Barr Lake and Milton Reservoir Watershed Plan Update

September 2017

Mission - To encourage cooperation, involvement, and awareness by interested parties in collaborative efforts to improve the water quality of Barr Lake and Milton Reservoir.

Vision - To maintain appropriate water quality in Barr Lake and Milton Reservoir through the continuous implementation of a collaboratively-developed watershed management plan. Clear communication to all watershed stakeholders will be a major attribute.

Barr Lake & Milton Reservoir Watershed Association

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SUMMARY

Members of the Barr Lake and Milton Reservoir Watershed (BMW) Association and its partnering agencies and stakeholders continue to advance efforts towards meeting its mission of encouraging cooperation, involvement, and awareness by interested parties in collaborative efforts to improve the water quality of Barr Lake and Milton Reservoir. This update to the original 2008 Watershed Plan includes accomplishments and work completed from 2008 through June 2017.

A Watershed Plan is an overarching document that discusses the original water quality issues and partnerships that formed to resolve them, solutions and water quality goals that have emerged in the process, progress made towards meeting those goals, involving the public, and future steps. Two documents guide Association actions, the *Phased Total Maximum Daily Load to Achieve pH Compliance in Barr Lake and Milton Reservoir, Colorado (TMDL),* and an *Adaptive Implementation Plan*. Both documents are consistent with the U.S. Environmental Protection Agency's (EPA) Watershed Planning Guidelines. The Watershed Plan is a living document and, as such, periodic updates will serve to keep regulators and the public apprised of advances made to implement the pH and dissolved oxygen Total Maximum Daily Loads (TMDLs).

Accomplishments Described in this Update

- TMDLs were developed to address both pH and dissolved oxygen impairments in the reservoirs. Load and wasteload allocations for total phosphorus (TP) were assigned to address these impairments and in-lake water quality goals for TP and chlorophyll a (Chl-a) were established (Section 5.0).
- A TMDL Implementation Plan was developed as a companion document to the TMDLs. The Implementation Plan outlines the steps envisioned in ultimately meeting water quality goals (Section 6.0).
- A multi-year limnocorral study was conducted to better understand the site-specific linkages between TP and a number of other response variables including pH, Chl-a, alkalinity, and the ratio to nitrogen. Results of the study have established a better understanding of the interplay of these analytes and confirmed the suitability of the originally established in-lake water quality goals (Section 6.1.1).
- Some publicly owned treatment works have initiated TP reductions in their effluent while others are planning for a first phase of reductions to be implemented in the near-term, as required under Regulation No. 85 and the TMDLs (Section 6.2.1). Municipal separate storm sewer system operators are planning new stormwater control projects to further reduce TP contributions from the watershed (Section 6.2.2). Outreach and education efforts are underway, particularly targeting agricultural producers, to implement best management practices for control of nonpoint sources (NPS) of phosphorus runoff (Section 6.3.2).

Evaluations of preventative source control for TP in detergents and lawn fertilizers is ongoing (Section 6.2.3).

- An evaluation was conducted to evaluate the effectiveness of TP removal in the canal entering Barr Lake. Designed to remove background sources of TP, it was determined that alum dosing could be utilized cost effectively at a small to large scale to remove TP originating from a variety of sources. Similarly, an in-reservoir treatment evaluation was conducted to determine the best technologies for inactivating or removing TP once it has entered the lakes. This study found that alum treatments, both in-canal and in-lake, are likely the most effective method for addressing TP in the reservoir (Section 6.3)
- Biomanipulation work is underway in Barr Lake to evaluate the effectiveness of carp removal in reducing bioturbation and resuspension of TP from the sediments. To date, a total of 2,200 carp have been removed, equating to 18,000 pounds of carp and an estimated 52 pounds of phosphorus (Section 6.3.1)
- Public information and education (I/E) has been a large focus since 2014, educating the public about the importance of keeping the watershed healthy and reducing phosphorus to both reservoirs. To date, the focus has been educating people about their daily impacts to the watershed and how the collective impact from 2.5 million people can add up. Educational venues are varied including water festivals that reach 4th and 5th graders, talks to elementary and high school classes, fairs (local and county), brochures, presentations at professional organizations, bike tours, and media materials (Section 8.0).

MONITORING AND EVALUATION RESULTS

Water quality in Barr Lake and Milton Reservoir has improved as measured by decreases in summer season Chl-a concentrations, fewer hypereutrophic Trophic Status Index (TSI) scores, and improved water clarity. Water quality trends for Barr Lake indicate strong decreases in Chl-a and TP but no improvement in clarity and variable TSI scores. While the lake is still in the hypereutrophic range, the decrease in TP did result in an almost 10 point drop in its TSI score. Water quality trends for Milton Reservoir for all parameters show improvement, e.g., TP is decreasing, clarity is improving, and there appears to be a few more TSI scores in the eutrophic range. See Section 7.0 for more detail.

NEXT STEPS

Moving forward, the Association will continue to work through tasks outlined in the Implementation Plan. As with any adaptive plan, the BMW will use the information generated from the ongoing work of this Plan to inform next steps and make appropriate changes to work toward meeting the goals of the TMDL. This includes:

- Continued POTW upgrades to remove phosphorus and monitoring to evaluate the in-lake response to reductions;

- Evaluating the effectiveness of MS4 efforts at phosphorus reduction, perhaps through real-time monitoring;
- Continued discussions on the need for and support available to implement the in-canal treatment system and in-reservoir management options;
- Implementation of preventative source control that would help eliminate sources of phosphorus in the watershed;
- Investigations on the magnitude of NPS loading, ways to minimize these sources, and if pollutant trading may be available;
- Discussions on the need for and appropriateness of site-specific standards if the current standards are unable to be met through TMDL implementation; and
- Continued evaluation and updating of the TMDL, as necessary.

1.0 INTRODUCTION

The Barr Lake and Milton Reservoir Watershed Association (BMW or Association) is a partnership of diverse agencies and individuals working towards improving the water quality in Barr Lake (Barr) and Milton Reservoir (Milton). Barr and Milton are large, warm-water reservoirs located downstream of the Denver metropolitan area. The South Platte River is their main source of water. The watershed includes diverse land and water uses. Excessive loading of nutrients, primarily phosphorus, is the dominant water quality concern.

The BMW membership includes water and wastewater agencies, local and state government, water and sanitation districts, irrigation companies, industry, and neighboring watershed groups. The Association was incorporated as a nonprofit in 2005. A consensus-based approach is employed to direct activities aimed at reducing eutrophication problems and addressing related water quality issues. This collaborative effort has resulted in a pollutant reduction plan that specifies limits on annual phosphorus loads to each reservoir to achieve water quality goals. Efforts to control both external phosphorus loading (e.g., from publicly owned treatment works (POTWs) or wastewater treatment facilities) and internal loading (from phosphorus resuspension) are necessary. External control efforts include wastewater and stormwater treatment improvements while internal control efforts include treatment options within the inlet canals and body of the reservoirs.

The BMW Association strives to improve awareness of these water quality issues and provides a forum to evaluate solutions. Opportunities to increase awareness are provided to stakeholders through monthly meetings, publications, and events. The public is offered a chance to learn about water quality issues through a variety of outreach events conducted by the organization. From its beginnings, clear communication has been identified as a cornerstone of organizational success.

The following Watershed Plan (Plan) update describes the BMW Association and provides information on past, current, and future efforts that have developed since the first watershed plan written in 2008. The Plan can be thought of as a roadmap to improve water quality in the reservoirs. The Plan requires continuous updating to remain relevant and account for changes in data, information, technology, and environmental policy and regulation.

- *At the end of each section of this Plan is a list of important links provided for readers to learn more about the watershed and the ongoing efforts to improve water quality.*

Important Links:

2008 Watershed Plan

2.0 WATERSHED - CHARACTERISTICS

2.1 EXTENT OF THE WATERSHED

Half of all Coloradoans live in the 850 square-mile area that is defined as the BMW watershed. The boundary of the watershed was developed based on the need for a watershed group, availability of water quality data, and feasible manageability. The upper boundaries of the BMW connect with those of several watershed groups including the Chatfield Watershed Authority, Cherry Creek Basin Water Quality Authority, and Bear Creek Watershed Association. Lower sections of the watershed connect with the boundaries of the Clear Creek Watershed Foundation and the Big Dry Creek Watershed Association.

The watershed incorporates six highly populated counties: Douglas, Jefferson, Arapahoe, Denver, Adams, and Weld. The river tributaries in the watershed connect such communities as Littleton, Englewood, Aurora, Denver, Thornton, Brighton, and Lochbuie. Beneficial water uses include: drinking water, agriculture, aquatic life, and recreation.

The South Platte River system in the metropolitan Denver area is both the principal source of water for some local communities as well as the main conduit to send treated wastewater downstream to others for beneficial use. Water rights regulate when, where, and how much water is moved within the BMW. The South Platte River is a heavily used system in this area. For example, there are more miles of managed canals than streams in the watershed.

2.2 THE RESERVOIRS

Barr and Milton are warm-water, plains reservoirs filled via surface water diversions from the South Platte River at the Burlington Canal and Platte Valley Canal, respectively. Barr and Milton are interconnected through the Beebe Draw Canal. Water is diverted from the South Platte River into the Burlington Canal just upstream of the Metro Wastewater Reclamation District (Metro) Robert W. Hite Treatment Facility. These canals and reservoirs are owned and managed by the Farmers Reservoir and Irrigation Company (FRICO) for delivering water to its numerous shareholders. The Burlington Canal also supplies water to the City of Thornton's drinking water reservoirs (Tani Lakes) as well as other reservoirs (Horse Creek Reservoir and Prospect Reservoir) located downstream of Barr.

2.3 FEATURES AND INVENTORY

The BMW lies within the U.S. Geological Survey (USGS) Hydrological Unit Code watershed delineation for the Missouri Water Resource Region, 1019 South Platte Sub-region, 10190003 Middle South Platte-Cherry Creek Cataloging Unit. Barr is located 14-miles northeast of Denver and immediately north of Denver International Airport (DIA) in Adams County. Barr Lake, at 2,000 surface acres in size, is used for irrigation and municipal water supply. Located within

Barr Lake State Park, the reservoir provides critical avian and wildlife habitat as well as outstanding recreational opportunities.

Milton Reservoir, also, 2,000 surface acres in size, is located eight miles southeast of the town of Gilcrest in Weld County. Milton is used principally for agricultural irrigation, although the reservoir also provides wildlife habitat and recreational opportunities leased to a private enterprise.

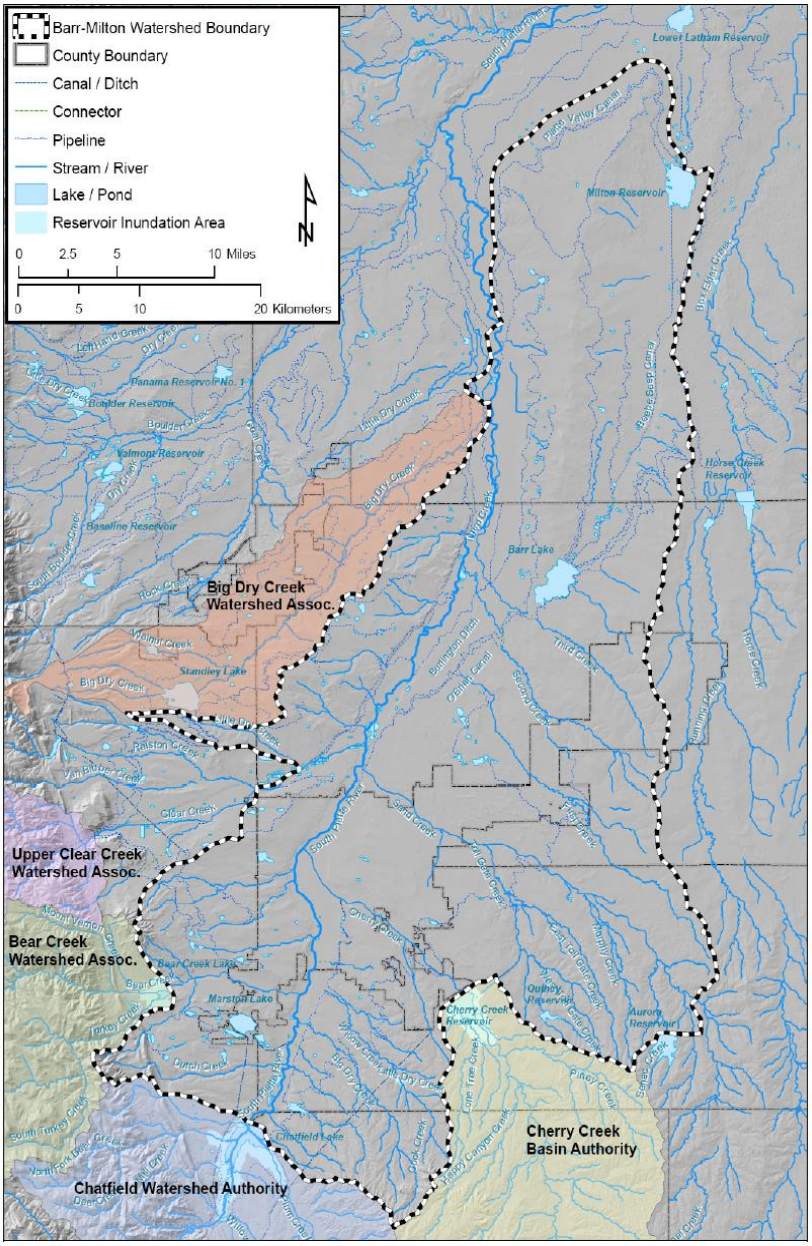

Figure 1: Map of the Watershed

The watershed is characterized by a continental-type climate with a wide annual temperature range and irregular seasonal and annual precipitation. Annual precipitation in the watershed is less than 15 inches per year. Most of the precipitation on the plains occurs as brief, isolated thunderstorms during the summer months. December is the driest month for the watershed while May is the wettest. Snowmelt from the higher elevations upstream of the watershed supplements the annual water budget.

Major land uses in the watershed include residential, commercial, and industrial urban areas; open land (most notably the Rocky Mountain Arsenal National Wildlife Refuge); Denver International Airport; agriculture; and oil and gas resource areas.

There are forty-two major discharges permitted under the National Pollutant Discharge Elimination System (NPDES) in the watershed, three Phase I Municipal Separate Storm Sewer Systems (MS4) permits, and seventeen MS4 permits for Phase II dischargers. Phase I dischargers include Denver, Aurora, and Lakewood. Phase II dischargers include Arvada, Brighton, Broomfield, Commerce City, Englewood, Federal Heights, Littleton, Northglenn, Thornton, Westminster, Wheat Ridge, and all six counties.

3.0 WATER QUALITY STANDARDS

3.1 STATE REGULATIONS

Passed in 1972, the objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by controlling point and nonpoint sources (NPS) of pollution.

To that end, the Colorado Water Quality Control Act implements the goals of the CWA through state regulations developed and enforced by the Colorado Department of Public Health and Environment (CDPHE). Regulation No. 38 (5 CCR 1002-38) describes enforceable water quality standards for surface waters in the South Platte Basin, including Barr and Milton.

3.2 STANDARDS

Barr and Milton (Middle South Platte Segment 4, COSPMS04) have the following classified uses:

- Domestic Water Supply
- Aquatic Life Warm Water Class 2
- Recreation Class E
- Agriculture

Corresponding water quality standards set to protect those uses specific to Barr Lake and Milton Reservoir can be found on page 90 of the Regulation 38 tables.

The antidegradation designation for Barr and Milton is “use protected” meaning that water quality with respect to assimilative capacity is not better than necessary to protect the classified uses.

3.3 WATER QUALITY IMPAIRMENTS

Section 303(d) of the CWA requires that each state prepare a list of waters that do not meet water quality standards. Regulation 93 documents Colorado’s List of Impaired Waters (303(d) List). The list describes the waterbody and the parameter for which it is impaired.

Barr and Milton were added to the 2002 303(d) list of water quality-impaired stream segments for not meeting the pH standard. For pH, the applicable water quality standard is 6.5 to 9.0 standard units for all uses (except for agriculture, which has no pH standard).

Milton was identified on the 303(d) list of impaired waters in 2010, for exceedance of the dissolved oxygen (DO) standard. In 2012, Barr Lake was also added to the 303(d) list. The DO standard is a 5.0 mg/L minimum that cannot be exceeded at any time.

An explanation for why pH and DO impairments occur can be found in Section 5.1.

3.4 TOTAL MAXIMUM DAILY LOADS

For water bodies that are not attaining their classified uses, development of a Total Maximum Daily Load (TMDL) is appropriate. A TMDL is a tool that implements the CWA by establishing allowable pollution limits for both point sources (such as domestic POTWs) and NPS (diffuse runoff, sediments, etc.). TMDL assessments use water quality and flow data to determine the amount, or load, of a given parameter than can be in the waterbody without exceeding applicable water quality standards. The TMDL reports contaminant loads that originate from point and nonpoint sources within the study area. Once this information is available, a plan is developed to address how each of the contributing sources can be reduced to meet the allowable load.

To address the pH and DO impairments, a third-party TMDL was developed and submitted to CDPHE and EPA for approval. On June 27, 2013, EPA issued its final approval letter. More on the TMDL process and its elements can be found in Sections 4.4 and 5.0.

Important Links:

2008 Watershed Plan

EPA Clean Water Act

EPA Information on TMDLs

Regulation 31 – Basic Standards

Regulation 38 – South Platte River Basin Standards

Regulation 38 – Appendix of Standards Tables

4.0 STAKEHOLDERS-PARTNERSHIPS AND PROGRESS

4.1 THE ORGANIZATION

In response to the state's 303(d) listing of Barr and Milton for pH impairments, FRICO and local water and wastewater treatment agencies initiated stakeholder-based meetings in 2002 to discuss the regulatory issues. The meetings resulted in an agreement that the issues would best be solved through a stakeholder-driven process. Consequently, the BMW Association was formalized as a nonprofit organization in 2005. The Association's established mission is to encourage the cooperation, involvement, and awareness of interested parties to use a collaborative effort to improve lake and reservoir water quality. More on the Association can be found at www.barr-milton.org.

Making substantive water quality changes in the BMW has required input and cooperation from a variety of stakeholders. Gaining support and buy-in from all stakeholders leads to thoughtful discussions and decision-making that minimizes conflict. The BMW Association is a consensus-driven, decision-making organization. Each member brings a unique perspective to the group. By acknowledging and addressing issues proactively as a cohesive group, informed decision-making can occur in a collaborative fashion.

The BMW Association has a Board of Directors (Board) that make recommendations for ratification by its stakeholders. Stakeholders in the BMW are the ultimate decision-makers. The BMW Association utilizes the services of a contract watershed coordinator to manage administrative tasks while keeping the Association moving forward with its mission.

4.2 MEMBERS

The 2016/17 membership roster includes twenty-three dues paying entities plus another dozen or so active, non-dues paying members. Member entities include water and wastewater agencies, local and state government, water and sanitation districts, irrigation companies, industry, and neighboring watershed groups. Over one hundred individuals and entities are notified of group activities via an e-mail distribution list. This list includes all the members plus a wide variety of interested recreational, environmental and citizen-based groups and individuals.

Individuals, as well as agencies, are encouraged to become members of the BMW Association. Association members join at one of four membership levels: Sustaining, Active, Supporting, and Ex - officio. Fees and voting rights vary with each level of membership. While dues are encouraged, it is not required as a condition of general membership. Any member of the public is invited and encouraged to attend and participate.

Sustaining Member — Members are entitled to appoint one representative to the Board. Sustaining members are required to attend stakeholder meetings and to vote upon any substantive decision.

- Centennial Water and Sanitation District

- City of Thornton
- East Cherry Creek Valley Water and Sanitation District
- FRICO
- Littleton/Englewood Wastewater Treatment Plant
- Metro Wastewater Reclamation District
- South Adams County Water and Sanitation District

Active Member — Members are eligible to serve as at-large members on the Board. Active members are entitled to participate in all meetings, vote upon any substantive decision, and vote at each at-large Board election.

- The City of Aurora
- The Burlington Land and Reservoir Company
- City and County of Denver
    - Denver International Airport
    - Denver Public Works
    - Denver Environmental Health
- South Platte Coalition for Urban River Evaluation (SPCURE)
- Suncor Energy
- United Water and Sanitation District

Supporting Member — Members are eligible to serve as at-large members on the Board. Supporting members are entitled to participate in all meetings, vote upon any substantive decision, and vote at each at-large Board election.

- Adams County
- Big Dry Creek Watershed Association
- City of Brighton
- Colorado Parks and Wildlife – Barr Lake State Park
- Friends of Barr Lake
- Henrylyn Irrigation Company
- Town of Lochbuie
- North Front Range Water Quality Planning Association
- Xcel Energy
- Stormwater Professionals Learning About Stream Health (SPLASH)

Ex-officio Member — Members are entities that want to participate and stay involved but cannot vote or pay to be a member due to conflicts of interest.

- Colorado Department of Public Health and Environment
- U.S. Environmental Protection Agency

4.3 COORDINATING ORGANIZATIONS

The BMW Association coordinates its efforts with several other organizations in the field of watershed protection. These include the neighboring watershed associations of Chatfield Watershed Authority, Cherry Creek Basin Water Quality Authority, Bear Creek Watershed Association, Clear Creek Watershed Foundation, Big Dry Creek Watershed Association, and Groundwork Denver that works on the urbanized portions of lower Bear Creek. The Greenway Foundation is another nonprofit organization that focuses on environmental, recreational, and water quality enhancements on the South Platte River through the Denver metropolitan area. A number of municipal storm water organizations concentrate efforts on public education and reducing storm water impacts in the watershed. The Colorado Stormwater Council and Arapahoe County SPLASH (Stormwater Permittees for Local Awareness of Stream Health) are two organizations that BMW teams with to offer outlets for public education.

Barr Lake State Park staff and volunteers are instrumental educational partners with the Association. In 2016, Barr Lake State Park renovated its nature center to include the Oasis Room, a room dedicated to teaching the public about the watershed and water quality topics. The Friends of Barr Lake is a grass roots organization that helps fund restoration projects around Barr and assists with public education. See Section 8.0 for more detail on outreach efforts.

4.4 PROGRESS TO DATE

The early years of the organization, spanning from 2002 to 2005, included identification of stakeholders, regular stakeholder meetings, a collective identification of stakeholder goals and objectives, and the formation of a comprehensive water quality database.

The Association was formally incorporated in 2005 when it turned its attention to developing a long-term funding structure to ensure its longevity. From 2005 to 2008, the organization undertook compilation of its first iteration of a watershed plan. Technical work included assessing then-current water quality conditions in both reservoirs, calculating water quality and quantity budgets, creating two computer models to predict water quality improvements under various scenarios, establishing initial water quality targets, investigating feasibility of control and management strategies, and developing an information and education program.

The period from 2009 through 2011 was spent on assembling the regulatory documents, principally a third-party TMDL report. This included finalizing numeric water quality targets with CDPHE, negotiating the details of allocations between affected stakeholders, identifying and

selecting water quality improvements needed for implementation of the TMDL, defining the TMDL implementation schedule, and gathering input from the regulatory agencies.

Once the draft TMDL documents were completed in 2011 (then approved in 2013), the BMW Association embarked on TMDL implementation, a process which is still underway today. Implementation to date has included conducting special studies to reduce TMDL uncertainty, improvements at POTWs to reduce nutrient loading, feasibility studies related to reducing nonpoint load sources, gathering data, updating the models, and evaluating progress towards meeting TMDL water quality goals. More on implementation details is found in Section 6.0.

Important Links:

Barr Lake State Park
Bear Creek Watershed Association
Big Dry Creek Watershed Association
Chatfield Watershed Authority
Cherry Creek Basin Water Quality Authority
Clear Creek Watershed Foundation
Colorado Stormwater Council
Friends of Barr Lake
Groundwork Denver (lower Bear Creek)
SPLASH
The Greenway Foundation
BMW pH TMDL
BMW DO TMDL

5.0 WATER QUALITY – PROBLEMS, SOLUTIONS, GOALS

Water quality planning for Barr and Milton has been underway for seventeen years and has included the following steps:

- Watershed Characterization – understanding the physical, chemical, and anthropogenic influences on the reservoirs. This work was initiated in 2005 and is documented in the Barr Reservoir Assessment and Milton Reservoir Assessment.
- Water Quality Monitoring – scientific data collection and analysis in the reservoirs and watershed. Both Barr and Milton have been regularly monitored since June of 2002. Metro conducts in-reservoir monitoring while FRICO is responsible for inflow and outflow monitoring. All routine monitoring results are uploaded to the Colorado Data Sharing Network (instructions for access can be found here).
- Source Assessment – identification of point and non-point sources of pollutants (primarily phosphorus) within the watershed. Descriptions and quantification of sources can be found in the Watershed and Reservoir Modeling report as well as in the pH TMDL.

- Development of Water Quality Targets – identification of appropriate surrogate water quality constituents and concentrations that can be used as targets for meeting pH and DO standards in the reservoirs. These targets and their basis for derivation are found in the pH and DO TMDL documents.
- Load and Wasteload Allocation Targets – calculation of phosphorus reductions needed from both point and non-point sources within the watershed. See Table 1 and **Error! Reference source not found.** below or Table 4.2 and 4.3 in the TMDL document.
- TMDL Implementation Plan – development of a strategy to realize the required point and non-point source reductions. Detail can be viewed in the Implementation report.

Information developed through each step of the process has been used to inform problem identification, the establishment of new water quality targets for eliminating impairments, and calculations of pollutant reductions needed to meet water quality standards in the reservoirs, as described in the following sections.

5.1 WATER QUALITY PROBLEMS

Barr and Milton have a long history of being impacted by large, summer-time algal blooms that affect water quality, beneficial uses, and aesthetics. For most of these reservoirs' 100-plus year history, large quantities of nutrients have been delivered to each, resulting in major water quality problems. These conditions appear to have peaked in the 1950's and 1960's. With improvements in wastewater management in the mid 1960's, noticeable improvements were seen downstream. By the mid 1970's, water quality at Barr had improved sufficiently to support a state park. With continued population growth pressures, drinking water needs, wastewater treatment requirements, and a renewed focus on recreational demands, Barr continued to receive attention to identify methods to improve water quality. Milton also has seen growth in recreational and other uses that require improvements in water quality.

Although a variety of water quality issues exists throughout the watershed, the primary concern with respect to Barr and Milton are exceedances of the pH standard and excessive nutrient levels. Both water bodies have been included on Colorado's 303(d) List as impaired for pH since 2002. Barr additionally was listed for DO impairment in 2012. The most obvious water quality symptoms are related to cultural eutrophication, resulting in the following imbalances within the reservoirs:

- high pH above the upper limit of the standard (9.0 units);
- excessive algae growth;
- extensive blue-green algae populations;
- reduced water clarity;
- low DO near the reservoir sediments; and
- high un-ionized ammonia concentrations.

Impairment has been directly linked, through modeling efforts, to high loads of nutrients contributed principally from human derived sources within the watershed. While both nitrogen and phosphorus contribute to excessive algal growth, it has been determined that total phosphorus (hereafter referred to as TP) reductions are the logical focus for nutrient control efforts.

	Barr Lake		Milton Reservoir	
Contribution by Source	kg/yr.	% of Total	kg/yr.	% of Total
POTWs	61,162	86.9	32,654	83.7
MS4s	2,189	3.1	452	1.2
Background/NPS	3,025	4.3	3,893	10
In-Lake	4,000	5.7	2,000	5.1
Total Annual Loading	70,376	100	38,999	100

Table 1: Current estimated TP loadings to the reservoir

5.2 PHOSPHORUS SOURCES

TP loading to Barr is currently estimated at 70,400 kg/yr., while TP loading to Milton is estimated at 39,000 kg/yr. Modelling efforts were conducted to partition sources. The following subsections describe each of the source categories and their contributions of TP to each of the reservoirs.

5.2.1 Point Sources

Forty-two major dischargers in the watershed hold NPDES permits, including industrial, wastewater and drinking water treatment, and other facilities. Within this group of point sources, municipal POTWs are the largest contributors of TP. The largest municipal discharger in the watershed is Metro at a rated capacity of 227 million gallons per day (mgd), followed by the Littleton-Englewood Wastewater Treatment Plant at a rated capacity of 50 mgd. Other wastewater dischargers have rated capacities less than 9 mgd. Of the TP loading to Barr, municipal wastewater sources collectively contribute 87%. For Milton, the contribution is 84%.

5.2.2 Municipal Separate Storm Sewer Systems (MS4s)

MS4s are another category of permitted point source discharges. There are three MS4 permits in place for municipalities that are greater than 100,000 in population (Denver, Aurora, and Lakewood), plus a non-standard MS4 permit covering the Colorado Department of

Transportation facilities and activities in the watershed and a similar non-standard permit for the Regional Transportation District. Phase II storm water permits are held by 15 smaller communities and 5 counties in the urbanized and urbanizing area around Denver. MS4s account for 3% of the TP loading to Barr and 1% of the loading to Milton.

5.2.3 Background Nonpoint Sources

This category of sources can be described as non-permitted, nonpoint source (NPS) discharges originating from diffuse sources. NPS of phosphorus can be contributed from residential and park areas, agricultural lands, and stream bank erosion. This category also includes "background" sources of TP that originate upstream of the watershed boundaries used for modeling purposes, specifically TP captured and conveyed out of Cherry Creek, Chatfield, and Bear Creek Reservoirs. This source category is responsible for 4.3% of the TP loading to Barr and 0.7% of the loading to Milton.

5.2.4 In-Lake Sources

Reservoirs naturally collect and store nutrients in the sediments. These nutrients originate from the watershed and can built up in the bottom sediments of the reservoirs. This sink of nutrients, including dissolved P and ammonia, can re-suspend in the water column under the right conditions. TP loading from the reservoir sediments contribute to the overall loading and account for 6% of the TP load in Barr and 5% of the TP load in Milton.

5.3 SOURCE CONTROLS

Modeling results indicate that pH and DO standards can be achieved if annual TP loading is reduced to 5,779 and 5,319 kg/yr. in Barr and Milton, respectively. This represents a 92% reduction in TP source loading for Barr and an 86% reduction for Milton. Table 5.2 reports allowable load and percent reduction requirements for each of the identified TP sources as reported in the pH TMDL.

	Barr Lake		Milton Reservoir	
TMDL Load by Source	kg/yr	% Reduction	kg/yr	% Reduction
POTWs	2,272	96.3	1,713	94.8
MS4s	1,751	20	362	20
Background	756	75	2,744	30
In-Lake	1,000	75	500	75
Annual Allowable Load	5,779	91.8%	5,319	86.4%

Table 2: Estimated allowable TP loadings from source

5.4 WATER QUALITY GOALS

As reported in the pH TMDL, an in-lake maximum value of 100 µg/L has been selected as the initial TP target for achieving pH and DO standards attainment. A corresponding chlorophyll a (Chl-a) value of 25 µg/L and an alkalinity of 95 mg/L are assumed to support the TP goal. The 100 ug/L TP value will be the primary management target, with Chl-a tracked as a secondary variable to guide implementation refinement. TP and Chl-a targets may require modification as water quality improves and the relationship among TP, Chl-a, and pH is further refined.

5.5 INDICATORS TO MEASURE SUCCESS

The primary measure of success will be attainment of the pH and DO standards as defined in re
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Important Links:

Barr Reservoir Assessment
Milton Reservoir Assessment
2009 Watershed and Lake Modeling for a TMDL Evaluation of Barr Lake and Milton Reservoir
BMW pH TMDL
BMW DO TMDL
TMDL Implementation Plan
Cherry Creek Basin Water Quality Authority
Clear Creek Watershed Foundation
Colorado Stormwater Council
Friends of Barr Lake
Groundwork Denver (lower Bear Creek)
SPLASH
The Greenway Foundation

6.0 TMDL IMPLEMENTATION

The pH and DO Implementation Plan (Plan) for Barr and Milton was developed as a companion to the TMDL to lay out a plan forward for adaptively implementing phosphorus reductions required under the TMDL.

Adaptive implementation allows for ongoing assessment of improvements and costs from implementation of controls and uses this information to improve the predictive models and

adjust implementation elements. This method of implementation allows for BMW to take measured steps toward the goals of the TMDL while simultaneously confirming or adjusting the goals themselves based on additional collected data and information. Adaptive implementation focuses on:

- Refining water quality goals based on reduced uncertainty;
- Evaluating and implementing point source reductions for POTWs and MS4s;
- Evaluating and implementing options for reducing background and NPS; and
- Determining appropriate water quality to support the designated uses.

At the time of this Watershed Plan update, a considerable amount of work has been completed on the initial adaptive implementation of the TMDL as well as efforts associated with resolving uncertainty. This section provides an update on progress made to date, conclusions drawn, and future work.

6.1 REDUCING UNCERTAINTY

The 2009 modeling identified four areas of uncertainty that required additional investigation: 1) the relationship among pH, TP, and Chl; 2) the magnitude of the existing TP load; 3) the derivation for internal loading of TP; and 4) the future effects of alkalinity on pH attainment. Reducing uncertainty in these areas is important for validating the underlying assumptions used in deriving the TMDL water quality goals.

6.1.1 Limnocorral Studies

Limnocorrals, a form of experimental microcosm, were deployed in Barr from 2011 to 2013 to better understand the relationships among several chemical variables including pH, TP, and Chl-a. Water chemistry was experimentally manipulated in the limnocorrals to evaluate the response of these key constituents.

In general, the studies confirmed that the initial water quality goals reported in the TMDL appear to still be relevant based on what was assumed for the relationships between pH, TP and Chl-a. The studies also yielded information on the relationship between pH and alkalinity specific to Barr. Conclusions drawn from the study are as follows:

- **pH change as Chl-a decreases.** pH decreases as Chl-a decreases. For every 10 ug/L decrease in Chl-a, pH was seen to decrease by 0.13 units. A Chl-a level of 25 ug/L would result in a pH of 8.75.
- **Chl-a change as TP decreases.** Chl-a decreases as TP decreases. For every 50 ug/L decrease in TP, Chl-a was seen to decrease by 4.4 ug/L. A TP concentration of 100 ug/L would result in Chl-a of 0.90 ug/L. This does not match what would be expected, indicating that TP is not the only nutrient controlling primary productivity.

- **pH change as TP decreases.** pH decreases as TP decreases. For every 50 ug/L decrease in TP, pH was seen to decrease by 0.10 units. A TP concentration of 100 ug/L would result in a pH of 8.10.
- **Nitrogen to phosphorus ratio (N:P) to satisfy the TMDL.** Both pH and Chl-a decrease as the ratio of N:P increases. An N:P ratio (using TP and TN) of 15:1 would support the pH and DO TMDL targets. An N:P ratio of 15:1 would result in a pH of 7.50 and Chl-a of 10.7 ug/L. This means that controlling TP is not enough to attain the Chl-a goal. We must also control the N:P ratio.
- **pH change as alkalinity decreases.** pH decreases as alkalinity decreases. For every 20 mg/L as $CaCO_3$, pH would decrease by 0.10 units. Alkalinity of 95 mg/L as $CaCO_3$ would give a pH of 8.63 based on linear regression.

6.1.2 Internal Loading of TP

Internal loading of TP was evaluated as part of the Evaluation of Internal Phosphorus Load Management Options study for Barr Lake and Milton Reservoir (2016). The report offers a more detailed analysis of in-lake contributions to TP loading from the lake sediments. The conclusion of this work was that internal loading is thought to be of a lesser magnitude than originally reported in the 2009 watershed modeling report. However, this evaluation verified that contributions from internal loading still has potential of being a significant factor in the in-lake productivity after other sources of TP are substantially reduced.

6.2 POINT SOURCE REDUCTIONS

6.2.1 Publicly Owned Treatment Works (POTWs)

POTWs constitute the largest source of TP loading to the reservoir and, accordingly, are responsible for the largest TMDL reductions (a collective reduction of over 90%).

The initial effluent limitations for the three largest POTWs in the watershed will be set at 1.0 mg/L of TP, incorporated into discharge permits upon the first permit renewal following TMDL approval in 2013. These controls will be considered interim effluent limitations and are consistent with those required by Regulation No. 85, Nutrients Management Control Regulation (CCR 1002-85). As indicated in the TMDL allocation tables, in subsequent permit renewals, the most restrictive final permit effluent limitations at the largest facilities for total phosphorus will be 100 µg/L. In addition to the three largest POTWs identified in the TMDL as having wasteload allocations, other facilities located within the Barr-Milton watershed will be subject to the Regulation No. 85 effluent limitations.

Progress made by each of the POTWs identified in the TMDL in meeting Regulation No. 85 TP reductions is provided in Section 9.0: Appendix A : BMW Association TMDL Implementation Plan.

6.2.2 Municipal Separate Storm Sewer Systems

MS4 permit holders are expected to cumulatively reduce TP in its discharges by 20% above the current condition. The BMW Association is still determining how best to track and document these reductions. There are currently no MS4 permit requirements for general monitoring of BMP effectiveness.

BMW Association is investigating what it will take and who will partner to install and monitor a storm water monitoring station at the Burlington Head Gate. A Denver-wide storm water monitoring program has been capturing storm events since 1998. An additional monitoring site at the Burlington Head Gate would help monitor water quality improvements over time from storm water projects.

The City and County of Denver has initiated planning for several large storm water treatment projects upstream of the Burlington Canal diversion. Denver is scheduled to spend $2.25 billion over the next ten years to improve North Denver, come of these costs will go towards collecting data and improve storm water treatment upstream in the watershed. Platte to Park Hill is one of those projects based on a 2015 storm drain water quality prioritization scoring conducted by City and County of Denver. Conceptual plans include 26 projects from High Line Canal to the Heron Pond. These projects include improving existing BMPs, daylighting streams, restoring existing BMPs and streams, and revitalizing six north Denver urban neighborhoods. Impacts from the proposed improvement should reduce TP loading from MS4s.

6.2.3 Preventative Source Controls

Efforts are underway to evaluate the potential for reductions in TP from common sources, specifically household cleaning agents and lawn fertilizers. Several states have implemented phosphorus bans in detergents and fertilizers sold for residential use. As a result, manufacturers have developed phosphorus-free products that are readily available to consumers. The BMW Association is currently evaluating whether a state legislative action to ban the use of residential fertilizers and cleaning products would result in a measurable reduction in TP at the POTW or in stormwater.

6.3 BACKGROUND AND NONPOINT SOURCE REDUCTIONS

Background and nonpoint sources of TP are a small but eventually significant fraction of current loading to the reservoirs. External sources of background and nonpoint TP originate outside of the reservoirs. Internal sources of TP are also considered in this category and reside in the sediments at the bottom of the reservoirs. Both internal and external sources have been assigned a 75% reduction goal in the TMDL.

Two studies have been conducted to date to evaluate in-canal treatment and in-reservoir treatment options. Both studies evaluated existing and new data in support of a plan of action to reduce the annual load of TP into Barr.

Environmental Research and Design, Inc. prepared an In-Canal Phosphorus Treatment Study for Barr Lake (2015) that evaluates several treatment options to intercept phosphorus before entering Barr. The final report includes the use of liquid alum to remove four different amounts of phosphorus per year (2,500 kg, 14,500 kg, 53,250 kg, and 68,160 kg). These four options also included three possibilities with dealing with the alum floc (full capture in sedimentation ponds, full floc release to Barr, and partial discharge floc release to Barr). It was also concluded that in-canal treatment could reduce internal TP loading if the floc is released to the reservoir. The cost range per pound of phosphorus removed ranged from $8 to $34. The next step is to determine which entities may be interested in implementing this treatment option as part of their load or wasteload reduction requirements per the TMDL.

An Evaluation of Internal Phosphorus Load Management Options for Barr Lake and Milton Reservoir, Colorado (2016) was prepared by Water Resource Consulting, Inc. to evaluate the potential for dredging, phosphorus inactivation, oxygenation and circulation to reduce internal loading. It was concluded that in-lake options should be considered in tandem with external controls and could benefit from implementation of an in-canal treatment project. The use of alum for phosphorus inactivation appeared to be the most likely longer-term solution.

6.3.1 Biomanipulation Study

Biomanipulation deals with altering the aquatic food web to improve water quality. Currently, both reservoirs have a healthy population of common carp, an invasive nuisance species that causes internal phosphorus loading by bioturbation (actively agitating the lake sediment while feeding and mating) and excretion. It is hypothesized that removal of carp may reduce bioturbation that results in the resuspension of TP into the water column.

Biomanipulation experiments were initiated in 2014 and work continues annually. To date, a total of 2,200 carp have been removed from Barr, equating to 52 pounds of organic phosphorus and the avoidance of phosphorus loads from excretion and bioturbation. Milton was significantly drawn down in the fall of 2015 and 2016, which eradicated most of the carp, quite similarly to the complete draw down in 2009.

6.3.2 Other Nonpoint Source Controls

Agricultural sources of TP loading are not separately quantified in the TMDL because they are not known, but considered part of background. The BMW Association is partnering with the Colorado Monitoring Framework Agriculture Task Force to make progress on reduction from these sources. Much of the Task Force's work focusses on education and outreach to agricultural producers in the South Platte River basin regarding nutrient loading and what BMPs are available and which are appropriate to control loading. The Task Force includes a number of ag. -related public and private entities that work together with the stakeholder community.

6.4 NEXT STEPS

In general, the next steps in the Implementation Plan include:

- Continued POTW upgrades to remove phosphorus;
- Evaluating the effectiveness of MS4 efforts at phosphorus reduction, perhaps through real-time monitoring;
- Continued discussions on the need for and support available to implement the in-canal treatment system and in-reservoir management options;
- Implementation of preventative source control that would help eliminate sources of phosphorus in the watershed;
- Investigations on the magnitude of NPS loading, ways to minimize these sources, and if pollutant trading may be available;
- Discussions on the need for and appropriateness of site-specific standards if the current standards are unable to be met through TMDL implementation; and

Important Links:

Limnocorral Study Summary (2011-2014)
Evaluation of Internal Phosphorus Load Management Options study for Barr Lake and Milton Reservoir (2016)
Regulation 85 – Nutrient Control
Platte to Park Hill Stormwater Improvements
In-Canal Phosphorus Treatment Study for Barr Lake (2015)

7.0 MONITORING AND EVALUATION

7.1 WATER QUALITY MONITORING

In-reservoir, inflow, and outflow monitoring for both Barr and Milton is conducted year-round. The reservoirs are sampled once per month between November and February then twice per month from March to October resulting in 20 sampling events per year.

Barr's in-lake monitoring station is located at the deepest location between the west and east outlets. Milton is monitored at the deepest location by the dam's only outlet. Water samples are collected one meter below the water surface ("epilimnion") and one meter above the sediment surface ("hypolimnion"). Samples are analyzed for TP, soluble reactive phosphorus, total nitrogen, ammonia, nitrate/nitrite/, and Total Kjeldahl Nitrogen. Common cations (sodium, calcium, magnesium, and potassium) are sampled monthly, and the important metals (iron,

lead, zinc, copper, arsenic, selenium, and cadmium) are sampled quarterly. Alkalinity and Chl-a are analyzed only in the epilimnion sample. Profile data are collected from the surface to the reservoir bottom every half meter, which includes temperature, DO, pH, conductivity, and turbidity.

Water clarity is recorded using a Secchi disk. Other collected information includes weather, current conditions, time of day, and light availability. Water quality samples are analyzed at Metro's laboratory for both in reservoir and inflow/outflow samples.

7.2 CURRENT CONDITIONS

Annual water quality updates have been created for 2011 and for 2013 through 2016 highlighting the conditions for pH, Chl-a, DO, temperature, phosphorus, nitrogen, clarity, and alkalinity. The following sections describe conditions current through 2016 as well as trends that have been observed. The most current information on water quality in the water bodies can be found here.

7.2.1 Barr Lake

Water quality summaries from 2016 show that Barr did not meet the pH standard (9.18) but did meet the DO standard. The summer (July – September) Chl-a median (34.5 ug/L) was above the goal of 25 ug/L. The summer TP average in 2016 was 375 ug/L which is well below the 492 ug/L historical average (2003 – 2015) but above the 100 ug/L goal. This is a 24% reduction in TP. The summer TN average was 1.74 mg/L which was lower than the 2.16 mg/L historical average. This is a 19% reduction in TN. The water clarity summer average was 1.02 meters, which is close to the historical summer average of 1.21 meters. The 2016 summer alkalinity average was 131 as $CaCO_3$ mg/L, which was slightly less than the historical summer average of 144 as $CaCO_3$ mg/L.

Overall, Barr saw reductions in phosphorus, nitrogen, and alkalinity in 2016 which resulted in meeting the DO standard. Chl-a was still higher than the goal but was lower than the historical summer average of 66.3 ug/L.

7.2.2 Milton Reservoir

Water quality summaries from 2016 show that Milton satisfied both the pH and DO standards. The summer Chl-a median (66.7 ug/L) was well above the goal of 25 ug/L. The summer TP average in 2016 was 237 ug/L which is less than the 590 ug/L historical average (2003 – 2015), both well above the goal of 100 ug/L. The summer's TN average was 1.96 mg/L, which was like the 1.97 mg/L historical average. The summer average was 0.62 meters in Milton. This was less than the historical summer average of 1.49 meters. The 2016 summer alkalinity average was 123 as $CaCO_3$ mg/L, which was less than the historical summer average of 182 as $CaCO_3$ mg/L.

Overall, Milton is seeing reduced nutrient loading and reduced alkalinity resulting in lower Chl-a, higher DO, and better water clarity.

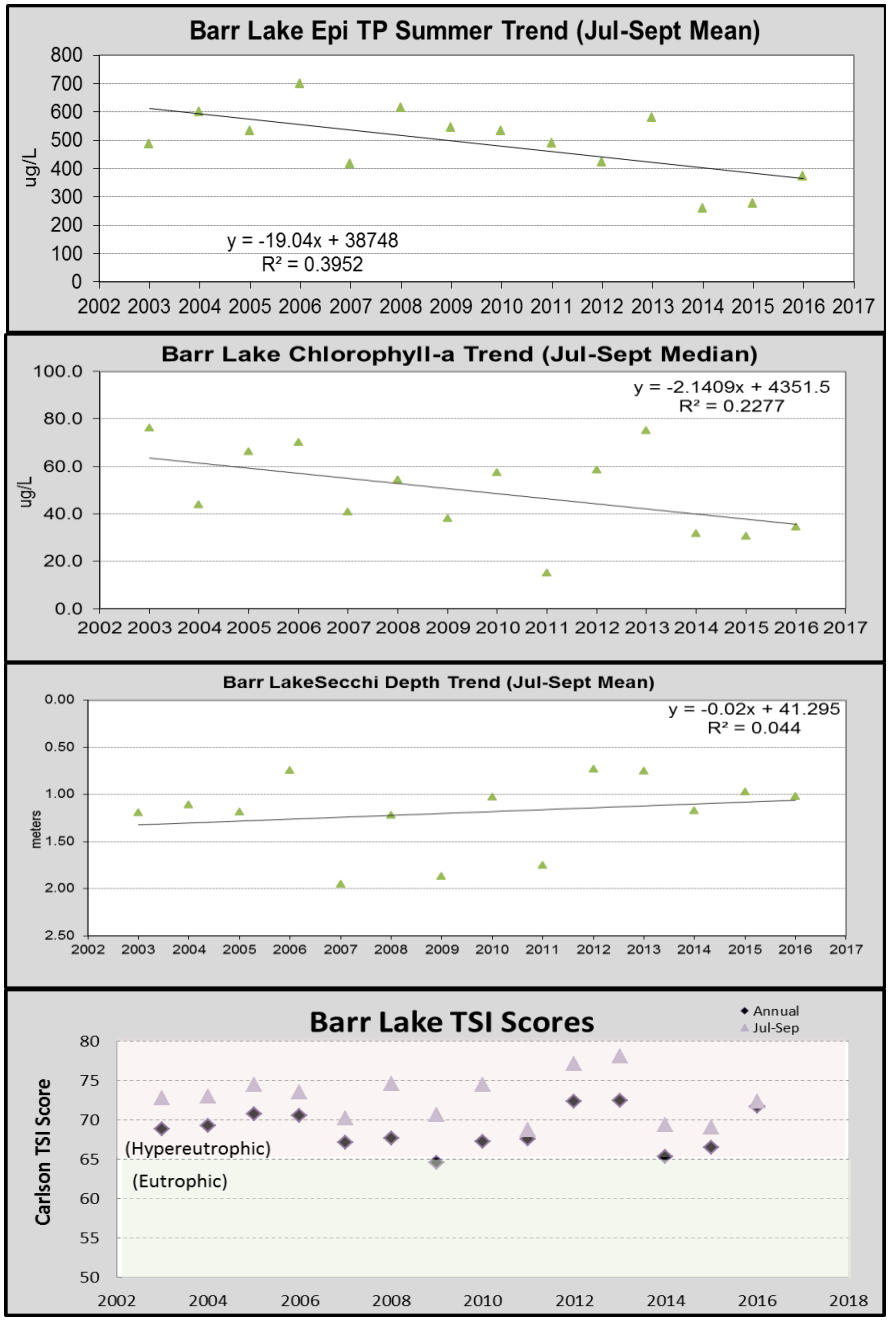
7.3 WATER QUALITY TRENDS

Water quality parameters used to track changes in the reservoirs over time include TP, Chl-a, and water clarity. These three parameters are also used to develop a Carlson Trophic Status Index (TSI) rating related to degree of eutrophication. These parameters have been monitored in-reservoir since June of 2002. A trend line can be draw through the data to determine if each water quality parameter is increasing or decreasing.

The second measure of progress has been the recent attainment of pH and DO in both reservoirs. Barr has satisfied the DO standard since 2011 and the pH standard in 2013, 2014, and 2015. Barr was also removed from the 303(d) list for ammonia. Milton satisfied the pH standard in 2013, 2015, and 2016 and the DO standard since 2012. Milton was in attainment of the ammonia standard in 2015 and 2016. The goal of the Association is to have no exceedances of the DO and pH standards in both Barr and Milton.

7.3.1 **Barr Lake**

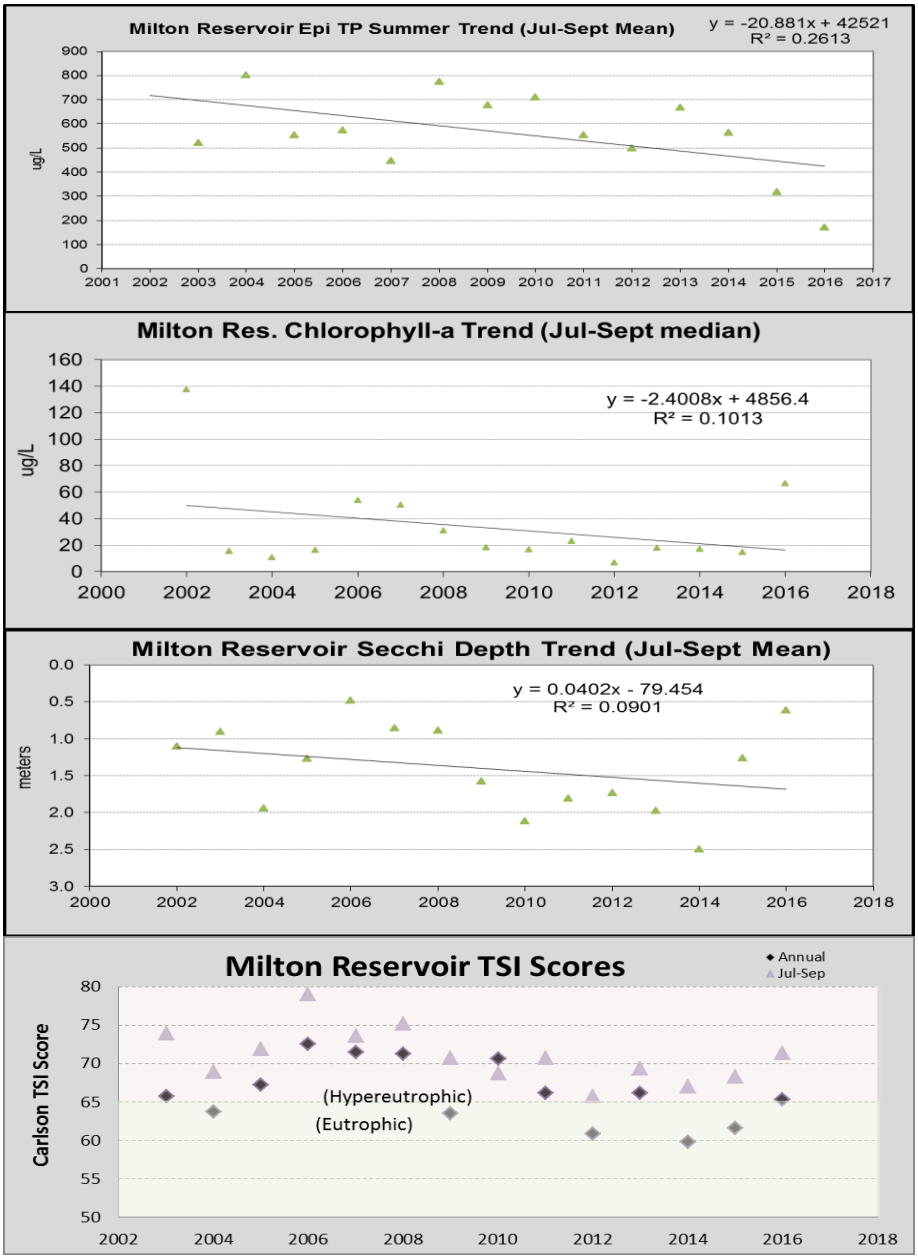
Water quality trends for Barr indicate a strong decrease in Chl-a along with a decrease in TP, but the water clarity has not changed during the summer months. Aesthetically, visual water clarity improvements may not be noticeable until Chl-a and TP are closer to the goals. The TSI scores still oscillate in the hypereutrophic range. For 2014 and 2015, there was an almost 10-point drop due to the decrease in TP and Chl-a.



Graph 1: TP, Chl-a, water clarity, and TSI trends for Barr Lake.

7.3.2 **Milton Reservoir**

Trend lines for TP, Chl-a, and water clarity all have a downward slope indicating slight decreases in TP and Chl-a and an increase in water clarity. These are all good indicators that water quality is improving over time.



Graph 2: TP, Chl-a, water clarity, and TSI trends for Milton Reservoir.

Important Links:

[Annual Water Quality Summaries for Barr and Milton]

8.0 OUTREACH AND EDUCATION – SPREAD THE WORD

The Information and Education (I/E) committee has been actively working on educating the public about BMW and water quality issues at Barr and Milton at such venues as lake specific events, local lake community events, and watershed events. The focus has been educating people about their daily impacts to the watershed and how the collective impact from 2.5 million people can add up. Materials used by the I/E committee were generated from a 2015 EPA grant that helped create the "*Keep It Clean*" campaign. Visual ads, logo, and brand were developed to educate the public about keeping the water clean in the urban watershed.

8.1 EVENTS AND ACTIVITIES

Since 2014, the I/E committee has participated in several annual events that occur near Barr Lake as well as around the watershed.

- *Barr Lake Events* – train volunteers so they can educate park users, Raptor Run, Fishing Clinic, Lake Appreciation Day, Harvest Festival, Fall Birding Festival, and a shoreline clean up.
- *Local Lake Community Events* – Pelican Lake Ranch meeting, Commerce City Neighborhood Celebration, Bromley East Charter School, water festivals, River Fest, Adams County Fair, and Brighton Culture Fest.
- *Watershed Events* – National Water Quality Awareness Week, World Water Quality Monitoring Day, Cherry Creek Watershed Partnership Conference, Adopt-a-Watershed program, and Colorado Watershed Assembly Conference.
- *Products* – quarterly newsletter, table top display, signage around Barr Lake State Park, zip drives, brochures, annual Barr lake post cards, bi-weekly water quality updates, t-shirts and coloring books for kids, and free giveaways. A popular giveaway is free t-shirts. A personalized color-on print is used to promote water quality for BMW; over 3,000 BMW shirts have been created since 2015.

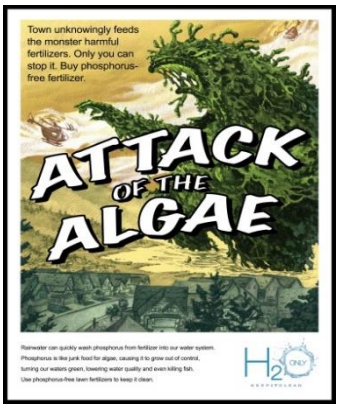
The I/E committee also reaches out to people through presentations, school events, watershed tours, and watershed meetings. In 2015, several presentations were delivered on BMW's in-canal treatment study.

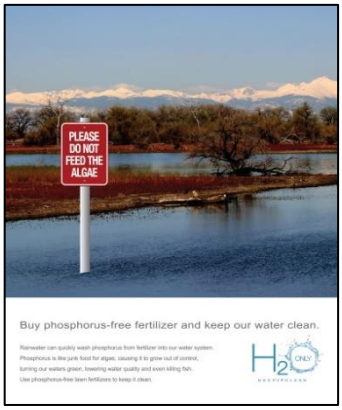
One I/E project in 2016 involved creation of a public display at Denver International Airport (DIA). Six glass display cases located near baggage claim were used to educate travelers about watersheds, nutrients, Lakes Appreciation Month, Colorado State Parks, Barr Lake State Park, and the BMW. Another I/E project is the concept of an Adopt-a-Watershed program, conceived in 2016 using a Denver high school in a pilot project.

8.2 WATER QUALITY CAMPAIGN

The "*Keep It Clean*" campaign was developed using EPA grant funds to develop a logo, campaign slogan, and several visual advertisements. The campaign focuses on four areas: phosphorus free fertilizers, pet waste, reducing algae, and the creation of portable displays.

Products from this campaign are publicly available for use by other watershed and storm water groups. The portable straw structure was built by the Southeast Metro Stormwater Authority placed in a local storm water facility.





Important Links:

[BMW Quarterly Newsletters]

[BMW Current Events]

[BMW Messaging Concepts downloadable files]

9.0 APPENDIX A : BMW ASSOCIATION TMDL IMPLEMENTATION PLAN

POTW TP Nutrient Reduction Progress

Last Updated 4-28-17

ENTITY	CONTACT	RESPONSE DATE	INFORMATION
Centennial WSD	Julie Tinetti (720) 884-9583	4-27-2017	CWSD's permit was issued 1/1/2016. We are required to meet TP of 1.0 mg/l by 6/30/21. CWSD compliance schedule includes the following timeframe in order to meet these limits: 6/30/16-Hire a consultant/PE 6/30/17- Submit a letter of notification that a design engineer has been selected and design work is beginning. 6/30/18- Submit a progress report on design and site approval activities completed to date 12/31/2018- Submit a letter of notification that final design approval has been received 12/31/19- Submit a progress report on activities related to construction 12/31/20- Submit a progress report on activities related to construction 6/30/21- Submit a notification that construction has been completed
Littleton/Englewood	Dennis Stowe	3-3-17	Expect permit renewal sometime in 2017. 2017 - Hire consultant to develop alternatives for nutrient treatment to attain Regulation 85 permit limits. 2018-19 – Design treatment improvements. 2020-2022 – Construction of improvements to meet Regulation 85 permit limits.

Metro Wastewater Reclamation District	Emily Jackson 303-286-3416	04-18-17	For the Robert W. Hite Treatment Facility, the Metro District anticipates taking the following actions: 2017 or 2018: anticipated permit renewal 2016 – 2021: anticipated TP effluent limitation of 1.0 mg/L annual average achieved during this timeframe by using existing infrastructure improvements to reduce phosphorus through biological nutrient removal 2020-2021: Installation of phosphorus recovery technology 2021-2027: undertake operational enhancements to increase reliability of biological nutrient removal. TP at 0.50 to 0.70 mg/L during this timeframe. Evaluate emerging phosphorus technologies. The Northern Treatment Plant does not have a wasteload allocation. Anticipated meeting Reg. 85 requirements at start-up.
South Adams County Water and Sanitation District	Blair Corning Environmental Programs Manager South Adams County Water and Sanitation District office 720.206.0463 cell 303.601.5828	3/16/2017	South Adams County is finished with upgrades to its Williams Monaco WWTP. These upgrades allow the plant to meet a phosphorus of <1.0 mg/L. The improvements also for ammonia removal down to the limits contained in our current compliance schedule (lowest limit of 2.0 mg/L monthly average.) The improvements include conversion of the MBBR (moving bed biological reactor) system to an IFAS (integrated fixed-film activated sludge) configuration. This upgrade involved construction of more basin capacity and sludge recycle piping. Also included in the upgrade was construction of larger more efficient secondary

			clarifiers, a new grit removal system, and switch-over to UV disinfection from the current chlorine disinfection system. The cost of the improvements was around $20M dollars including a $1M nutrient grant from the State of Colorado. Project construction was completed in mid-2016.
Fort Lupton	Mike Rousey Project Manager OMI-Fort Lupton, CO Wastewater Plant 12285 Highway 52 Fort Lupton, CO 80621 Direct 720-466-6182 Cell 303-506-2654 Fax 303-857-1006l	4-10-17	Already meeting the TMDL's for pH and DO. The only one that will take work is the phosphorous since we're running 1-2 mg/l on that one. Currently working on the permit renewal application. Due to the state's mixed signals we are waiting until the permit/PEL's are back since we are unsure of what future permit changes we will see beyond Reg 85. City will hire a consultant once permit is returned and begin addressing those issues at that time.
Lochbuie	Jeff Rabas, Ramey Environmental Compliance, Inc. Contract Operator	2-24-2017	Permit Expires August 31, 2017 2017 – The Town will be hiring a consultant to complete a facilities plan update to address growth, upgrade the headworks building and adding a dewatering facility. 2018-2019 – Construct upgrades to headworks, dewatering facility and any other areas identified in the 2017 facility plan update. The WWTP for the most part is meeting the TMDL's listed.
Brighton	Kim Schoen		No report.