

REFLECTIONS: “Boulder Reservoir; a Retrospective Look”, by Jim Shelley City of Boulder, Source Water Quality Program Manager, January, 2008

Boulder Reservoir is a place near the city, yet peaceful to visit. There are times when the water is like glass and times when the reservoir is a roaring monster with waves four feet high. Most of the time the water has a greenish-tan color due to light reflecting off suspended inorganic fine silt/clay and dissolved solids rather than organic matter or phytoplankton.



Boulder Reservoir was constructed in 1955 for irrigation and drinking water. It's owned by the City of Boulder and operated by Northern Colorado Water Conservancy District. Boulder Reservoir is a class one warm water fishery. It's a low volume shallow (depth normally ranges

from nineteen to twenty-eight feet deep) reservoir with a surface area of 640 acres and a capacity of 13,000 acre-feet. Ninety percent of the water in the reservoir comes from the Boulder Feeder Canal (BFC). Both the BFC and Boulder Reservoir are part of the 954 square mile Colorado Big Thompson River Project (CBT) which includes the Windy Gap watershed project.

Boulder Reservoir is a multi-use reservoir. It is used for drinking water, irrigation and recreation such as boating, skiing, fishing, swimming, hiking/jogging and wildlife observation. Boulder Reservoir resources currently supply twenty percent of Boulder's drinking water.



The Boulder Reservoir natural watershed encompasses a ten square mile area north of Boulder and just east of the foothills. The land adjacent to the reservoir is seventy percent city open space with well-managed grazing, light recreation and grass/hay crop production. Also within this watershed are Lake Valley Estates and golf course, plus Left Hand Valley Reservoir.

This watershed is a haven for wildlife, over the years I've observed osprey, marsh hawks, bald eagles, swanson's hawks, ferruginous hawks, herons, great horned owls, burrowing owls, american bittern, egrets, white pelicans and western grebes. While sampling Boulder Reservoir tributaries, I always love hearing the whoooooo of the black swift feeding on airborne small insects. This noise comes from their wings when they dive. Boulder Reservoir is a favorite stopping place for migratory birds and its watershed provides nesting habitat for many bird species. The fisheries include bluegill, catfish, largemouth bass, rainbow trout, walleye and yellow perch. I've heard stories of a twelve pound walleye which was caught in Boulder Reservoir.





Numerous recreational events are held at Boulder Reservoir, this is because the area has a feel of being in the country amidst tremendous views of the flatirons, mountains and Haystack Mountain. In 2002, "The Day on the REZ" was held at Boulder Reservoir. This CLRMA event was conducted on a picture perfect day with demonstration/vendor activities on the water and on shore, ending with a canoe race. One of CLRMA's influential leaders and one of our CU work study students won the race due to the fact that they started thirty yards out in front of everyone as to avoid collisions at the starting line. Next time this leader will have to spot us thirty yards and he has to team up with

another lake professional not one of our young strong work study students!

While sampling around Boulder Reservoir, one can watch paratroopers soar through the sky and remote control model airplanes and helicopters buzz through the air. To the west of Boulder Reservoir, there is a model airplane airport equipped with a paved runway. Every Monday morning in the south-west corner of the reservoir, the remote control pontoon airplanes land and take off of the water.

I've been involved with many special studies on Boulder Reservoir over the past fifteen years. Some of the studies conducted were:

- USGS loading and transport study
- CU-Center for Limnology
 - optimization of reservoir withdrawal elevation
 - analysis of modeling results
 - drifter study
 - water quality drought analysis
 - canal inflow mixing study
 - source of selected metals from in treatment plant sludge
- EPA national lakes survey



Some of my most memorable times were when a CU researcher who is now working for the state of Colorado broke out the floating drifter equipment which incorporated his wife's old nylon stockings. I will never forget the time during the recent EPA national lakes survey when one of USGS's pre-selected GPS habitat assessment sites put us smack dab in the middle of the nude swim beach! We had to use quick evasive action to avoid disturbing their peaceful tranquility. It's rumored that one of the remote controlled helicopters equipped with a small camera is patrolling the remote areas around the reservoir.

The energizer bunny monitoring program, as I refer to it, is our monthly monitoring program. The monitoring program has been up and running for fifteen years and it keeps going and is never totally completed. However, it's very important that monitoring programs like this continue. Without good solid baseline trending information over time, it's impossible to predict water quality change, plan and design the best fit treatment plant processes or know when reoccurring reservoir source water problems occur. We continue to use our environmentally friendly canoe monitoring procedures without one injury or loss of equipment.



Boulder Reservoir is mesotrophic when looking at chlorophyll *a* numbers. Trends in chlorophyll *a* numbers are increasing slightly over time. The reservoir goes anoxic at the bottom early in the summer due to a small hypolimnion volume. However, the bottom water can be re-oxygenated by high irrigation flows through the reservoir which remove anoxic bottom water and replace it with oxygenated surface water. The reservoir is typically nitrogen limited during the summer. Another phytoplankton limiting factor is reduced light penetration due to suspended very fine inorganic silt/clay.



Curly leaf pondweed
Potamogeton crispus
Vermont, USA
Photo by A. Bove
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For the first time in 2007 aquatic vegetation started to become a concern in shallower water within the western portion of the reservoir. Curly Leaf Pondweed (*Potamogeton Crispus*) was identified which is considered an invasive species. We will attempt to map aquatic vegetation for the first time in Boulder Reservoir this coming summer and hope to continue an annual mapping effort to establish how much this plant is spreading. Everything I've read about curly leaf pondweed says it's not as dominant as other aquatic invasive plants because it dies off in late spring allowing natives to grow. Last summer in Boulder Reservoir, this plant persisted

into the fall. Please contact me if anyone has observed curly leaf pondweed thriving throughout the summer.

Another change we're seeing in Boulder Reservoir is an increase in a very small (1 um) colonial blue green algae, *Aphanothece smithii*. Over the last two years cell counts have peaked above 200,000 per ml yet the chlorophyll *a* numbers remained fairly low, below six ug/L. Low chlorophyll *a* can be explained by this particular algae's very small size. We had a fairly bad (musty, dirty-MIB/geosmin type) taste in the water last October through mid-November, which coincided with one of these *Aphanothece* blooms. If anyone has associated this particular algae with a difficult to reduce drinking water taste please let me know. Also, at what concentration (number per ml), does this very small blue green algae become a drinking water taste problem?

CLRMA is planning another Day on the Rez at Boulder Reservoir to coincide with lake appreciation month this year. Lake and shore demonstrations along with a vendors show is in the works for this event. Since the canoe race was such a hit last time we are scheduling the 2nd Day on the Rez canoe race. Hope to see all of you there.

