tr>
<td></td>
<td>Record Water Quality Sonde Readings at 1 Meter Intervals</td>
</tr>
<tr>
<td></td>
<td>Collect Water Samples from top, middle, and bottom</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Streams – Physical and Chemical</th>
<th>Navigate to Monitoring Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measure Flow by Measuring Velocity at 0.5 to 1 Foot Increments across Stream</td>
</tr>
<tr>
<td></td>
<td>Read Water Quality Sensors Upstream of Flow Measurement in Middle of Stream</td>
</tr>
<tr>
<td></td>
<td>Read Transparency Tube from Water Collected at Middle of Stream and Record Climatic Data</td>
</tr>
<tr>
<td></td>
<td>Collect Water Samples from Middle of Stream</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Field Work Activities</th>
<th>Ship Water Samples to Analytical Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enter Data, Perform Quality Control Checks, and Format Data for Database</td>
</tr>
<tr>
<td></td>
<td>Clean and Repair Equipment</td>
</tr>
<tr>
<td></td>
<td>Reporting and Summarizing Data for Managers, Citizens, Cities, and Others</td>
</tr>
</tbody>
</table>
2.1.3 Analytical Laboratory Methods

RMB Environmental Labs, located in Detroit Lakes, MN, is the third party company that is responsible for conducting the analytical tests on the lake and stream water samples that were collected by the District’s Water Quality Specialists. The methods used by the laboratory to analyze the water samples for the specified parameters are noted in Table 2.1-3.

Table 2.1-3 RMB Environmental Laboratories Parameters and Methods Used for Analyses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>EPA 310.2</td>
</tr>
<tr>
<td>Ammonia</td>
<td>EPA 350.1 Rev 2.0</td>
</tr>
<tr>
<td>Nitrogen, Nitrate &amp; Nitrite</td>
<td>EPA 353.2 Rev 2.0</td>
</tr>
<tr>
<td>Chlorophyll a.</td>
<td>SM 10200H</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>EPA 365.3</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
</tr>
<tr>
<td>Chloride</td>
<td>SM 10200H</td>
</tr>
</tbody>
</table>

2.1.4 Lake Water Levels

Lake level readings were used to monitor water quantity in District water bodies, recording continuous water level monitoring data from ice out until late fall. Lake levels are measured using an In-Situ Level Troll 500, 15-psig water level sensor that is mounted inside a protective PVC pipe attached to a vertical post placed in the water. A staff gauge or measuring device was mounted to the vertical post and was then surveyed by District staff to determine the elevation at the specific level sensor. Once the Level Trolls are installed and activated, they record the lake level at 30 minute intervals until they are deactivated.

In 2015, lake level measurements were collected on thirteen lakes in the District and one high value wetland, Lake Idlewild (Table 2.1-4). Lake level data is used for developing and updating the District’s models, which are used for stormwater and floodplain analysis. Monitoring the lake water levels can also help to determine the impact that climate change may have on lakes and land interactions in the watershed. Lake level data is submitted to the Minnesota Department of Natural Resources (DNR) at the end of each monitoring season. See Exhibit A for 2015 level sensor results. Lake Levels for 2014 are also provided for a year to year comparison.

Table 2.1-4 District Lakes with Level Monitoring Staff Gauges in 2015

- Duck Lake
- Hyland Lake
- Lake Idlewild
- Lake Ann
- Lake Lucy
- Lake Riley
- Lake Susan
- Lotus Lake
- Mitchell Lake
- Red Rock Lake
- Rice Marsh Lake
- Round Lake
- Silver Lake
- Staring Lake
3 Water Quality Standards

In 1974, the Federal Clean Water Act set forth the requirements for states to develop water quality standards for surface waters. In 2014, specific standards were developed for Eutrophication and Total Suspended Solid for rivers and streams. In Minnesota, the agency in charge of regulating water quality is the Minnesota Pollution Control Agency (MPCA). Water quality monitoring and reporting is a priority for the District in order to determine the overall health of the water bodies within the watershed boundaries. The District’s main objectives are to prevent a decline in the overall water quality within lakes and streams and to prevent water bodies from being added to the 303d Impaired Water Bodies list (MPCA). The District is also charged with the responsibility to take appropriate actions to improve the water quality in water bodies that are currently listed for impairments.

There are seven ecoregions within Minnesota, the RPBCWD is within the Northern Central Hardwood Forest (NCHF) ecoregion. Rural areas in the NCHF are dominated by agricultural land use practices as the ecoregion is characterized by fertile soils. For most water resources in the region, phosphorous is the limiting (least available) nutrient within lakes and streams, meaning that the extent of algal growth is often controlled by the available concentration of phosphorous. The accumulation of excess nutrients (i.e. Total Phosphorus and Chlorophyll-a) in a waterbody is called eutrophication. This relationship has a direct impact on the clarity and recreational potential of our lakes and streams. Water bodies with high phosphorus concentrations and increased levels of algal production have reduced water clarity and limited recreational potential.

All waters sampled in 2015 are considered Class 2B surface waters. This means that they should support the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. They should also be suitable for aquatic recreation of all kinds, including bathing. This class of surface water is not protected as a source of drinking water.

For more detailed information regarding water quality standards in Minnesota, please see the MPCA’s Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment, 305(b) Report, and 303 (d) List of Impaired Waters. These resources provide information to better understand the water quality assessment process and the reasoning behind their implementation.

3.1 Lakes

The MPCA defines a shallow lakes using two criteria; (1) 80% of the total lake surface area is able to support aquatic plants (littoral zone) or in which the maximum depth is less than 15 feet. Summer averages of the parameters listed in Table 3.1-1 are compared to the MPCA standards to determine the overall state of the lake. The standards are set in place to address issues of eutrophication or excess nutrients in local water bodies. Lakes with a maximum depth greater than 15 feet and a littoral area that is less than 80% of the lake surface area are categorized as deep lakes. Table 3.1-1 shows the deep lake and shallow lake key water quality standards set forth by the MPCA.

Secchi Disk readings are collected to measure the transparency, or visibility, in a given lake. A higher individual reading corresponds to increased clarity within the lake as the Secchi Disk was visible at a deeper depth in the water column.

Table 3.1-1 MPCA Water Quality Standards for Lakes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Shallow Lakes Criteria</th>
<th>Deep Lakes Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus (mg/L)</td>
<td>≤ 0.060</td>
<td>≤ 0.040</td>
</tr>
<tr>
<td>Chlorophyll a (ug/L)</td>
<td>≤ 20</td>
<td>≤ 14</td>
</tr>
<tr>
<td>Secchi Disc (m)</td>
<td>≥ 1</td>
<td>≥ 1.4</td>
</tr>
</tbody>
</table>
3.2 Streams

Table 3.2-1 displays the new water quality parameters developed by the MPCA in 2014 for Eutrophication and Total Suspended Solids. The new standards include some parameters the District has not yet incorporated into their monitoring procedures, but they may be added in the future.

Eutrophication pollution is measured based upon the exceedance of the summer average (May-September) of total phosphorus levels and chlorophyll-a (seston), five-day biochemical oxygen demand (amount of dissolved oxygen needed by organisms to breakdown organic material present in a given water sample at a certain temperature over a 5 day period), diel dissolved oxygen (DO) flux (difference between the maximum DO concentration and the minimum daily DO concentration), or summer average pH levels. Streams that exceed phosphorus levels but do not exceed the chlorophyll-a (seston), five-day biochemical oxygen demand, diel dissolved oxygen flux, or pH levels meet the eutrophication standard. The District added Chlorophyll-a to its sampling regime in 2015 to account for the polluted condition when chlorophyll-a (periphyton) concentration exceeds 150 mg/m² more than once in ten years. The daily minimum Dissolved Oxygen concentration for all Class 2B Waters cannot dip below 4 mg/L to achieve the MPCA standard and was used in the analysis for the Annual Report.

Total suspended solids (TSS) is a measure of the amount of particulates (soil particles, algae, etc) in the water. Increased levels of TSS can be associated with many negative effects including: nutrient transport, reduced aesthetic value, reduced aquatic biota, and decreased water clarity. For the MPCA standard, TSS concentrations are assessed from April through September and can be exceeded no more than 10 percent of the time during that period.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Parameter</th>
<th>Exceedance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eutrophication</td>
<td>Phosphorus</td>
<td>≤ 100 ug/L</td>
</tr>
<tr>
<td></td>
<td>Chlorophyll-a (seston)</td>
<td>≤ 18 ug/L</td>
</tr>
<tr>
<td></td>
<td>Diel Dissolved Oxygen</td>
<td>≤ 3.5 mg/L</td>
</tr>
<tr>
<td></td>
<td>Biochemical Oxygen Demand</td>
<td>≥ 2 mg/L</td>
</tr>
<tr>
<td></td>
<td>pH Max</td>
<td>≤ 9 su</td>
</tr>
<tr>
<td></td>
<td>pH Min</td>
<td>≥ 6.5 su</td>
</tr>
<tr>
<td>TSS</td>
<td>TSS</td>
<td>≤ 30 mg/L</td>
</tr>
</tbody>
</table>

Table 3.2-1 MPCA Water Quality Standards for Streams
4 Water Quality Projects/Monitoring

In order to improve water quality within the watershed, the District conducts studies to root out key sources of pollution. Once identified, the District will often monitor these sites and eventually implement a water quality project if the data confirms the suspicion. Below is a summary list of special projects/monitoring the District has worked on in 2015.

4.1 2015 Lakes Water Quality Summary

The 2015 growing season chlorophyll-a mean concentrations for all lakes sampled within the District are shown in Figure 4-1. Four lakes sampled in 2015 within the District are categorized as ‘deep’ by the MPCA (>15 ft deep, <80% littoral area): Lake Ann, Lotus Lake, Lake Riley, and Round Lake. The MPCA standard for Chlorophyll-a in deep lakes (<14 ug/L) was met by Lake Ann and Round Lake, but levels were twice the standard in Lotus Lake and above the standard for Lake Riley. The remainder of the lakes sampled in 2015 are categorized as ‘shallow’ by the MPCA (<15 ft deep, >80% littoral area): Duck Lake, Hyland Lake, Lake Lucy, Mitchell Lake, Red Rock Lake, Rice Marsh Lake, Staring Lake, Lake Susan, and Silver Lake. The water quality standard for shallow lakes (<20 ug/L) was met by Duck Lake, Lake Idlewild, and Red Rock Lake in 2015. Mitchell Lake, Staring, and Silver exceeded the standard, while Lake Lucy, Rice Marsh Lake and Lake Susan doubled the MPCA standard. Hyland Lake experienced a large increase in Chlorophyll in 2015 (86 ug/L) from 2014 (39 ug/L) with values 3 times higher than the standard. Overall, five of the fourteen lakes were sampled in 2015 met the MPCA Chlorophyll-a standard for their lake classification: Lake Ann, Duck Lake, Lake Idlewild, Red Rock Lake, and Round Lake. Mitchell Lake was the only lake that changed from meeting the standard in 2014 to slightly exceeding (26 ug/L) the standard in 2015.

The total phosphorous growing season averages for all lakes sampled within the District in 2015 is shown in Figure 4-2. The MPCA standard for total phosphorus in deep lakes (<0.040 mg/L) was met by Lake Ann and Round Lake, but the levels were above the standard in Lotus Lake and Lake Riley. For shallow lakes, the MPCA standard (<0.060 mg/L) was met by Duck Lake and Red Rock Lake. Rice Marsh Lake had the highest total phosphorous concentrations with 0.11 mg/L, while Staring, Susan, Lucy, and Silver Lake all exceeded the standard. Lake Idlewild and Mitchell Lake were slightly above the standard (0.063 mg/L) which was a change from 2014 when both lakes met the MPCA standard. Overall, four of the fourteen lakes sampled met the MPCA total phosphorus standard for their lake classification in 2015: Lake Ann, Duck Lake, Red Rock Lake and Round Lake.
The 2015 secchi disk growing season mean for all District lakes sampled is shown in Figure 4-3. The MPCA standard for secchi disk depth for deep lakes (> 1.4 m) was met by all deep lakes in the District. For shallow lakes (>1 m), eight of ten lakes monitored met and exceeded the secchi depth water quality standard. Silver Lake and Hyland Lake did not meet the standard while, Duck Lake, Lake Idlewild, Lake Lucy, Mitchell Lake, Red Rock Lake, Rice March Lake, Staring Lake, and Lake Susan met the standard. Lake Ann had the highest secchi readings at 3.7 m, while the shallow lakes ranged between 1.1-1.8 m. Average secchi disk readings for 2015 were fairly similar to 2014, except for Hyland Lake which did not exceed standards in 2015 (0.96 m) as it did in 2014 (1.5 m).

4.2 Lake Lucy Road (Proposed Project Site)

The Use and Attainability Analysis (UAA) was conducted for Lake Lucy in 2013 indicated that runoff from Lake Lucy Road and the area north of Lake Lucy Road was significantly contributing to the nutrient load of Lake Lucy. District and Barr Engineering Staff placed an automated sampling unit at Lake Lucy Road, north of Lake Lucy, to collect water samples during high precipitation events (>1.5 inches) during the summers of 2014 and 2015. This was done in order to explore the potential and benefit of installing an iron enhanced sand filter system to remove excess...
phosphorous and total suspended solids. In both 2014 and 2015, total phosphorus levels consistently exceeded the MPCA set standard for stormwater retention ponds (0.1 mg/L - 0.6 mg/L), in some cases more than doubling the standard (Figure 4-4). Additionally, dissolved phosphorous levels were high ranging from 0.003 mg/L to 0.4 mg/L. Likewise total suspended solid levels were also high ranging from 15mg/L-200 mg/L (Figure 4-5). The results from 2 years of monitoring suggest that an iron enhanced sand filter system has the potential to reduce the nutrient load to Lake Lucy.

**Figure 4-4 2014-2015 Lake Lucy Road Total Suspended Solids**

**Figure 4-5 2014-2015 Lake Lucy Road Dissolved Phosphorus and Total Phosphorus**

### 4.3 Creek Restoration Action Strategy

The Riley Purgatory Bluff Creek Watershed District (RPBCWD) developed the Creek Restoration Action Strategy (CRAS) in order to prioritize creek reaches, sub-reaches, or sites, in need of stabilization and/or restoration. RPBCWD has identified eight categories of importance for project prioritization including: infrastructure risk, erosion and channel stability, public education, ecological benefits, water quality, project cost, partnerships, and watershed benefits. These categories will be scored using methods developed for each category based on a combination of published studies and reports, erosion inventories, field visits, and scoring sheets from specific methodologies. Final tallies of scores for each category using a two-tiered ranking system was used to prioritize sites for restoration/remediation.
In 2015, creek walks were conducted on 2 of the lower reaches of Riley Creek (R1 and R2), 5 reaches of Purgatory Creek (P1, P2, P3, P4, and P5), and all but reach 1 of Bluff Creek. Staff conducted Pfankuch Stream Assessments, MPCA Stream Habitat Assessments, took photos, and recorded notes of each subreach to assess overall stream conditions. The CRAS was finalized/adopted in 2015 and a severe site list was developed including reaches from all three creeks (Table 4.3-1). Staff will continue to go out and conduct creek walks in the future to collect more stream information and update the CRAS in order to prioritize project sites for restoration across the District. In addition to creek walks, staff also installed bank pins near all regular water quality sites (Figure 4-6). Site selection was based upon general stream conditions, so pins were installed in “representative” erosion sites for each reach. Once the site was selected, 3 pieces of rebar were installed horizontally into starting from the bottom of the stream and moving to the top of the exposed bank. Pins were installed in both banks and will be checked yearly or after major rain events to evaluate erosion rates for each reach. This information is incorporated within our Creek Fact Sheets (Appendix D) and in our CRAS program.

Table 4.3-1 Severe Reaches Identified by the Creek Restoration Action Strategy

<table>
<thead>
<tr>
<th>Stream</th>
<th>Rank Tier II</th>
<th>Rank Tier I</th>
<th>Reach</th>
<th>Subreach</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purgatory</td>
<td>1</td>
<td>7</td>
<td>P7</td>
<td>P7E</td>
<td>Covington Road to Covington Pond</td>
</tr>
<tr>
<td>Riley</td>
<td>2</td>
<td>1</td>
<td>R2</td>
<td>R2E</td>
<td>Mid 1/3 between Dell Road and Eden Prairie Road</td>
</tr>
<tr>
<td>Bluff</td>
<td>3</td>
<td>9</td>
<td>BST</td>
<td>BT3A</td>
<td>Audubon Road to Pioneer Trail</td>
</tr>
<tr>
<td>Purgatory</td>
<td>4</td>
<td>8</td>
<td>P1</td>
<td>P1E</td>
<td>1,350 ft Downstream of Pioneer Trail to Burr Ridge Lane</td>
</tr>
<tr>
<td>Bluff</td>
<td>5</td>
<td>2</td>
<td>B1</td>
<td>B1D</td>
<td>475 ft Upstream of Great Plains Blvd to Great Plains Blvd</td>
</tr>
<tr>
<td>Bluff</td>
<td>6</td>
<td>4</td>
<td>B3</td>
<td>B3A</td>
<td>750 ft Downstream of RR Bridge to 860 ft Downstream</td>
</tr>
<tr>
<td>Bluff</td>
<td>7</td>
<td>3</td>
<td>B5</td>
<td>B5C</td>
<td>Galpin Blvd to West 78th Street</td>
</tr>
<tr>
<td>Bluff</td>
<td>8</td>
<td>5</td>
<td>B3</td>
<td>B3C</td>
<td>1,675 ft Upstream of Audubon Road to Lyman Blvd</td>
</tr>
<tr>
<td>Bluff</td>
<td>9</td>
<td>6</td>
<td>B5</td>
<td>B5B</td>
<td>985 ft Upstream of Galpin Blvd to Galpin Blvd</td>
</tr>
</tbody>
</table>

4.4 Chloride Monitoring

Chloride levels in our water bodies are becoming of greater concern within the state of Minnesota. It takes only one teaspoon of road salt to permanently pollute 5 gallons of water. At high concentrations, chloride can also be harmful to fish, aquatic plants, and other aquatic organisms. The District has been monitoring salt concentrations in our lakes and ponds since 2013 and plans to continue monitoring efforts in order to identify high salt concentration areas and to assess temporal changes in salt concentrations over time. Currently the District is monitoring the Riley Chain of Lakes (Lake Ann, Lake Lucy, Lake Susan, Rice Marsh Lake, and Lake Riley) and a chain of ponds that drains the City of Eden Prairie Center to Purgatory Creek. During sampling, staff collects a surface 2m composite and a bottom water sample to be analyzed. This is the final year of monitoring for the RCL for the 3 year rotation the District currently has in place.
4.5 Lake Susan Park Pond Monitoring

Similar to the Lake Lucy Road, Lake Susan Park Pond was identified as contributing a considerable amount of nutrient pollution to Lake Susan as identified in the Use and Attainability Analysis (UAA) conducted in 2013. Staff conducted sampling at the Lake Susan Park Pond (East and West side) and at the Lake Susan Park Pond Outlet on the south end of the pond. Grab samples were conducted to confirm/deny the amount of nutrient pollution being contributed to Lake Susan. Water samples were analyzed for total dissolved phosphorous, total phosphorous, total suspended solids, and chlorophyll-a. This was the first year of data collection at these sites and the District will be placing an automated water sampling unit at the outlet structure in 2016 to better capture rain events.

4.6 Zooplankton

In 2015, 3 lakes were sampled for zooplankton including Mitchell Lake, Red Rock Lake, and Lake Riley. Zooplankton play an important role in a lake’s ecosystem, specifically for the fishery and bio control of algae. Healthy zooplankton populations are characterized by balanced densities (number per meter squared) of three main groups of zooplankton: Rotifers, Cladocerans, and Copepods. The District analyzed zooplankton population for the following reasons:

1. Epilimnetic Grazing Rates: The epilimnion is the uppermost portion of the lake during stratification. Zooplankton are bio controls for algae that may otherwise grow to an out-of-control state and therefore can have effects on water clarity.

2. Population Monitoring: Zooplankton are a valuable food source for planktivorous fish and other organisms. The presence or absence of healthy zooplankton populations can determine the quality of fish in a lake. Major changes in a lake (removal of common carp, winter kill, etc.) can change zooplankton populations drastically in lakes. By insuring that the lower parts of the food chain are healthy, we can protect the higher ordered organisms.

3. Aquatic Invasive Species Monitoring: Early detection of water fleas is important to ensure these organisms are not spread. These invasive species outcompete native zooplankton for food and grow large spines which make them difficult for fish to eat.

Lake Riley

In 2015, all three groups of zooplankton were captured in Lake Riley (Exhibit C). Copepods were the most abundant zooplankton sampled in the 2015 across all sampling dates, except for the August sample which had a large spike in rotifers Figure 4-7. The number of copepods were at their highest point in spring, spiking in June and trailing off for the remainder of the year. The rotifer community spiked in August and remained in relatively low numbers for year. Cladoceran numbers remained relatively low, but stable across all sampling dates with the highest number recorded in June and the lowest in September. Across all sampling dates the cladoceran community was dominated by large bodied zooplankton with the most common being *Daphnia pulex*.

Cladocera consume algae and have the potential to improve water quality if abundant. The estimated epilimnetic grazing rates of cladocera observed in 2015 ranged from 1% to 39% (Figure 4-8). During the spring grazing rates were high and then began to steadily decrease for the remainder of the year. The high spring grazing rates were linked with the high number of *Daphnia pulex* present which declined after the June date and were replaced with small bodied cladocera. The reduction in large bodied zooplankton during the early summer months is often seen in zooplankton communities as a result of the hatching of young of the year (YOY) fish (fish born in the spring) which consume large/high energy zooplankton or because of an increase in cyanobacteria in the phytoplankton community which are inedible to cladocera.
Red Rock Lake

In 2015, all three groups of zooplankton were present in Red Rock Lake (Exhibit C). Rotifers were the most abundant zooplankton sampled in the 2015 across all sampling dates, except for the June sample which had high numbers of copepods (Figure 4-9). Cladoceran numbers decreased from June to July mainly caused by the reduction in the number of small bodied cladocera, however larger body cladocera also decreased. These reductions may be due to an increase in the number of YOY fish or the increase in cyanobacteria as discussed in the Lake Riley summary. After August both the number of small and large bodied cladocera recovered to levels previously seen in the spring. Both copepods and rotifers followed a similar trend except each experienced the lowest abundance of both species during the August sampling date. The most abundant large bodied cladoceran was *Daphnia galeata mendotae* which is very common in lakes of the glaciated region.
Large cladocera consume algae and if enough are present in a lake there is the potential to improve water quality. The estimated epilimnetic grazing rates observed in 2015 experienced a wide range from 8% to 94% (Figure 4-10). In August the grazing rate was at its lowest point due to the lower number of large bodied zooplankton present. Grazing rates did spike in September when the number of *Daphnia galeata mendotae* increased substantially from previous sampling dates.

![Figure 4-9 Red Rock Lake Zooplankton Counts (#/m²)](image)

![Figure 4-10 Red Rock Lake Epilimnetic Grazing Rates](image)

Mitchell Lake

Although rotifers were consistently higher, the three groups of zooplankton had fairly similar numbers during the 2015 field season on Mitchell Lake (Exhibit C). Cladocera, copepods, and rotifers also followed a similar pattern with moderate numbers present in the spring, a decline in July, and an increase for the remainder of the year peaking during the September sampling event (Figure 4-11). The cladocera community was comprised mainly of
smaller bodied organisms with fewer large bodied cladocera in 2015. The most abundant cladocera was *Bosmina longirostris* which is small and common throughout the continent.

The estimated epilimnetic grazing rate upon algae observed in 2015 ranged from 10% to 41% (Figure 4-12). During spring and early summer, grazing rates were erratic before stabilizing during August and September. The highest recorded grazing rate was observed in September when larger bodied cladocera were more numerous in the zooplankton community.

Figure 4-11 Mitchell Lake Zooplankton Counts (#/m²)

Figure 4-12 Red Rock Lake Epilimnetic Grazing Rates
4.7 Bluff Creek Fish Assessment

In 2015, Barr Engineering sampled the fish community in Bluff Creek to assess general stream health, the fish assemblage, and to assess any future changes that may occur in the fish community as a result of the planned restoration project at the Minnesota River Bluffs LRT National Trail (near Pioneer Trail). Sampling included backpack electrofishing surveys with the LR-24 Smith-Root Electrofisher across 6 sites, including 5 regular monitoring sites and an additional site below the major stream disconnect (falls) located under the trail.

During the sampling events, a total of 9 fish species were sampled including the Iowa darter, logperch, brook stickleback, fathead minnow, creek chub, black bullhead, spotfin shiner, central mudminnow, and green sunfish (Table 4.7-1). Of these 9 species, the Iowa darter and the logperch are considered sensitive species or species that are intolerant to pollution. The most common fish species found in Bluff Creek was the Brook Stickleback which is a short-lived, tolerant species. All 9 species of fish were found below the falls under the recreational trail, while only 4 were found above the falls which included only tolerant species. These results fit with the results found in the most recent Bluff Creek TMDL conducted by Barr Engineering (City of Chanhassen and MPCA) in 2010 which identified the falls as a significant impediment for fish traveling upstream and explains the MPCA impaired status for aquatic life in 2009.

Table 4.7-1 Fish Species Data from Bluff Creek

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B1A</td>
</tr>
<tr>
<td>black bullhead</td>
<td><em>Ictalurus melas</em></td>
<td>4</td>
</tr>
<tr>
<td>brook stickleback</td>
<td><em>Eucalia inconstans</em></td>
<td>55</td>
</tr>
<tr>
<td>central mud minnow</td>
<td><em>Umbra limi</em></td>
<td>2</td>
</tr>
<tr>
<td>creek chub</td>
<td><em>Semotilus atromaculatus</em></td>
<td>37</td>
</tr>
<tr>
<td>green sunfish</td>
<td><em>Lepomis cyanellus</em></td>
<td>38</td>
</tr>
<tr>
<td>*Iowa darter</td>
<td><em>Etheostoma nigrum</em></td>
<td>19</td>
</tr>
<tr>
<td>*logperch</td>
<td><em>Percina caprodes</em></td>
<td>1</td>
</tr>
<tr>
<td>northern fat head minnow</td>
<td><em>Pimephales promelas</em></td>
<td>23</td>
</tr>
<tr>
<td>spotfin shiner</td>
<td><em>Cyprinella spiloptera</em></td>
<td>15</td>
</tr>
<tr>
<td>Total Number of Organisms</td>
<td></td>
<td>194</td>
</tr>
<tr>
<td>Total Number of Species</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>*Sensitive Species</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
5 Aquatic Invasive Species

5.1 AIS Management

Due to the increase in spread of Aquatic Invasive Species (AIS) throughout the state of Minnesota, staff completed an AIS early detection and management plan in 2015. As part of the plan, an AIS inventory for all waterbodies within the District was completed and a foundation was set up to monitor invasive species that are currently established within District waters (Table 5.1-1). Early detection is critical to reduce the negative impacts of AIS and to potentially eliminate and invasive species before it becomes fully established within a waterbody. Effective AIS management of established AIS populations will also reduce negative impacts and control their further spread. The RPBCWD AIS plan is adapted from the Wisconsin Department of Natural Resources (WIDNR), Minnehaha Creek Watershed District (MCWD), and the Minnesota Department of Natural Resources (MNDNR) Aquatic Invasive Species (AIS) Early Detection Monitoring Strategy. The goal is to not only assess AIS that currently exist in RPBCWD waterbodies, but to be an early detection tool for new infestations of AIS.

Table 5.1-1 Aquatic Invasive Species Infested Lakes

<table>
<thead>
<tr>
<th>Lake Names</th>
<th>Infested Waters</th>
<th>Brittle Naiad</th>
<th>Eurasian Water Milfoil</th>
<th>Curlyleaf Pondweed</th>
<th>Purple Loosestrife</th>
<th>Common Carp</th>
</tr>
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<tbody>
<tr>
<td>Ann</td>
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<td></td>
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<tr>
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</tr>
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<td>x</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Susan</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell</td>
<td>x</td>
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</tr>
</tbody>
</table>

*X – New aquatic invasive species infestation in 2015.

5.2 New Infestations

In 2015 the District had two new infestations of AIS both occurring in Staring Lake. Eurasian Watermilfoil and Brittle Naiad were identified in the fall of 2015 by plant surveys conducted by the University of Minnesota. Both Eurasian watermilfoil and brittle naiad are species native to Europe and Asia and have been introduced to the United States. The concern with these species is that they can form dense mats that outcompete native species and interfere with recreational activities such as boating, swimming, and fishing.

The pathway of infestation of Eurasian water milfoil into Staring Lake was most likely contaminated boats and equipment as the areas where it was found were near the boat ramp and fishing pier. The infestation was in the early stages and the District immediately began working with James Johnson from the Freshwater Scientific LLC to develop a mechanical and chemical strategy to potentially eliminate the plant from the lake. Staff and University of Minnesota volunteers spent a day hand pulling individual plants which was then followed up by an herbicide treatment. This means of control is a fairly new strategy, but has been shown to be effective on a few lakes in the past. Next year aquatic plant surveys will evaluate the success of the combined mechanical and chemical treatment.
Brittle naiad has been established in the Purgatory Recreational Area for some time which is located directly North of Staring Lake. Distribution maps suggest that brittle naiad infested Staring Lake through Purgatory Creek which connects the two waterbodies as it was found in locations near the outlet of Purgatory Creek into Staring Lake. As of now there are limited tools for the elimination/management of brittle naiad due to its resistance to herbicide treatments. The RPBCWD will continue to monitor brittle naiad in the Staring Lake to the effects on the native plant community.

5.3 Aquatic Plant Management

Aquatic plant surveys are important because they allow the District to map out invasive plant species for treatment, locate rare plants for possible protection, create plant community/density maps which evaluate temporal changes in vegetation community, and they can assess the effectiveness of herbicide treatments. Aquatic plant surveys have been conducted on a rotational basis within RPBCWD to ensure all lakes have received adequate assessments. Additionally, as projects arise or issues occur, additional plant surveys were conducted to aid in the decision making process. In 2015 aquatic plant assessments occurred on Lake Riley, Staring Lake, and Mitchell Lake by the RPBCWD and Red Rock Lake by the City of Eden Prairie. Curly leaf herbicide treatments occurred on Red Rock Lake, Mitchell Lake, and Lake Riley in the spring of 2015. Eurasian watermilfoil herbicide treatments occurred on Lake Riley in early summer and on Lake Staring in the fall as part of the District’s AIS rapid response action. Herbicide treatments have been shown to reduce and control aquatic invasive plants at a manageable level to allow for native plants to increase in abundance and reduce the negative impacts associated with AIS. The District will continue to monitor the aquatic plant communities within our lakes and use herbicide treatments to manage aquatic invasive plants to sustain healthy aquatic communities into the future.

5.4 Common Carp Management

The RPBCWD in cooperation with the University of Minnesota, has been a key leader in the development of successful carp management strategy for lakes within the state of Minnesota. Following the completion of the Riley Chain of Lakes (RCL) Carp Management Plan drafted by the University of Minnesota in 2014, the District took over monitoring duties from the University in 2015. Adult carp were monitored by conducting (3) 20 minute electrofishing transects per lake between August and October. If the total biomass estimate of carp reached over 100kg/h than the District would need to look into hiring commercial fisherman to conduct winter seining. Young of the year (YOY) carp were monitored by conducting (5) 24 hour small mesh fyke net sets between the end of July and September. If YOY carp were captured during this event it meant successful recruitment occurred and monitoring efforts should be increased with the additional option of conducting winter seining.

Staff completed fyke net surveys in August on all lakes within the RCL. As true with many lakes during late summer located within the twin cities metro area, the Riley Chain of Lakes inshore community was dominated by bluegill sunfish and yellow bullhead with other centrarchid species including pumpkinseed sunfish and black crappie also common (Exhibit B). In 2015 no YOY carp were captured in Lake Lucy, Lake Ann, and Lake Riley. In Lake Susan 4 young of the year YOY carp were captured and 1 YOY carp was captured in Rice Marsh Lake. This is evidence that recruitment in occurring in these two lakes at a relatively low level and monitoring should continue to ensure carp populations do not exceed the biomass threshold.

Electrofishing surveys conducted on the RCL were completed between August and early October. All lakes within the RCL have carp biomass estimates below the set threshold developed by the University of Minnesota (U of M) except Lake Lucy (Table 5.4-1). Lake Lucy has a calculated carp biomass estimate of 109 kg/h which is just over the recommended level (100 kg/h). In discussion with the U of M it was determined that this was of limited concern as
many carp within the RCL migrate to Lucy throughout the year and because of the small sample size. Additionally, no YOY carp were captured in Lake Lucy and all carp captured electrofishing were very large adults suggesting that no/very little recruitment is occurring. Electrofishing surveys are normally scheduled to be conducted on a bi-annual basis, however due to the capture of multiple YOY carp in Lake Susan and the high number of adults captured on Lake Lucy, staff recommends electrofishing both lakes in the upcoming 2016 field season.

Table 5.4-1 Common Carp Catch Rates & Biomass Estimates for the Riley Chain of Lakes

<table>
<thead>
<tr>
<th>Lake</th>
<th>Fish per Hour</th>
<th>Density per Hectare</th>
<th>Average Weight (kg)</th>
<th>Carp Biomass (kg/h)</th>
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<tbody>
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<td>Susan</td>
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<tr>
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<td>0</td>
<td>0</td>
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<td>Riley</td>
<td>1.67</td>
<td>10.91</td>
<td>2.92</td>
<td>31.84</td>
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5.5 Zebra Mussel Monitoring

Although no zebra mussels have been found within the boundaries of the Watershed District, the threat is very near. In 2015 zebra mussels were found across a wide area of Christmas Lake which was thought to have been clean of mussels since their discovery in August of 2014. The 2015 discovery concluded a year of an intensive effort spanning multiple organizations to eliminate zebra mussels which included the use of a barrier and 3 separate treatments using pot ash, copper sulfate, and Zequanox. Additionally, Three Rivers Park District staff discovered a single zebra mussel on a settlement plate in Bryant Lake in the fall of 2015. Since both lakes lie directly adjacent to RPBCWD, it will be critically important to continue to monitor, inspect, and provide education to residents to stop the spread of these invasive mussels.

This year the District conducted veliger sampling from June to July on 14 lakes to detect the presence of zebra mussels. Each lake was sampled once except for Lake Riley which was sampled twice because during the 2015 open water season an inspector stopped 2 boats from entering the lake with zebra mussels attached. RMB processed the samples and found no zebra mussel veliger’s across all lakes.

Adult zebra mussel were assessed using monitoring plates that were hung from all public access docks and private residents participating in the Adopt-a-Dock program. Monitoring plates were checked bi-weekly and no mussels were found across all lakes during the 2015 open water season.
6 Lake and Creek Fact Sheets

The Riley-Purgatory-Bluff Creek Watershed District has included in this report informational fact sheets for the lakes and creeks that were monitored during the 2015 sampling season (See Exhibit D). The lake fact sheets include: Lake Ann, Duck Lake, Hyland Lake, Lake Idlewild (high value wetland), Lotus Lake, Lake Lucy, Mitchell Lake, Red Rock Lake, Rice Marsh Lake, Lake Riley, Round Lake, Silver Lake, Staring Lake, and Lake Susan. The creek fact sheets include: Bluff Creek, Purgatory Creek, and Riley Creek.

Each lake fact sheet includes a summary of the historical water quality data collected as related to the MPCA water quality parameters: Secchi Disk depth, Total Phosphorus, and Chlorophyll-a. Each creek fact sheet includes a summary of the most current Creek Restoration Acton Strategy which includes the analysis of infrastructure risk, water quality, stream stability/erosion, and habitat. Lake or creek characteristics, stewardship opportunities, and information about what the District is doing in and around local water bodies are also described in each fact sheet.
Exhibit A

2014 & 2015 Lake Level Sensor Graphs
Figure A-1. **Lake Ann** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-2. **Duck Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-3. **Hyland Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.
Figure A-4. **Lake Idlewild** level elevation data (ft.) for 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-5. **Lotus Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-6. **Lake Lucy** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.
Figure A-7. **Mitchell Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-8. **Red Rock Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-9. **Rice Marsh Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.
Figure A-10. **Lake Riley** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-11. **Round Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-12. **Silver Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.
Figure A-13. **Staring Lake** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.

Figure A-14. **Lake Susan** level elevation data (ft.) for 2014 and 2015 along with the lake’s ordinary high water level (OHWL). Daily rainfall (in.) is displayed along the top of the graph.
Exhibit B

2015 Riley Chain of Lakes Trap Net Data
Table B1: 2015 Lake Lucy Trap Net Data Summary

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of fish caught in each category (inches)</th>
<th>Total</th>
<th>Fish/Net</th>
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<tbody>
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<td>0-5</td>
<td>6-8</td>
<td>9-11</td>
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Table B2: 2015 Lake Ann Trap Net Data Summary

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<th>Fish/Net</th>
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Exhibit C

2015 Zooplankton Summary Data
### Table C1: 2015 Mitchell Lake Zooplankton Counts (#/m²)

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| **TOTAL** | 1,481,998 | 885,078 | 499,791 | 1,135,305 | 2,483,171 |
### Table C2: 2015 Red Rock Lake Zooplankton Counts (#/m²)

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Table C3: 2015 Lake Riley Zooplankton Counts (#/m²)

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<td>724597</td>
</tr>
</tbody>
</table>
Help prevent the spread of aquatic invasive species

Aquatic invasive species (AIS) are a serious concern. Both managing invasives, and preventing their spread are important strategies to keep our waters healthy.

The district uses several tools to help in this work including education programs for youth and adults, early detection monitoring aided by volunteers, boat launch inspectors, fish and plant surveys, and lake treatment for invasive plants.

You can help too!

- Inspect your boat
- Clean, drain, dispose
- Pull the boat plug

Become a volunteer monitor

Contact us for more information

Located in Chanhassen northwest of Highway 5 and Powers Blvd, Lake Ann is one of the deepest lakes in the watershed district. It is surrounded by open hills and trees, with very little development on its shores. Lake Ann Park is a popular place for a swim. If planning a trip to the lake, keep in mind that only boats with electric motors and carry-on craft are permitted.

Dive deeper

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

Aquatic plants

Watershed study

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Carp management

Quick facts

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Size</td>
<td>119 acres</td>
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<td>Volume</td>
<td>2005 acre-ft</td>
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<td>16.8 ft</td>
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<td>Watershed size</td>
<td>250 acres</td>
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<td>105 acres</td>
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<td>MPCA lake classification</td>
<td>Deep</td>
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</table>

Common fish
Bluegill, White Sucker, Black Crappie, Yellow Perch

Invasive Species
Curlyleaf pondweed, Eurasian watermilfoil, Common Carp

Trophic status
Mesotrophic

Impairment
Mercury

Did you know?

- Lakes Ann and Lucy are the headwaters to Riley Creek, which eventually flows into the Minnesota River
- Existing land use is mostly natural spaces but may be turned into homes in the future
- Water entering Ann stays in the lake for 11 years before it flows out Riley Creek

Land use

The land area that drains into Lake Ann is small and mostly open parks and natural spaces.

Contact us

DISTRICT OFFICE
14500 Martin Drive
Suite 1500
Eden Prairie, MN 55344

CONTACT INFO
952.607.6481
info@rpbcwd.org
rpbcwd.org

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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 for each graph is for the average values (the dots) to be below the red line.

During the growing season (May - 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. These deep lake standards are listed in the summary table.

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 Ann.

<table>
<thead>
<tr>
<th>Keep the curb clean</th>
<th>Water with care</th>
<th>Salt smart</th>
<th>Reuse the rain</th>
<th>Build a raingarden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweep up leaves, grass clippings and fertiliser from driveways and streets.</td>
<td>Grass requires 1 inch of water per week, about one hour of sprinkling per week if it has not rained.</td>
<td>The salt we use to melt ice can pollute our lakes and creeks. Use salt sparingly and always shovel first.</td>
<td>Collect and reuse rainwater with a rain barrel.</td>
<td>Raingardens soak up water and filter out pollution. Visit our website for help.</td>
</tr>
</tbody>
</table>

<summary_table>

<table>
<thead>
<tr>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
</tr>
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<tbody>
<tr>
<td>TP</td>
<td>0.05 0.009 0.026</td>
<td>0.03 0.016 0.024</td>
</tr>
<tr>
<td>Chl-a</td>
<td>26 1.3 8.1</td>
<td>19 4 7.8</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1.4 m</td>
<td>6.8 1 2.5</td>
</tr>
</tbody>
</table>
</summary_table>

**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.
**What’s happening**

**Cycle the Creek**

On October 10th, 2015 community members came together to explore Bluff Creek by bicycle. At stops on the way they discovered new things about Bluff Creek, the work the City of Chanhassen and watershed district are undertaking to keep it clean, and what they could do to help. The weather was perfect for this 8-mile ride, and the fall colors were out in full display. Cycle the Creek was such a success that the district has decided to make it an annual activity. In 2016, we’ll be touring Purgatory Creek. The event will be held in early October. It is relaxed-paced and family-friendly. Check the district website for updates. You can also call or write at the contact information below.

**Grants available for clean water projects**

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**

**Contact:** Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

**You can help us**

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 Bluff 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.

**Did you know?**

- **Bluff Creek is entrenched (confined to a ravine) for most of its length**
- **A change from forest to farming landuse in the past led to increased sediment and water movement**
- **Nearly 85% of the watershed is covered with glacial deposits of loamy till and some deposits of muck**

**Land use**

- **Agricultural**
- **Low Density Development**
- **Medium Density Development**
- **Undeveloped**
- **Open Space**

**Quick facts**

- **Length**: 6.8 miles
- **Elevation drop**: 232 ft
- **Watershed size**: 5.8 sq miles
- **# of cities in watershed**: 2
- **# of lakes connected**: 0
- **# of monitoring sites**: 5
- **# of parks along creek**: 3

**Common fish**

- Brook Stickleback, Northern Fathead Minnow

**Invasive Species**

- Reed Canary Grass, Buckthorn

**Impairment**

- Fish, turbidity

The headwaters of Bluff Creek are located near Hwy 41 in Chanhassen. The creek discharges into the Minnesota River south of Hwy 212. Throughout much of the watershed, the creek is sinuous with steep, tree-lined banks.
How healthy is Bluff Creek?

Keeping Bluff 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 Bluff Creek water quality for almost 30 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 2015.

Dive deeper  Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

### Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

### Restoration prioritization

### Implementation plan
What’s happening

Master Water Stewards

Master Water Stewards have arrived in our district! The program offers training from water professionals - engineers, educators, planners and more. Participants also build a network with like-minded peers, with an emphasis on creativity and collaboration.

Armed with that knowledge, Stewards build projects in their communities that protect water quality and work to educate their neighbors on clean water issues. Past Stewards have installed rain gardens, rain barrels, cisterns, and water-permeable walkways that catch polluted rainwater before it makes its way to a nearby lake or stream.

Interested in becoming a steward, or learning how a steward can help you? Visit masterwaterstewards.org, or contact us at 952-607-6481, mjordan@rpbcwd.org.

Dive deeper

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

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

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Watershed study
BARR Engineering. COMMING SOON. Purgatory Creek Watershed Restoration Study.

Grants available for clean water projects

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Awards: up to $3000 (25% homeowner match)
Technical help available
Contact: Michelle Jordan 952-607-6481 mjordan@rpbcwd.org

Duck Lake
Located in northwest Eden Prairie, Duck Lake is situated just west of Eden Prairie Road and south of Duck Lake Trail. Off the northern side of the lake, public parking and a paved trail are available along Duck Lake Trail. Boat access on the lake is limited due to a motorized boat restriction. Non-motorized boats such as canoes, kayaks, and sailboats are welcome.

Quick facts

| Size      | 38 acres |
| Volume   | 164 acre-ft |
| Average depth | 4 ft |
| Maximum depth | 10 ft |
| Watershed size | 228 acres |
| Direct land draining | 174 acres |
| MPCA lake classification | Shallow |

Common fish
Bluegill, Black Crappie, Bullhead

Invasive Species
Curlyleaf pondweed, Common carp

Trophic status
Mesotrophic (moderate nutrient level)

Did you know?
Water entering Duck stays in the lake for 3 years before it flows out
Duck stands alone - there are no upstream creeks or lakes that flow directly into the lake
Water leaves Duck Lake through an outlet pipe on its south-east side

Land use

Duck Lake

Riley Purgatory Bluff Creek Watershed District

2015

Water leaves Duck Lake through an outlet pipe on its south-east side

Contact us
and find out how you can get involved

DISTRICT OFFICE
14500 Martin Drive
Suite 1500
Eden Prairie, MN 55344

CONTACT INFO
952-607-6481
info@rpbcwd.org
rpbcwd.org

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How healthy is Duck Lake?

Water clarity has been measured at Duck Lake since 1975, nutrients since 1996. Until 2011, water quality failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). For the past five years however, water quality showed improvement. Continued monitoring will track whether this continues, and help us understand why.

During the growing season (May - 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. Find out more about each on the next page.

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. 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. These shallow lake standards are listed in the summary table.

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 fertilizers 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]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MPCA standard</th>
<th>Since 1975 or 1996</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP</td>
<td>&lt;0.06 mg/l</td>
<td>max 0.191 min 0.035 average 0.069</td>
<td>max 0.055 min 0.035 average 0.043</td>
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<td>Chl-a</td>
<td>&lt;20 ug/l</td>
<td>max 92.3 min 18.1 average 14.4</td>
<td>max 21 min 6 average 10.3</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>max 2.7 min 0.2 average 1.3</td>
<td>max 2.3 min 0.8 average 1.8</td>
</tr>
</tbody>
</table>

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.
**Hyland Lake**

**Riley Purgatory Bluff Creek Watershed District**

**Quick facts**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<td>Size</td>
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<td>Volume</td>
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<td>Average depth</td>
<td>7.5 ft</td>
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<td>Maximum depth</td>
<td>10 ft</td>
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<tr>
<td>Watershed size</td>
<td>1040 acres</td>
</tr>
<tr>
<td>MPCA lake classification</td>
<td>Shallow</td>
</tr>
</tbody>
</table>

**Common fish**

- Bluegill, Black Crappie, Walleye, Black Bullhead

**Invasive Species**

- Curlyleaf Pondweed

**Trophic status**

- Impairment: Nutrients

**Did you know?**

- Hyland Lake lies entirely within the borders of Three Rivers Park District.
- A weir at the outlet controls discharge, and Hyland only outflows to Purgatory Creek during very wet conditions.
- It is not designated as a swimming lake, but does support a recreational fishery.

---

**Grants available for clean water projects**

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

**Contact:** Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

---

**What’s happening**

**Master Water Stewards**

Master Water Stewards have arrived in our district! The program offers training from water professionals - engineers, educators, planners and more. Participants also build a network with like-minded peers, with an emphasis on creativity and collaboration.

**Armed with that knowledge, Stewards build projects in their communities that protect water quality and work to educate their neighbors on clean water issues. Past Stewards have installed raingardens, rain barrels, cisterns, and water-permeable walkways that catch polluted rainwater before it makes it to a nearby lake or stream.**

Interested in becoming a steward, or learning how a steward can help you? Visit masterwaterstewards.org, or contact us at 952-607-6481, mjordan@rpbcwd.org.

**Come explore Hyland Lake**

Hyland lake is part of the Hyland Lake Park Reserve, managed by the Three Rivers Park District. It is a scenic retreat in the heart of West Bloomington. Hyland Lake Park offers breathtaking prairie landscapes, paddle boating during the summer and cross-country skiing in winter. While there, you can check out the visitor center, Richardson Nature Center, or the disk golf course, all excellent ways to enjoy and explore the outdoors. For more information, go to threeriversparks.org.

---

**Contact**

and find out how you can get involved

**DISTRICT OFFICE**
14500 Martin Drive
Suite 1500
Eden Prairie, MN 55344

**CONTACT INFO**
952.607.6481
info@rpbcwd.org
rpbcwd.org

**FIND US ON**
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How healthy is Hyland Lake?

Water quality has been measured at Hyland Lake for over 40 years. Since that time, it has consistently failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). There appeared to be improvement over the last decade, however quality decreased significantly in 2015. Continued monitoring will track whether this trend continues, and help us understand why.

During the growing season (May - 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. Find out more about each on the next page.

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. 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. These shallow lake standards are listed in the summary table.

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 Hyland Lake.

Keep the curb clean
Sweep up leaves, grass clippings, and fertilizers 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.

Help keep Hyland healthy

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

<table>
<thead>
<tr>
<th>Summary table</th>
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<tr>
<td></td>
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<td>MPCA standard</td>
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<td></td>
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<tr>
<td>Chl-a</td>
</tr>
<tr>
<td>Secchi disk depth (m)</td>
</tr>
</tbody>
</table>
Lake Idlewild  
Riley Purgatory Bluff Creek Watershed District 2015

Grants available for clean water projects

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Technical help available
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952-607-6481
mjordan@rpbcwd.org

Quick facts

<table>
<thead>
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<th>Size</th>
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<tr>
<td>Maximum depth</td>
<td>9 ft</td>
</tr>
<tr>
<td>MPCA lake classification</td>
<td>Shallow</td>
</tr>
</tbody>
</table>

Common fish

Bluegill, Golden Shiner, Black Crappie, Black Bullhead

Invasive Species

None listed

Trophic status Impairment

Eutrophic (rich in nutrients) Not listed

What’s happening

Master Water Stewards

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Aquatic Plants

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

Stormwater ponds

RPBCWD. 2013. Stormwater pond project.

Watershed study

BARR Engineering. COMMING SOON. Purgatory Creek Watershed Restoration Study.

Contact us

and find out how you can get involved

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rpbcwd.org

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Did you know?

Though small, Idlewild is a natural basin, not a constructed pond

The land surrounding Idlewild Lake is entirely commercial development

Idlewild is a part of the Purgatory Creek Watershed

Turtles can often be spotted basking in the sun along the edges of Idlewild.

Idlewild Lake is located in Eden Prairie, south of the intersection of Highways 212 and 494, and west of Flying Cloud Drive. Idlewild outflows eventually to Purgatory Creek through the Purgatory Creek Recreation Area.
How healthy is Lake Idlewild?

Lake Idlewild was first monitored last year. In both 2014 and 2015, water quality met the clean water standards set by the Minnesota Pollution Control Agency (MPCA). Graphs of the 2015 data, and a table with data from both year are presented on the following page.

During the growing season (May - September), staff visit Lake Idlewild 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 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. Find out more about each on the next page.

Idlewild 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 1 meter down, and have low TP and Chl-a levels. These lake standards are listed in the summary table.

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 Idlewild.

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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Help Keep Idlewild healthy

Summary table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MPCA standard</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max</td>
<td>min</td>
<td>average</td>
</tr>
<tr>
<td>TP</td>
<td>&lt;0.06 mg/L</td>
<td>0.06</td>
<td>0.02</td>
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<tr>
<td>Chl-a</td>
<td>&lt;20 ug/L</td>
<td>2.8</td>
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</tr>
<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>2.6</td>
<td>1.2</td>
</tr>
</tbody>
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How healthy is Lake Idlewild?  

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.

*Help Keep Idlewild healthy*

**Water quality graphs - 2015**

[Image: Water quality graphs - 2015]
**Lotus Lake**

**Riley Purgatory Bluff Creek Watershed District**

Lotus Lake is located in northeast Chanhassen within Carver County, west of Highway 101 and north of Highway 5. The Lotus Lake watershed includes the majority of Chanhassen and a small portion of Eden Prairie east of Highway 101. The west side of the lake's landscape has steep topography containing many ravines, which can make the lake vulnerable to sedimentation.

**Quick facts**

- **Size**: 240 acres
- **Volume**: 3509 acre-ft
- **Average depth**: 16 ft
- **Maximum depth**: 26 ft
- **Watershed size**: 1339 acres
- **Direct land draining**: 316 acres
- **MPCA lake classification**: Deep

**Common fish**

- Bluegill, Yellow Perch, Walleye

**Invasive Species**

- Eurasian Watermilfoil, Common Carp

**Trophic status**

- Impairment: Mercury and nutrients

**Eutrophic (rich in nutrients)**

**Fish, plant, and sediment studies** are just some of the research the district and its partners conduct. Can't find what you are looking for? Feel welcome to call or write.

**Aquatic plants**


**Watershed study**


**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.

**Carp management**


**Did you know?**

- **Lotus Lake** is one of three headwaters of Purgatory Creek

- Water entering Lotus stays for 3 years before seeping into the ground or flowing out Purgatory Creek

- You can visit a district shoreline restoration project at Carver Beach

**Contact us**

- **DISTRICT OFFICE**
  - 14500 Martin Drive
  - Suite 1500
  - Eden Prairie, MN 55344

- **CONTACT INFO**
  - 952.607.6481
  - info@rpbcwd.org
  - rpbcwd.org

- **FIND US ON**
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  - Facebook
  - Twitter
  - Pinterest
  - Facebook
  - Twitter

**Grants available for clean water projects**

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**

**Contact**: Michelle 952-607-6481 mjordan@rpbcwd.org

**Dive deeper**

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**Much of the Lotus Lake watershed is developed.**
How healthy is Lotus Lake?

For the past 40 years, Lotus Lake has consistently failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). Recent years have shown an improvement in water clarity, but not in the other two indicators. 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 (May - 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. Find out more about each on the next page.

Lotus is classified as a “Deep Lake”, which means that it is over 15 feet deep and light cannot 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. These deep lake standards are listed in the summary table.

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.

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

<table>
<thead>
<tr>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP</td>
<td>max</td>
<td>min</td>
</tr>
<tr>
<td>&lt;0.04 mg/l</td>
<td>0.152</td>
<td>0.005</td>
</tr>
<tr>
<td>Chl-a</td>
<td>&lt;14 ug/l</td>
<td>192</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1.4 m</td>
<td>4.2</td>
</tr>
</tbody>
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</tr>
<tr>
<td>Secchi</td>
<td>&gt;1.4 m</td>
<td>4.2</td>
</tr>
</tbody>
</table>
Located in Chanhassen northwest of Highway 5 and Powers Blvd, Lake Lucy is connected to Lake Ann by a small channel in the southeast corner of the lake. Lake Lucy is primarily used for fishing and canoeing. There is no public boat access on the Lake, but the public is permitted to carry in small water craft (canoes or kayaks) via the channel that connects the two lakes.

Quick facts

- Size: 88 acres
- Volume: 558 acre-ft
- Average depth: 6.5 ft
- Maximum depth: 20 ft
- Watershed size: 997 acres
- Direct land draining: 111 acres
- MPCA lake classification: Shallow

Common fish
- Bluegill, Northern Pike, Yellow Bullhead

Invasive Species
- Curlyleaf pondweed, Eurasian watermilfoil, Common carp

Trophic status
- Impairment: Eutrophic (rich in nutrients), Mercury

Monitoring carp

In 2014, University of Minnesota researchers completed a management plan for invasive carp in the Riley Creek chain of lakes. The plan includes monitoring to estimate the number of carp over time. You may have seen district staff out on Lucy this summer in a noisy boat and holding long nets. The boat is an electro-fishing boat that shocks the water to stun fish. The nets are used to scoop up carp so they can be measured. These measurements are put into an equation to calculate the number of carp in the lake. With these data, the district can then decide whether carp need to be caught and removed from the lake.

Grants available for clean water projects

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

Technical help available

Contact: Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

Dive deeper

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Aquatic plants

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

Watershed study

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Carp management

Water entering Lucy stays in the lake for five years before it flows to Lake Ann

Lakes Ann and Lucy are the headwaters to Riley Creek, which eventually flows into the Minnesota River

Though water flows out of Lucy through a channel, there are no streams that flow into it

DID YOU KNOW?

Contact us

and find out how you can get involved

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Land use

The land area that drains into Lake Lucy is mostly developed. There may be more development in the southwest corner in the future.
How healthy is Lake Lucy?

For the past 40 years, Lake Lucy water quality has stayed relatively steady, oscillating around the clean water standards set by the Minnesota Pollution Control Agency (MPCA). Water quality decreased from 2014 to 2015, and only the standard for water clarity was met. Monitoring in 2016 will help us determine if this is an outlier year, or a trend.

During the growing season (May - September), district staff visit Lake Lucy 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.

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. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see 1 meters down, and have low TP and Chl-a levels. These shallow lake standards are listed in the summary table.

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.

---

**Summary table**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP</td>
<td>&lt;0.06 mg/l</td>
<td>0.103</td>
<td>0.111</td>
</tr>
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<td></td>
<td></td>
<td>0.062</td>
<td>0.075</td>
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<tr>
<td>Chl-a</td>
<td>&lt;20 ug/l</td>
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<td>87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.7</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26.9</td>
<td>42.5</td>
</tr>
<tr>
<td>Secchidisk depth (m)</td>
<td>&gt;1 m</td>
<td>6.9</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**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.

Help keep Lake Lucy healthy

**Keep the curb clean**
Sweep up leaves, grass clippings, and fertilizers 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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[Water quality graphs 1972 - 2015](#)}

Points are growing season (May-Sep) averages. Thin lines are the minimum and maximum values for each year.

**Phosphorus**

Since 1972 | 2015
---|---
max | min | average | max | min | average
0.103 | 0.03 | 0.062 | 0.111 | 0.036 | 0.075

**Chlorophyll-a**

Since 1972 | 2015
---|---
max | min | average | max | min | average
73.8 | 2.7 | 26.9 | 87 | 11 | 42.5

**Secchidisk depth (m)**

Since 1972 | 2015
---|---
max | min | average | max | min | average
6.9 | 0.5 | 1.4 | 2.4 | 0.5 | 1.1
What’s happening

Master Water Stewards

Master Water Stewards have arrived in our district! The program offers training from water professionals - engineers, educators, planners and more. Participants also build a network with like-minded peers, with an emphasis on creativity and collaboration.

Armed with that knowledge, Stewards build projects in their communities that protect water quality and work to educate their neighbors on clean water issues. Past Stewards have installed raingardens, rain barrels, cisterns, and water-permeable walkways that catch polluted rainwater before it makes it to a nearby lake or stream.

Interested in becoming a steward, or learning how a steward can help you? Visit masterwaterstewards.org or contact us at 952-607-6481, mjordan@rpbcwd.org.

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**Aquatic plants**


**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.

**Stormwater ponds**

RPBCWD. 2013. Stormwater pond project.

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**Mitchell Lake**

Riley Purgatory Bluff Creek Watershed District 2015

Mitchell Lake is located in Eden Prairie, north of Highway 212 and west of Dell Road. Miller Park is situated on the south end of the lake and offers a public boat launch and fishing pier. A city ordinance prevents operating motors larger than 10 horse power on the lake.

**Quick facts**

<table>
<thead>
<tr>
<th>Size</th>
<th>119 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>632 acre-ft</td>
</tr>
<tr>
<td>Average depth</td>
<td>5.8 ft</td>
</tr>
<tr>
<td>Maximum depth</td>
<td>19 ft</td>
</tr>
<tr>
<td>Watershed size</td>
<td>980 acres</td>
</tr>
<tr>
<td>Direct land draining</td>
<td>154 acres</td>
</tr>
<tr>
<td>MPCA lake classification</td>
<td>Shallow</td>
</tr>
</tbody>
</table>

**Common fish**

Black Bullhead, Black Crappie, Bluegill, Northern Pike, Pumpkinseed

**Invasive Species**

Curlyleaf Pondweed, Eurasian Watermilfoil, Purple Loosestrife

**Trophic status**

Eutrophic (rich in nutrients)

**Impairment**

Mercury and nutrients

**Did you know?**

Mitchell is part of the Purgatory Creek Chain of Lakes. During high water events, Round Lake flows to Mitchell to Red Rock Lake

Miller Park, located along the south side of the lake, offers lake access and is a popular recreation spot

**Did you know?**

Mitchell is part of the Purgatory Creek Chain of Lakes. During high water events, Round Lake flows to Mitchell to Red Rock Lake

**Land use**

- Residential
- Commercial
- Industrial
- Agriculture
- Transportation
- Hydraulic Power
- Manufacturing
- Retail
- Education
- Light Industry
How healthy is Mitchell Lake?

Mitchell Lake has been monitored since 1972 and until recent years water quality failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). Over the past decade however there have been significant improvements, and Mitchell has begun to meet standards.

During the growing season (May - September), the City of Eden Praire visits Mitchell 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 phosphorus (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 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.

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. 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. These shallow lake standards are listed in the summary table.

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 Mitchell Lake.

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<tbody>
<tr>
<td></td>
<td>max  min  average</td>
<td>max  min  average</td>
<td></td>
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<tr>
<td>TP</td>
<td>&lt;0.06 mg/l</td>
<td>0.33 0.02 0.08</td>
<td>0.10 0.03 0.06</td>
</tr>
<tr>
<td>Chl-a</td>
<td>&lt;20 ug/l</td>
<td>211 1 36.7</td>
<td>64.8 2.1 25.7</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>5.1 0.3 1.4</td>
<td>2.5 1 1.2</td>
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Help Keep Mitchell healthy

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Purgatory Creek Watershed

Quick facts

<p>| | |</p>
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<th></th>
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<tbody>
<tr>
<td>Length</td>
<td>16 miles</td>
</tr>
<tr>
<td>Elevation drop</td>
<td>178 ft</td>
</tr>
<tr>
<td>Watershed size</td>
<td>35.6 sq miles</td>
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<tr>
<td># of cities in watershed</td>
<td>4</td>
</tr>
<tr>
<td># of lakes connected</td>
<td>8</td>
</tr>
<tr>
<td># of monitoring sites</td>
<td>5</td>
</tr>
<tr>
<td># of parks along creek</td>
<td>27</td>
</tr>
</tbody>
</table>

Common fish

Bluegill, Bullhead, Black Crappie

Invasive Species

Reed Canary Grass, Purple Loosestrife, Buckthorn, Common Carp

Impairment

Not Listed

The Purgatory Creek watershed is comprised of a large portion of Minnetonka, Chanhassen and Eden Prairie. The creek has three origins: draining from a wetland complex, from Lotus Lake, and from Silver Lake. Purgatory Creek drains a land area of more than 35 square miles before entering the Minnesota River Basin.

Cycle the Creek

On October 10th, 2015 community members came together to explore Bluff Creek by bicycle. It was such a success that in 2016, we’ll be doing it again, but this time the destination is Purgatory Creek. At stops on the way we’ll discover new things about Purgatory Creek, the work the watershed district and other organizations are undertaking to keep it clean, and what you could do to help. The event will be held in early October, and if it is anything like last year, the weather should be cool and the fall colors out in full display.

Cycle the Creek is relaxed-paced and family-friendly. Check the district website for updates. You can also call or write at the contact information below.

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Technical help available
Contact: Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

Purgatory Creek
Riley Purgatory Purgatory Creek Watershed

Did you know?

The sharpest drop in elevation happens between Staring Lake and the MN River

The Eden Prairie Chain of Lakes - Round, Mitchell, Red Rock - drains to the creek via a flood control system

Due to its location near the metro area, this was the first district watershed to see increased urbanization

Contact us

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Land use
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.

To this end, 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 2015.

**Water quality**

District staff take samples at 8 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

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**Assessment**


BARR Engineering. COMING SOON. Purgatory Creek Watershed Restoration Study.


**Carp management**


**Stormwater ponds**

RPBCWD. 2013. Stormwater Pond Project.

### 2015 assessment results

Each section, or reach, of Purgatory Creek is coded with one of 5 colors based on how healthy it is. Blue is the best and red the worst. In 2015, several of the upper reaches were in the blue category. However, erosion is an issue in the steep reaches, below Staring Lake. The district is working with its partners to improve Purgatory Creek by conducting restoration projects at the sites in most need. Community members can help too by keeping pollutants like dirt and grass clippings from going down stormdrains, or by putting in a project like a raingarden. Ask about our cost share program to find support in your efforts.

**Key**

- best
- good
- fair
- poor
- no score

A staff member measures velocity to calculate how much water is flowing through the creek.

An example of erosion.
**Grants available for clean water projects**

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**

**Contact:** Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

**Quick facts**

<table>
<thead>
<tr>
<th>Size</th>
<th>97 acres</th>
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<tbody>
<tr>
<td>Volume</td>
<td>381 acre-ft</td>
</tr>
<tr>
<td>Average depth</td>
<td>4 ft</td>
</tr>
<tr>
<td>Maximum depth</td>
<td>15 ft</td>
</tr>
<tr>
<td>Watershed size</td>
<td>1262 acres</td>
</tr>
<tr>
<td>Direct land draining</td>
<td>332 acres</td>
</tr>
<tr>
<td>MPCA lake classification</td>
<td>Shallow</td>
</tr>
</tbody>
</table>

**Common fish**

Yellow Perch, Bluegill, Northern Pike, Pumpkinseed

**Invasive Species**

Curlyleaf Pondweed, Purple Loosestrife

**Trophic status** Eutrophic (rich in nutrients)

**Impairment** Mercury and nutrients

---

**Aquatic plants**


**Stormwater ponds**

RPBCWD. 2013. Stormwater pond project.

**Watershed study**


---

**Dive deeper**

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

---

**Water exits Red Rock Lake through a piped outlet located in the southeast side, and continues down to Staring Lake**

**Water enters Red Rock by direct rainfall, stormwater inflow from lakeshore properties and parks, and from Mitchell Lake**

---

**Red Rock Lake**

Red Rock Lake is located in Eden Prairie, south of Highway 212 and east of Mitchell Road. Red Rock is at the downstream end of the Eden Prairie ‘Chain of Lakes’ watershed, from which the waters ultimately drain into Purgatory Creek through a flood control conveyance system. The lake has a public boat launch at the south end of the lake and there is a motor restriction in place by the City of Eden Prairie limiting the size of a motor used on the lake to 10 horsepower.
How healthy is Red Rock Lake?

Since 1972, Red Rock has often failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). For the past five years however, it has showed significant improvement and met all three standards.

During the growing season (May - September), the City of Eden Prairie visits Red Rock 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.

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. 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. These shallow lake standards are listed in the summary table.

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 Red Rock Lake.

Help Keep Red Rock healthy

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.

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.

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 Red Rock Lake.

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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 Red Rock Lake.
Rice Marsh Lake
Riley Purgatory Bluff Creek Watershed District 2015

Rice Marsh Lake straddles the border between eastern Chanhassen and western Eden Prairie, located north of Highway 212 and west of Dell Road. A part of the Riley Creek chain, Rice Marsh Lake is immediately downstream of Lake Susan (connected by a small channel) and upstream of Lake Riley. The lake has an informal boat launch that is accessible from a walking path that circles the lake.

Quick facts

<table>
<thead>
<tr>
<th>Size</th>
<th>81 acres</th>
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</thead>
<tbody>
<tr>
<td>Volume</td>
<td>350 acre-ft</td>
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<tr>
<td>Average depth</td>
<td>5 ft</td>
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<td>Maximum depth</td>
<td>10 ft</td>
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<tr>
<td>Watershed size</td>
<td>853 acres</td>
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<tr>
<td>Direct land draining</td>
<td>280 acres</td>
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<tr>
<td>MPCA lake classification</td>
<td>Shallow</td>
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</tbody>
</table>

Common fish
Bluegill, Northern Pike, White Sucker

Invasive Species
Curlyleaf Pondweed, Purple Loosestrife

Trophic status
Impairment Not listed

Eutrophic (rich in nutrients) Not listed

Did you know?

Rice Marsh Lake is an important spawning area for fish moving upstream from Lake Riley.

An aeration system helps keep bluegills alive as a way to manage invasive carp: the bluegills eat the carp eggs.

Rice Marsh Lake is prone to wind-driven mixing due to its large surface area and shallow depth.

Dive deeper
Interested in learning more? Find the reports below on our website.

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

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Watershed study

Carp management

Paleolimnology

In 2014, University of Minnesota researchers completed a management plan for invasive carp in the Riley Creek chain of lakes. The plan includes monitoring to estimate the number of carp over time. You may have seen district staff out on Rice Marsh Lake this summer in a noisy boat, holding long nets. The boat is an electro-fishing boat that shocks the water to stun fish. The nets are used to scoop up carp so they can be measured. These measurements are put into an equation to calculate the number of carp in the lake. With these data, the district can then decide whether carp need to be caught and removed from the lake.

Monitoring carp

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<td>Shallow</td>
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Common fish
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Invasive Species
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Trophic status
Impairment Not listed

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Common fish
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Invasive Species
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Trophic status
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Eutrophic (rich in nutrients) Not listed

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Dive deeper
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Aquatic plants
Blue Water Science. 2014. Aquatic plant survey for Rice Marsh Lake, Eden Prairie, MN.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Watershed study

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How healthy is Rice Marsh Lake?

Water quality has improved dramatically since monitoring began in 1972. For the last ten years two of the parameters tested have approached the clean water standards set by the Minnesota Pollution Control Agency (MPCA), and water clarity as been even better than the standard.

During the growing season (May - 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. Find out more about each on the next page.

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. 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. These shallow lake standards are listed in the summary table.

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
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.

Water quality graphs 1972 - 2015
Points are growing season (May-Sep) averages. Thin lines are the minimum and maximum values for each year.

Summary table

<table>
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<tr>
<th></th>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max</td>
<td>min</td>
<td>average</td>
</tr>
<tr>
<td>TP</td>
<td>&lt;0.06 mg/L</td>
<td>0.722</td>
<td>0.026</td>
</tr>
<tr>
<td>Chl-a</td>
<td>&lt;20 ug/L</td>
<td>242.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>3.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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.

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.
What’s happening

Grants available for clean water projects

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 rain gardens.

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

**Technical help available**

**Contact:** Michelle Jordan
952-607-6481
mjordan@rpbcwd.org

You can help us

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**
14500 Martin Drive
Suite 1500
Eden Prairie, MN 55344

**CONTACT INFO**
952-607-6481
info@rpbcwd.org
rpbcwd.org

**FIND US ON**
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facebook
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Did you know?

- The creek starts in Lakes Lucy and Ann, then flows through Susan, Rice Marsh, and Riley before entering the Minnesota River.

- The watershed has a storm sewer network of pipes and retention basins that ultimately discharge into the creek.

- Riley Creek flows through glacial outwash deposits of sand & gravel upstream of the MN River floodplain.

Riley Creek originates from Lakes Lucy and Ann in Chanhassen and flows through three downstream lakes in the District (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 there is a steep, north-valley wall in the lower section.
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 2015.

Water quality
District staff take samples at 5 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? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Restoration prioritization

Carp management
Managing plants

Lakes are complex ecosystems with many inter-connected processes. In order to manage aquatic plants in Lake Riley, it was first necessary to control common carp, a fish that disturbs plant roots. In 2015, with carp at a low level, the district conducted herbicide treatments to control two invasive aquatic plants: curlyleaf pondweed and Eurasian watermilfoil. By knocking down these invasives, the goal is to promote a healthy and balanced native plant population. Establishing a thriving native plant population now is particularly important as the district is looking ahead to applying an alum treatment to improve water clarity. Eurasian watermilfoil can reproduce rapidly in clear water, and having healthy native plants prior to alum treatment will help keep the invasives from spreading. The herbicide treatments were a part of the Lake Vegetation Management Plan, developed in winter 2013, and supported by the Lake Riley Improvement Association and residents and approved by the MN DNR.

Dive deeper

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

Aquatic plants

Watershed study

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.

Carp management

Contact us
and find out how you can get involved

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Eden Prairie, MN 55344

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Updating the use attainability analysis

A Use Attainability Analysis (UAA) is a scientific assessment that evaluates the health of a lake, and proposes actions to improve it. The district originally developed a UAA for Lake Riley in 2002. It included a water quality analysis and prescription of protective measures for the lake and its watersheds. It was based on historical water quality data, intensive lake water quality monitoring, and computer simulations of land use impacts on water quality. Since this original study, the district has implemented projects and monitored the water quality in Lake Riley.

In 2015, an updated UAA was completed. The goal was to assess the water quality in Lake Riley based on more recent physical, chemical, and biological data and to identify and evaluate watershed and in-lake best management practices (BMPs) that can be implemented to improve and preserve water quality in both lakes. Interested in learning more? The study can be found on our website www.rpbcwd.org.

Quick facts

| Size       | 286 acres |
| Volume     | 6419 acre-ft |
| Average depth | 23 ft |
| Maximum depth | 49 ft |
| Watershed size | 1763 acres |
| Direct land draining | 818 acres |
| MPCA lake classification | Deep |

Common fish
Bluegill, Northern Pike, Yellow Perch, Yellow Bullhead

Invasive Species
Common Carp, Curlyleaf Pondweed, Eurasian Watermilfoil

Trophic status
Eutrophic (rich in nutrients)

Did you know?

Lake Riley is the deepest lake in the district.

Fishing & boating are popular on Riley. The City of Eden Prairie operates a swimming beach & boat access.

Riley provides important habitat for migrating ducks, geese, and other waterfowl.
How healthy is Lake Riley?

For the past 40 years, Lake Riley has consistently failed to meet the clean water standards set by the Minnesota Pollution Control Agency (MPCA). In recent years however, there have been improvements, especially in water clarity. The goal for each graph is for the average values (the dots) to be below the red line.

During the growing season (May - 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 parameters help indicate whether the water is clean. Find out more about each on the next page.

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, deep lakes need to be clear enough to see 1.4 meters down, and have very low TP and Chl-a levels. These deep lake standards are listed in the summary table.

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 Riley.

1. Keep the curb clean: Sweep up leaves, grass clippings and fertilizers from driveways and streets.
2. Water with care: Grass requires 1-inch of water per week, about one hour of sprinkling per week if it has not rained.
3. Salt smart: The salt we use to melt ice can pollute our lakes and creeks. Use salt sparingly and always shovel first.
4. Reuse the rain: Collect and reuse rainwater with a rain barrel.
5. Build a raingarden: Raingardens soak up water and filter out pollution. Visit our website for help.

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<tr>
<td><strong>TP</strong></td>
<td>&lt;0.04 mg/l</td>
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<tr>
<td><strong>Chl-a</strong></td>
<td>&lt;14 ug/L</td>
<td>120</td>
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<tr>
<td><strong>Secchi</strong></td>
<td>&gt;1.4 m</td>
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<td>5.9</td>
</tr>
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</table>

Water quality graphs 1972 - 2015

Points are growing season (May-Sep) averages. Thin lines are the minimum and maximum values for each year.

**Help keep Lake Riley healthy**

[Image: images/1224x792/1.jpg]
Round Lake
Riley Purgatory Bluff Creek Watershed District

Round Lake is located in Eden Prairie, south of Valley View Road and West of Eden Prairie Road. The lake is entirely contained within Round Lake Park which has a fishing pier, swimming beach, public boat launch, and a trail system around the lake.

Dive deeper
Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can't find what you are looking for? Feel welcome to call or write.

Aquatic invasive species (AIS) are a serious concern. Both managing invasives, and preventing their spread are important strategies to keep our waters healthy. The district uses several tools to help in this work including education programs for youth and adults, early detection monitoring aided by volunteers, boat launch inspectors, fish and plant surveys, and lake treatment for invasive plants.

You can help too!
- Inspect your boat
- Clean, drain, dispose
- Pull the boat plug
- Become a volunteer monitor
- Contact us for more information

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

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.

Stormwater ponds
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</tr>
<tr>
<td>Average depth</td>
<td>11 ft</td>
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<tr>
<td>Maximum depth</td>
<td>37 ft</td>
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<tr>
<td>Watershed size</td>
<td>444 acres</td>
</tr>
<tr>
<td>MPCA lake classification</td>
<td>Deep</td>
</tr>
</tbody>
</table>

Common fish
Bluegill, Northern Pike, Yellow Perch, Yellow Bullhead

Invasive Species
Common Carp, Curlyleaf Pondweed, Eurasian Watermilfoil

Trophic status
Eutrophic (rich in nutrients)

Did you know?
- Round Lake is a part of the Purgatory Creek Chain of Lakes
- In 2012 Round received an alum treatment This lake management strategy helps to reduce nutrients in the water
- There is a trail system around Round that is actively used by community members

Contact us
and find out how you can get involved

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14500 Martin Drive
Suite 1500
Eden Prairie, MN 55344

CONTACT INFO
952.607.6481
info@rpbcwd.org
rpbcwd.org

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Land use

<table>
<thead>
<tr>
<th>% of Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density</td>
</tr>
<tr>
<td>Medium Density</td>
</tr>
<tr>
<td>High Density</td>
</tr>
<tr>
<td>Commercial</td>
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<tr>
<td>Federal</td>
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<tr>
<td>Transportation</td>
</tr>
<tr>
<td>Underground</td>
</tr>
<tr>
<td>Other Water</td>
</tr>
</tbody>
</table>

Duck Lake
Duck Lake Tr
Valley View Rd
Eden Prairie Rd
Duck Lake Tr
Round Lake
Valley View Rd
watershed boundary
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 in the last five years, and in 2015, it met all standards.

During the growing season (May - 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. Find out more about each on the next page.

Round is classified as a “Deep Lake”, which means that it is over 15 feet deep and light cannot 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. These deep lake standards are listed in the summary table.

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 Round Lake.

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

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<tr>
<th></th>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
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<td>Chl-a</td>
<td>&lt;14 ug/l</td>
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<td>min: 2</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1.4 m</td>
<td>max: 6.2</td>
<td>min: 0.5</td>
</tr>
</tbody>
</table>
Silver Lake is located in the City of Shorewood in the northwestern part of the Riley Purgatory Bluff Creek Watershed. The outlets to Silver and Lotus Lakes are the headwaters of Purgatory Creek, and merge to form a single stream.

**Quick facts**

- **Size**: 84 acres
- **Volume**: 201 acre-ft
- **Average depth**: 3 ft
- **Maximum depth**: 13 ft
- **Watershed size**: 361 acres
- **MPCA lake classification**: Shallow
- **Common fish**: Unknown
- **Invasive Species**: Curlyleaf Pondweed, Purple Loosestrife
- **Trophic status Impairment**: Eutrophic-hypereutrophic (nutrient rich)

**Did you know?**

- Silver Lake provides habitat for migrating waterfowl, like ducks, geese, herons, & egrets
- Silver is at the top of the Purgatory Chain of Lakes, which includes Lotus, Duck Round, Mitchell, Red Rock, Staring, and Idlewild
- Up until 1943, the MN Department of Natural Resources stocked Silver with gamefish

**Contact us**

**DIVE DEEPER**

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

**Aquatic plants**

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

**Paleolimnology**


**Stormwater ponds**

RPBCWD. 2013. Stormwater pond project.

**Watershed study**

BARR Engineering. COMING SOON. Purgatory Creek Watershed Restoration Study.

**Awards**

- **Grants available for clean water projects**
  - 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

**Contact**: Michelle Jordan

952-607-6481

mjordan@rpbcwd.org

**Silver Lake**

2015

Riley Purgatory Bluff Creek Watershed District

**Contact us**

and find out how you can get involved

**Dive deeper**

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**Silver Lake**

2015

Riley Purgatory Bluff Creek Watershed District

**Contact us**

and find out how you can get involved
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 (May - 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 1 meter down, and have low TP and Chl-a levels. These shallow lake standards are listed in the summary table.

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 Silver Lake.

**Keep the curb clean**
- Sweep up leaves, grass clippings, and fertilizers 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.

**Help keep Silver healthy**
- Water quality graphs 1996 - 2015

Points are growing season (May-Sep) averages. Thin lines are the minimum and maximum 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.

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<tr>
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<td>0.117 0.045 0.088</td>
</tr>
<tr>
<td>Chl-a</td>
<td>&lt;20 ug/l</td>
<td>30 8 92</td>
<td>30 20 38.3</td>
</tr>
<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>0.9 0.2 0.4</td>
<td>1 0.8 0.6</td>
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</tbody>
</table>
In 2015, the district began work on a restoration and protection study for the Purgatory Creek watershed. This study will provide updated and consistent information about the water quality and biological integrity of the lakes in the Purgatory Creek watershed, including Silver Lake. It will include trend analyses, and comparisons of water quality monitoring with state standards and district goals. It will also contain water quality modeling calibrated for critical conditions. These data will be used to evaluate and recommend the optimum restoration measures based on the potential water quality benefits and estimated life-cycle costs (i.e., a prioritized implementation plan). The study should be completed in 2016, and will be available on the district website when ready.

**Quick facts**

- **Size**: 84 acres
- **Volume**: 201 acre-ft
- **Average depth**: 3 ft
- **Maximum depth**: 13 ft
- **Watershed size**: 361 acres
- **MPCA lake classification**: Shallow

**Common fish**

- Unknown

**Invasive Species**

- Curlyleaf Pondweed, Purple Loosestrife

**Trophic status**

- Impairment

- Eutrophic-hypereutrophic (nutrient rich)

**Silver Lake**

Silver Lake is located in the City of Shorewood in the northwestern part of the Riley Purgatory Bluff Creek Watershed. The outlets to Silver and Lotus Lakes are the headwaters of Purgatory Creek, and merge to form a single stream.

**Did you know?**

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- **Silver is at the top of the Purgatory Chain of Lakes, which includes Lotus, Duck Round, Mitchell, Red Rock, Staring, and Idlewild**
- **Up until 1943, the MN Department of Natural Resources stocked Silver with gamefish**

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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 rain gardens.

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

**Technical help available**

**Contact:** Michelle Jordan

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mjordan@rpbcwd.org

**Contact us**

and find out how you can get involved

**Dive deeper**

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**Aquatic plants**

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

**Paleolimnology**


**Stormwater ponds**

RPBCWD. 2013. Stormwater pond project.

**Watershed study**

BARR Engineering. COMING SOON. Purgatory Creek Watershed Restoration Study.

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**Contact info**

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info@rpbcwd.org
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**District office**

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Eden Prairie, MN 55344

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How healthy is Silver Lake?

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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 Silver Lake.

### Help Keep Silver healthy

<table>
<thead>
<tr>
<th>Keep the curb clean</th>
<th>Water with care</th>
<th>Salt smart</th>
<th>Reuse the rain</th>
<th>Build a raingarden</th>
</tr>
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<tr>
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<td>Grass requires 1-inch of water per week; about one hour of sprinkling per week if it has not rained.</td>
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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.
Common fish
Bluegill, Black Crappie, Black Bullhead
Invasive Species
Curlyleaf pondweed, Eurasian watermilfoil, Common carp
Trophic status Impairment
Hypereutrophic (extremely rich in nutrients)

Quick facts
Size 164 acres
Volume 1137 acre-ft
Average depth 7 ft
Maximum depth 16 ft
Watershed size 10681 acres
Direct land draining 314 acres
MPCA lake classification Shallow
Common fish
Bluegill, Black Crappie, Black Bullhead
Invasive Species
Curlyleaf pondweed, Eurasian watermilfoil, Common carp
Trophic status Impairment
Hypereutrophic (extremely rich in nutrients)

Staff and volunteers pull plants by hand.

Responding to new AIS

The invasive aquatic plant Eurasian watermilfoil was spotted for the first time in Staring Lake in 2015. The watershed district responded quickly to stop its spread throughout the lake, first, mapping the locations of the plant. The next step was to pull plants by hand. Care had to be taken, as even small fragments can grow new plants. Last, an herbicide treatment was applied. The district hopes that these methods will eradicate the plant, and will continue to monitor the plant community in the lake as a part of the larger Staring Lake water quality improvement project. This will allow us to determine if the removal was successful and whether follow-up treatments are needed,” said Claire Bleser, Administrator for the watershed district.

Questions about these efforts can be directed to Claire: 952-607-6512, cbleser@rpbcwd.org.

Staring Lake is located in Eden Prairie, west of Flying Cloud Dr and north of Pioneer Trail. It has a large watershed, over 10,000 acres. 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.

Dive deeper
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Aquatic plants


Carp management

Assessments
BARR Engineering. COMING SOON. Purgatory Creek Watershed Restoration Study.

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and find out how you can get involved

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CONTACT INFO 952.607.6481 info@rpbcwd.org rpbcwd.org

FIND US ON

Universe of Minnesota researchers completed a management plan for invasive carp in the Purgatory Creek chain of lakes. The plan includes monitoring to estimate the number of carp over time. You may have seen university staff out on Staring this summer in a noisy boat and holding long nets. The boat is an electro-fishing boat that shocks the water to stun fish. The nets are used to scoop up carp so they can be measured. These measurements are put into an equation to calculate the number of carp in the lake. With these data, the district can then decide whether carp need to be caught and removed from the lake.

Did you know?

A walking path links Staring Lake to the Purgatory Creek Recreation Area, a great place for viewing wildlife.

Purgatory Creek is the major source of inflow, but during big rains water cascades through Duck, Round, Mitchell, & Red Rock Lake into The Staring Lake watershed includes parts of Chanhanassen, Deephaven, Eden Prairie, Minnetonka & Shorewood.

AIS

BARR Engineering. COMING SOON. Purgatory Creek Watershed Restoration Study.

% of land

Land use

Did you know?

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Aquatic plants


Carp management

Assessments
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How healthy is Staring Lake?

For the past 40 years, Staring Lake water quality has failed to meet the standards set by the Minnesota Pollution Control Agency (MPCA). The last five years of monitoring has shown some improvement. This may be influenced in part by carp management efforts in the Purgatory Creek chain of lakes.

During the growing season (May - September), district staff visit Staring 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.

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. To be considered healthy by the MPCA, shallow lakes need to be clear enough to see 1 meters down, and have low TP and Chl-a levels. These shallow lake standards are listed in the summary table.

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 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
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 rain garden
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Water quality graphs 1971 - 2015

Points are growing season (May-Sep) averages. Thin lines are the minimum and maximum values for each year.

[Water quality graphs showing 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 Susan
Riley Purgatory Bluff Creek Watershed District

Lake Susan is located in Chanhassen, north of Highway 212 and west of Great Plains Blvd, part of the Riley Creek watershed. Lake Susan is a recreational lake used for both fishing and boating. The topography of the Lake Susan watershed is characterized by rolling hills with depressions filled with ponds and wetlands.

Quick facts

| Size          | 88 acres |
| Volume       | 885 acre-ft |
| Average depth | 10 ft |
| Maximum depth | 17 ft |
| Watershed size | 1281 acres |
| Direct land draining | 66 acres |
| MPCA lake classification | Shallow |

Common fish
Bluegill, Black Crappie, Northern Pike, Black Bullhead

Invasive Species
Curlyleaf pondweed, Eurasian watermilfoil, Common carp

Trophic status Impairment
Eutrophic (rich in nutrients) Mercury and Nutrients

Contact us
and find out how you can get involved

DIVE DEEPER

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Aquatic plants

Watershed study

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Carp management

Contact info
952.607.6481 info@rpbcwd.org rpbcwd.org

FIND US ON
pinterest facebook twitter

Contact: Michelle 952-607-6481 mjordan@rpbcwd.org

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

Technical help available

Did you know?

Susan is the 3rd Lake in the Riley Creek chain, so it receives runoff from both the land around it, and from the lakes upstream.

Light can reach the bottom of Lake Susan for over 95% of its surface area.

Water entering Susan stays in the lake for about 1 year before flowing out through Riley Creek.

Grants available for clean water projects
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.

Grants available for clean water projects

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

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Water entering Susan stays in the lake for about 1 year before flowing out through Riley Creek.

Dive deeper

Interested in learning more? Find the reports below on our website. Fish, plant, and sediment studies are just some of the research the district and its partners conduct. Can’t find what you are looking for? Feel welcome to call or write.

Aquatic plants

Watershed study

Stormwater ponds
RPBCWD. 2013. Stormwater pond project.

Carp management

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Water entering Susan stays in the lake for about 1 year before flowing out through Riley Creek.
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). Water clarity has improved in the last ten years, possibly due in part to the management of carp, but nutrient levels remain high.

During the growing season (May - 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 water clarity 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. 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 1 meter down, and have low TP and Chl-a levels. These shallow lake standards are listed in the summary table.

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 fertilizers 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.

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.

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.

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

<table>
<thead>
<tr>
<th></th>
<th>MPCA standard</th>
<th>Since 1972</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max</td>
<td>min</td>
<td>average</td>
</tr>
<tr>
<td>TP</td>
<td>&lt;0.06 mg/l</td>
<td>0.208</td>
<td>0.024</td>
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<tr>
<td>Chl-a</td>
<td>&lt;20 ug/L</td>
<td>121</td>
<td>1.3</td>
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<tr>
<td>Secchi</td>
<td>&gt;1 m</td>
<td>3.6</td>
<td>0.3</td>
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APPENDIX C: 2013 ANNUAL BUDGET
## Riley Purgatory Bluff Creek Watershed District
### All Funds Performance Analysis
#### December 31, 2015

<table>
<thead>
<tr>
<th>Description</th>
<th>2015 Budget</th>
<th>Dec. 31, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REVENUES</strong></td>
<td></td>
<td></td>
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<tr>
<td>Property Tax Levies</td>
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<td><strong>TOTAL REVENUES</strong></td>
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<td><strong>EXPENDITURES</strong></td>
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<tr>
<td>Engineering Services</td>
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<td>Legal Services</td>
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<td>Manager Expenses</td>
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<td>Projects</td>
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<td><strong>TOTAL EXPENDITURES</strong></td>
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<td><strong>Excess (Deficiency)</strong></td>
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See Accountants Compilation Report
## RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT
### ALL Funds Project Performance Analysis
#### December 31, 2015

<table>
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<tr>
<th>Project</th>
<th>2015 Budget</th>
<th>Year to Date Dec. 31, 2015</th>
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<td>Mitchell Lake Plant Management</td>
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<tr>
<td>Red Rock Lake Plant Management</td>
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<td>Lake Lucy-Spent Lime</td>
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<td>Lake Lucy-Plant Management</td>
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<td>466.81</td>
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<td>Lake Susan Improvements</td>
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<td>Rice Marsh Lake Paleolimnology</td>
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<td>Fish Passage Bluff Creek Improvement</td>
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<td>UAA</td>
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<td>District Floodplain- Atlas 14</td>
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<td>Data Collection</td>
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<td>U of M</td>
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<td>SWLRT</td>
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<td>Creek Restoration Assessment Strategy</td>
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<td>Lake Riley EWM Treatment</td>
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<td>Lake Riley Alum Treatment</td>
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<td>Lake Lucy Iron Enhanced WQ</td>
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<td>Lake Susan WQ Improvement Phase 2</td>
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<td>Buffer Demonstration Site</td>
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<tr>
<td>Purgatory Creek Lakes UAA</td>
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<td>94,836.50</td>
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<td>Chanhassen Town Center</td>
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<td>Silver Lake Paleolimnology</td>
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<td>19,125.00</td>
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<td>Rice Lake Marsh Aeration</td>
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<td>RML/ Lake Riley UAA Update</td>
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<td>Starring Lake Plant Management</td>
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<td>7,968.00</td>
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<tr>
<td><strong>Total Project Costs</strong></td>
<td><strong>1,562,000.00</strong></td>
<td><strong>955,868.75</strong></td>
</tr>
</tbody>
</table>

See Accountants Compilation Report
## 2016 Budget

### REVENUES

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Tax Levies</td>
<td>2,481,500.00</td>
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<tr>
<td>Data Collection</td>
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<tr>
<td>Education and Outreach</td>
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<tr>
<td>Grant Income</td>
<td></td>
</tr>
<tr>
<td>Interest Income</td>
<td></td>
</tr>
<tr>
<td>Permit Income</td>
<td>15,000.00</td>
</tr>
<tr>
<td>Other</td>
<td>24,950.00</td>
</tr>
</tbody>
</table>

### EXPENDITURES

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td></td>
</tr>
<tr>
<td>Accounting &amp; Audit</td>
<td>34,000.00</td>
</tr>
<tr>
<td>Advisory Committee</td>
<td>4,500.00</td>
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<tr>
<td>Engineering Services</td>
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<tr>
<td>Insurance and Bonds</td>
<td>10,000.00</td>
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<tr>
<td>Legal Services</td>
<td>75,000.00</td>
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<tr>
<td>Manager Compensation</td>
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<td>MAWD</td>
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<tr>
<td>Administration Costs</td>
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<tr>
<td>Office Costs</td>
<td>45,000.00</td>
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<tr>
<td>Permit Review and Inspection</td>
<td>100,000.00</td>
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<tr>
<td>Recording Services</td>
<td>15,000.00</td>
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<tr>
<td>Staff Costs</td>
<td>265,500.00</td>
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<tr>
<td><strong>Total Expenditures</strong></td>
<td><strong>2,496,500.00</strong></td>
</tr>
</tbody>
</table>

### Programs and Projects

**District Wide**
- Education and Outreach: 114,000.00
- 10-year Plan: 100,000.00
- AIS: 75,000.00

- Cost-Share Program: 150,000.00
- Creek Restoration Assessment Strategy: 25,000.00
- Data Collection: 180,000.00
- District Floodplain Atlas 14: 10,000.00
- District Floodplain Vulnerability Evaluation: 55,000.00
- TMDL MPCA: 30,000.00
- U of M - Restoration: 75,000.00

**Total: $814,000**

**Bluff Creek One Water**
- Fish Passage Bluff Creek *[†]*

**Riley Creek One Water**
- Chanhassen Town Center *[†]*
- Lake Lucy Iron Enhanced: 400,000.00

**Lake Susan Improvement**
- Lake Susan Improvement Phase 2 *[†]*
- Lake Riley - CLP Treatment: 10,000.00
- Lake Riley - EWM Treatment: 10,000.00
- Lake Riley Alum: 60,000.00
- Lake Susan - CLP Treatment: 10,000.00
- Lake Susan Alum Feasibility: 11,500.00
- Rice Marsh Lake Aeration: 15,000.00
- Rice Marsh Lake Alum Feasibility: 11,500.00
- Lower Riley Creek Stabilization - E and D3: 265,000.00

**Total: 783,000.00**

**Purgatory Creek One Water**
- Purgatory Creek at 101
- Purgatory Creek Lakes UAA: 50,000.00
- Silver Lake Paleol: 15,000.00
- Mitchell Lake - CLP Treatment: 15,000.00
- Red Rock Lake - CLP Treatment: 15,000.00

**Total: 80,000.00**

**Reserve: 113,000.00**

**Total Expenditures: $2,496,500.00**

**Balance: $0**

*Denotes Multi-Year Project – See Table 2 for further details

*Grants are supplementing the Project see Table 3

* Denotes the project will be overlapping by one year as it was not fully complete by year end
APPENDIX D: ANNUAL AUDITED FINANCIAL REPORT AND AUDIT REPORT
For Audit Report please go to

http://www.rpbcwd.org/library/annual-reports-and-communications/