

## SAVE THESE DATES

### BMW Budget Committee Meeting

November 17, 2009, (2:30 pm – 4:30 pm) at Littleton/Englewood Wastewater Treatment Plant

### BMW Information/Education Committee Meeting

November 19, 2009, (1:30 pm – 3:30 pm) at Barr Lake State Park

### Technical Committee Meeting

November 23, 2009, (10:00 am – Noon) at Metro

### Board Meeting

November 24, 2009, (9:00 am – Noon) at Metro

## Thanksgiving

November 26, 2009

### Board Meeting

January 27, 2009, (9:00 am – Noon) at Metro

### Stakeholder Meeting

February 24, 2009, (9:00 am – Noon) Location TBD

Please see the calendar page at [www.barr-milton.org](http://www.barr-milton.org) for event confirmation, agendas and additional details.

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# The Barrimeter

A Publication of the Barr/Milton Watershed Association

Issue No. 10  
4th Quarter 2009



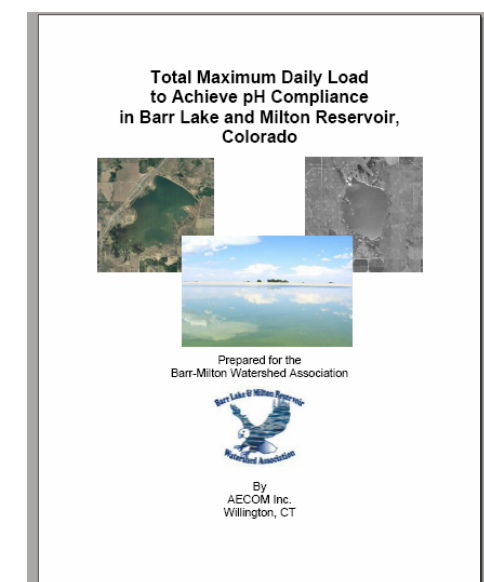
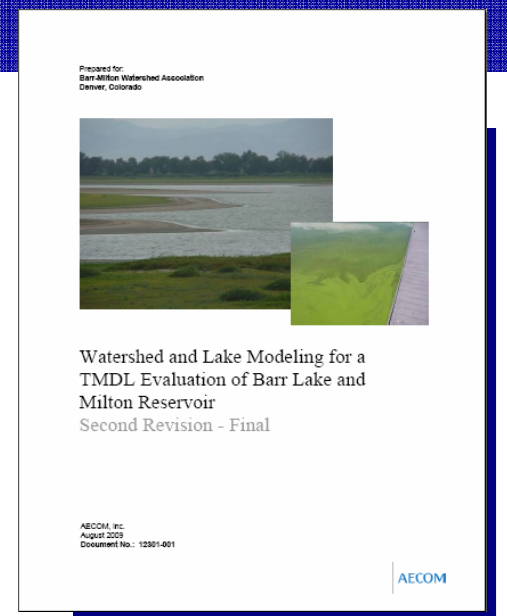
## pH TMDL Update

By Laurie Rink, FRICO

The Winter 2009 Issue of the Barrimeter (#8) featured an article summarizing the results of water quality modeling conducted by AECOM. The basic modeling work has since been completed, with the official results contained in the report titled "Watershed and Lake Modeling for a TMDL Evaluation of Barr Lake and Milton Reservoir" (August 2009). The results do not differ much from what was summarized in the newsletter article, but the report contains a considerable amount of backup information and analysis, as well as recommendations for pH TMDL development. An electronic copy of this document is posted on the BMW website at [www.barr-milton.org](http://www.barr-milton.org).

The Summer Issue of the Barrimeter (#9) presented a basic primer of a TMDL (Total Daily Maximum Load), starting with the simplified equation that comprises the TMDL and finishing with a list of specific components that the Barr Lake and Milton Reservoir pH TMDL will address. A first draft of the equation has now been solved and most of the supporting pieces have been addressed. AECOM has assembled a first cut draft of the pH TMDL that is available for stakeholder review and comment. This document is also available on the BMW website. Ken Wagner, project manager for AECOM, presented his work at the stakeholder meeting on October 20th and was available to answer questions about the draft TMDL process (The presentation is available for download on the BMW website). The draft is intended to be a working document subject to review, comment, and modification. The Association hopes to solicit and address the majority of public comment (including CDPHE comment) through an informal process while the document is in draft form. Document finalization will occur by mid-summer 2010.

**Please send your initial comments on the Draft pH TMDL by November 23rd to Darcie Garland-Renn at [dgreenn@integral-corp.com](mailto:dgreenn@integral-corp.com)**



*\*Both documents are available for download at [www.Barr-Milton.org](http://www.Barr-Milton.org)*

# Construction Improvements at Milton Reservoir

By Laurie Rink, FRICO

Have you noticed that Milton is looking a bit empty this month? The water is indeed being drained, all to facilitate a winter-time construction improvement project at the dam's outlet works. The purpose of the project is to replace the existing upstream outlet gates (i.e., the openings to the outlet pipes on the inside of the dam) with new gates. Planned improvements are intended to provide for the continued safe operations of the dam and provide improved operational flexibility and safety.

The emptying process started in early September and should be complete by the end of October. This will allow for a contractor to access the outlet works which are located at the very base of the dam. The work will consist of two parts: 1) replacing the existing flap gates on the upstream side of the outlet pipes, and 2) removing and replacing damaged sections of the steel outlet pipe underneath the dam structure.

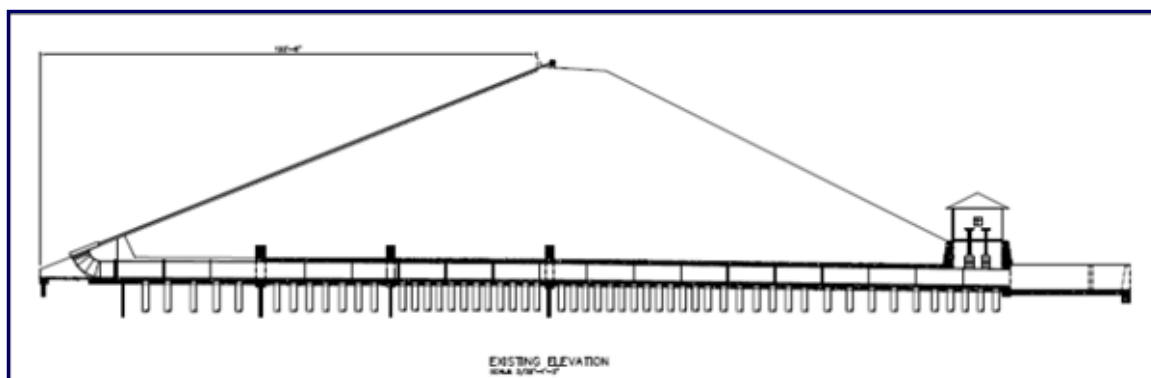
The outlet works at Milton Dam currently consist of two (2) 48-inch diameter conduits located near the middle of the main earthfill embankment. These conduits were originally installed in the early 1900's. Shortly after the initial installation, cracks developed in the cast iron. These problems were repaired by lining the cracked pipe sections with a 44-inch internal steel pipe section. These two steel pipe sections have now reached the end of their useful life, as evidenced by delamination of the pipe.

Flap gates were originally designed and installed on the upstream end of the conduit in order to regulate flows out of the reservoir. These gates have also reached their useful life. Wear on the system has degraded the operations of the upstream gates so that they can no longer be used to regulate flows out of the dam as intended. In their current condition, these gates can only be set as open or closed and cannot control flows.

Releases from the reservoir have, in recent years, been controlled at the downstream end of the conduits by circular, bonneted cast iron sluice gates. The conduits discharge downstream to the Gilmore Canal.

Replacing the upstream gates will allow FRICO to operate the reservoir from the upstream end of the gate, eliminate pressurized flows in the outlet works and provide the desired safety of fully operational upstream and downstream gates. Remote operational capabilities will be added to the new gates, allowing FRICO to open and close the gates from their office — if required in an emergency situation.

Construction should take approximately 45 days. Diamond Excavating of Arvada, Colorado, will perform the work. If all goes according to schedule, Milton should start refilling in late December.



## North American Lake Management Society (NALMS)

NALMS is the international lake management group that specializes in how to best manage and care for lakes and reservoirs. Their mission statement is: *“The purpose of the Society is to forge partnerships among citizens, scientists, and professionals to foster the management and protection of lakes and reservoirs for today and tomorrow.”*

NALMS provides many educational opportunities to its members including the annual symposium that includes several great workshops on lake management techniques, Lakeline Magazine, Public Policy and Position Papers, a Certified Lake Manager's program, and the peer-reviewed Lake & Reservoir Management Journal. If you want to have a lake question answered or find an expert on a lake topic, NALMS should be your first place to look. Go to [www.nalms.org](http://www.nalms.org) to learn more about this organization.

# Barr Lake Interpretive Sign

By Michelle Seubert

A new interpretative sign will be placed near the nature center and boat ramp after over a year planning and designing. The theme of the sign is “ Barr Lake: An Oasis in transition”. Many visitors have wondered where water comes from in Barr Lake, and this sign will help answer those questions. Barr Lake will continue to be an oasis in transition, from a buffalo wallow, to irrigation reservoir, to renewed irrigation reservoir, to state park, to Colorado’s top bird watching destination, to a drinking water resource.

## Barr Lake: An Oasis in Transition

Water continues to be the flowing life force in the Barr Lake area.

**1860s**  
Hunted buffalo wallows became rest stop for cattle drives.

**1880s**  
A dam is built on the north end of the buffalo wallow, creating Oxbow Reservoir. The dam is replaced in 1911 to carry water from the South Platte River to the newly formed reservoir. Farming begins to rely on this permanent source of water.

**1900s**  
The U.S. Army station widens the lake during World War I. It is used to prevent enemy submarines from sinking the large and valuable water reservoir.

**1930s**  
Water quality in the South Platte River and consequently Barr Lake deteriorates. Barr Lake, situated downstream from Denver's rapid population growth, wastewater treatment plants, and stockpiles, eventually becomes a source of raw sewage.

**1950s**  
Barr Lake is declared "the biggest sewage lagoon in the United States" by a stream pollution report filed in 1950.

**1975**  
FRCC loses recreational rights on the reservoir to the State of Colorado and the legislation which creates Barr Lake is passed and the reservoir is developed into Barr Lake State Park.

**1980s**  
How has our water quality standards improved and a new wastewater treatment plant is built, improving the quality of the South Platte River and Barr Lake.

**2004**  
Barr Lake is designated a drinking water reservoir.

**2005**  
Barr Lake and Milton Reservoir Watershed Association is formed to work with all stakeholders to improve water quality for both reservoirs.

**You Can Help**  
Water is a limited natural resource – the water we have now is all we will ever have. You can be a caretaker of this precious resource.

- Turn off the water when brushing your teeth and washing your hands.
- Take short showers and shallow baths.
- Fix leaky faucets and use low-flow devices on faucets and shower heads.
- Efficiently water and fertilize lawns and gardens and only when needed.
- Don't dump anything down storm drains.
- Pick up pet waste, trash, and litter before it pollutes our water.
- Use only small squirt guns (just kidding!)

**Barr Lake will continue to be an oasis in transition: from buffalo wallow, to irrigation reservoir, to sewage lagoon, to renewed irrigation reservoir, to state park, to Colorado's top bird watching destination, to a drinking water resource. What does the future hold?**

**Acknowledgements**  
Art by Suzanne Finkbeiner, Dale Jones, Malcolm Kirkham, and Larry Stewart. Map created by Integrated Consulting Inc. and used with permission from the Barr Lake and Milton Reservoir Watershed Association. Technical review by Dennis Deibel-Brown, Scientist with Integrated Consulting Inc. and Shere Landt, Water Quality Scientist with Metro Wastewater Reclamation District.

## Fall Birding Festival

By Michelle Seubert

Even in the midst of cool and rainy weather, over 260 people came out for the 2009 Barr Lake Fall Birding Festival. There were a variety of activities during the event ranging from bird walks to kids crafts. There were many educational booths including Wild Birds Unlimited, Audubon of Greater Denver, Colorado Hawking Club, Prairie Dog Action, and Windsong Education Foundation.

**Thank you to THF Realty for the \$600 donation to help support the event!**



# 3rd Annual Lakes Appreciation Day: Shoreline Cleanup and Celebration

by Steve Lundt

Close to 450 people helped organize and participate in this year's Lake Appreciation Day on July 18<sup>th</sup> at Barr Lake State Park, seizing an opportunity to give back to a place that represents an oasis for waterfowl and fishermen, just northwest of Denver.

The first thanks goes out to those that helped organize and sponsor the well-attended event. Michelle Seubert, Park Manager for Barr Lake State Park, was the ring leader and lead organizer for the event. Others that helped organize include Laurie Rink (FRICO), Steve Lundt (Metro Wastewater Reclamation District), Darcie Garland-Renn (Integral Consulting), Kathy Spinella (Adams County Open Space), and Juliana Archuletta (City of Brighton). Sponsors for this event included: FRICO, Eldorado Natural Spring Water, CLRMA, Rocky Mountain Bird Observatory, Dick's Sporting Goods, Barr/Milton Watershed Association, City of Brighton, Commerce City, Colorado Division of Wildlife, Little Valley Wholesale Nursery, and Colorado State Parks.

Park staff and volunteers started off the event the day before by setting up seven clean-up stations around the 9-mile shoreline. Everything from bug spray and gloves to shovels and trees were placed around the reservoir, requiring many hours from staff and volunteers.

Beginning at seven a.m. on Saturday morning, volunteers were sent to their stations to prepare for the onslaught of volunteers. Of the 425 volunteers, 225 of them came from Americorps. Twenty-four passenger vans arrived at eight a.m. and were escorted to the inlet of Barr Lake. There, the Americorps volunteers helped plant trees, remove mullen and thistle seed heads, and remove trash from the shoreline. This size of group from the Americorps felt like a small army, ready to do what



Volunteers remove the flowering seed stalks from the noxious mullen weed.

For the rest of the 200 volunteers that showed up, many came in groups of 10 to 20. Some businesses and organizations such as Staples®, Environmental Learning for Kids (ELK), Salud Health Clinic, Jobs for America's Graduates (JAG), Stout Street Foundation, Latter Day Saints Church, and Western Summit Construction, used this event as a chance to have their employees and members give back to their community.

Volunteers plant donated trees around Barr Lake State Park.



Volunteers collect trash that has come across the lake.



Every volunteer received a bag of goodies and a free event t-shirt for participating. The t-shirts were paid for by an Adams County Open Space grant that was awarded for the second year in a row. A few donated items from event sponsors were also given away to the volunteers.

Barr Lake was certainly pampered on July 18<sup>th</sup>. About 123 trash bags were filled with noxious weeds, 51 trash bags were filled with typical plastic debris, and several tires were removed from the shoreline and inlet. Little Valley Wholesale Nursery donated 300 cottonwoods and willows, and they were planted around the entire reservoir.

After 3 hours of hard work, the volunteers made their way back to the Nature Center to enjoy a free barbecue lunch that was paid for by the Farmers Reservoir and Irrigation Company (FRICO), which owns and manages Barr Lake. During lunch, guest speakers Larry Pace (County Commissioner) and Toya Nelson (Executive Director of Governor's Commission on Community Service) gave praise to the volunteers and expressed their gratitude for Barr Lake.

The lake appreciation event was also a zero-waste event thanks to Integral Consulting, who donated the necessary funds to purchase compostable cups, plates, and flatware. A total of 12 large trash bags were taken to the Eco-cycle recycling center in Boulder to be composted.

At the end of the event, several water-related activities were available near the boat ramp. Children enjoyed free fishing poles and gear from the Colorado Division of Wildlife, free canoe lessons, and ride-alongs on the Park Ranger patrol boat. At the end of the day, Barr Lake was cleaner, had more trees, and over 400 people left with a little bit more

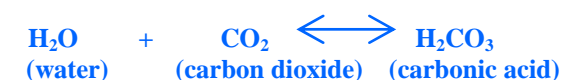


## Tech Corner...

## Alkalinity and What Part It Plays in the pH Problem

by Steve Lundt

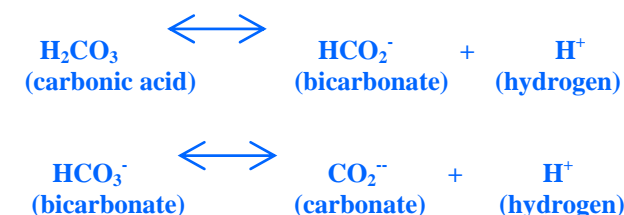
It all goes back to basic aquatic chemistry, which most people try to forget after college. The acidity of water is measured on the pH scale. The pH scale is a logarithmic scale that covers a range of 0 (acidic) to 14 (basic). Typical surface water generally has pH 6 to pH 8. It is expected that when algae productivity increases (i.e. photosynthesis), the pH of the water will also go up. This is due to the photosynthetic reaction where algae take up carbon dioxide (CO<sub>2</sub>) in order to produce organic carbon. By taking CO<sub>2</sub> out of the water, there is less carbon to form carbonic acid (H<sub>2</sub>CO<sub>3</sub>); less acid means higher pH.



In Barr Lake and Milton Reservoir, high pH is expected during the summer algae growing season. Summertime pH values of greater than pH 9.0 are frequently observed at Barr and Milton. What is not expected is the continued elevated pH from about the first of July all the way through to the end of September and early October. What is causing the continued high pH in Barr and Milton? Even during the night when there is no photosynthesis occurring, pH remains above 9.0.



One theory is that the second problem causing high pH is the high alkalinity levels observed in the lakes. What is alkalinity? Alkalinity is the measure of the ability of water to resist changes in pH. Alkalinity is also called Acid Neutralizing Capacity (ANC). This is the total summation of dissolved inorganic carbon in the water, typically derived from calcium carbonate (CaMg(CO<sub>3</sub>)<sub>2</sub>, a.k.a. limestone). Alkalinity is measurement of carbonate (CO<sub>3</sub><sup>-2</sup>) and bicarbonate (HCO<sub>3</sub><sup>-1</sup>) in the water expressed as a concentration in mg/L of CaCO<sub>3</sub>.

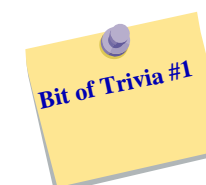


The relationship among alkalinity, pH, and carbonate concentrations can be described with complex mathematical equations. The amount of alkalinity in water does not affect

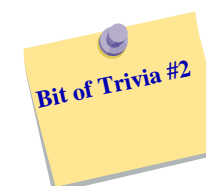
the rate of pH change, but it does affect the magnitude of the pH change. At the median alkalinity measured in Barr Lake (159 mg/L CaCO<sub>3</sub>), the pH is calculated to be 8.8 when Barr Lake is in equilibrium with the atmosphere. However, photosynthesis can drive the system out of equilibrium and lead to even higher pH values.

At high pH (>8.3) the dominant form of alkalinity is CO<sub>3</sub><sup>-2</sup>. For every one molecule of carbonate, it can neutralize two H<sup>+</sup> ions and buffer the water from a change in pH. This may be part of the reason why pH in Barr Lake does not drop at night or during periods of low productivity in late summer. Barr and Milton are both buffered due to their alkalinity. For both Barr Lake and Milton Reservoir, the typical range of alkalinity is about 150 – 200 mg/L of CaCO<sub>3</sub>. Bodies of water that are not alkaline are typically less than 80 mg/L of CaCO<sub>3</sub> and can be as low as 20 mg/L of CaCO<sub>3</sub> with a pH below 7.0.

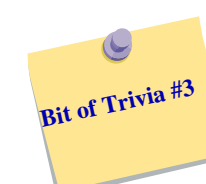
Another possible explanation for the high pH observed in the fall months in the lakes is also related to carbon dioxide (CO<sub>2</sub>) uptake by the algae. Water pH is very sensitive to changes in total carbon. Look for a future Tech Corner to explain this phenomenon!



Alkalinity and hardness are similar but not the same thing. Hardness is the measurement of Ca<sup>+2</sup> and Mg<sup>+2</sup>. Calcium and magnesium are typically the dominating cations in water and are the minerals that are removed when a softener is used to treat water. A home water softener replaces the calcium and magnesium with sodium and reduces water hardness. The alkalinity, though, is about quantifying the inorganic carbon that is associated with the mineral cations



The pH of rain is typically around 5.6. This is because of the CO<sub>2</sub> that is stripped out of the atmosphere when the droplet falls through the air. The acquired CO<sub>2</sub> helps form carbonic acid within the raindrop before reaching the ground.



On average, the pH of carbonated soda pop is about 2.80. The pH of pop changes (gets higher) as soon as it is opened. This is due to the CO<sub>2</sub> (the fizz) leaving the pop (same idea as algae removing CO<sub>2</sub> from the lake water) and not forming carbonic acid.