



Sediment delta formation in Evergreen Lake caused by the flooding event in September 2013.

# BCWA PINNACLE



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## Bear Creek Watershed Association, Colorado

### Flood Chemistry Bear Creek Reservoir and Evergreen Lake

*The Bear Creek Watershed Association protects and restores water and environmental quality within the Bear Creek Watershed from the effects of land use.*

- Clear Creek County
- Jefferson County
- City of Lakewood
- Town of Morrison
- Aspen Park Metropolitan District
- Bear Creek Cabins
- Brook Forest Inn
- Conifer Sanitation Association
- Conifer Metropolitan District
- Denver Water Department
- Evergreen Metropolitan District
- Forrest Hills Metropolitan District
- Genesee Sanitation & Water District
- Geneva Glen
- Jefferson County School District
- Kittredge Water & Sanitation District
- Singing River Ranch
- The Fort Restaurant
- Tiny Town Foundation, Inc.
- West Jefferson County Metropolitan District
- Evergreen Trout Unlimited
- U.S. Army Corps of Engineers

**BCWA Policy 21**—The BCWA has established an online management process as a dynamic component of the Bear Creek Watershed Management Plan. This online management process is an interactive decision support tool to help manage natural resources and protect water and environmental quality in the watershed. The process characterizes the watershed, identifies problems, solutions and projects. The BCWA membership utilizes the online management process to help administer Bear Creek Watershed program elements. The BCWA will allow all designated members and active participants access to the online management system.

After the September 2013 flood event, the Association started a water quality evaluation to document short-term and long-term changes to water quality caused by this significant flood event. In Bear Creek Reservoir the estimated September inflow was about 31,000 ac-ft. The peak flood chemistry showed a Total Phosphorus load in excess of 14,000 pounds, a Total Nitrogen load of 82,000 pounds and the Total Suspended Sediment load was about 1.7 million pounds. Bed-load

may have exceeded a 1/2 million tons. In comparison the entire Total Phosphorus load in 2012 was 3,298 pounds. More Total Phosphorus was loaded into the reservoir in September than measured from 2007-2012. The reservoir also received a high organic matter load, as seen in the photo. This organic load will decay over the next few years and influence reservoir chemistry. A similar massive nutrient loading occurred in Evergreen Lake. Evergreen Lake

received about 20,650 ac-ft of runoff. The peak flood chemistry showed a Total Phosphorus load in excess of 1,650 pounds, a Total Nitrogen load of 22,550 pounds and the Suspended Sediment load was about 900 tons (750 cubic-yards) with an estimated bedload of about 13,500 tons (11,200 cubic-yards). It is very likely that Evergreen Lake will need dredging to reduce this massive sediment load. The Association monitored watershed nutrients beginning near Mt. Evans following the flood event. From a water quality perspective, the watershed showed remarkable resilience. Although Bear Creek Reservoir returned to normal pool by the end of October, the water quality in the reservoir may be altered for years to come. This storm event has provided valuable insight into big-event nutrient loading. The Bear Creek Watershed Association is applying an adaptive management process to adjust monitoring, strategies and options, and redefine restoration projects throughout the watershed.



**Bear Creek Reservoir Chemistry Comparison**

2013 Total Pounds/ Month	August	September
Total Nitrogen	3,340	81,560
Nitrate/Nitrite as N, dissolved	95	17,610
Nitrogen, ammonia	391	4,128
Phosphorus, total	336	13,986
Total Dissolved Phosphorus	231	2,528
Residue, Non-Filterable (TSS)	18,400	1,720,000

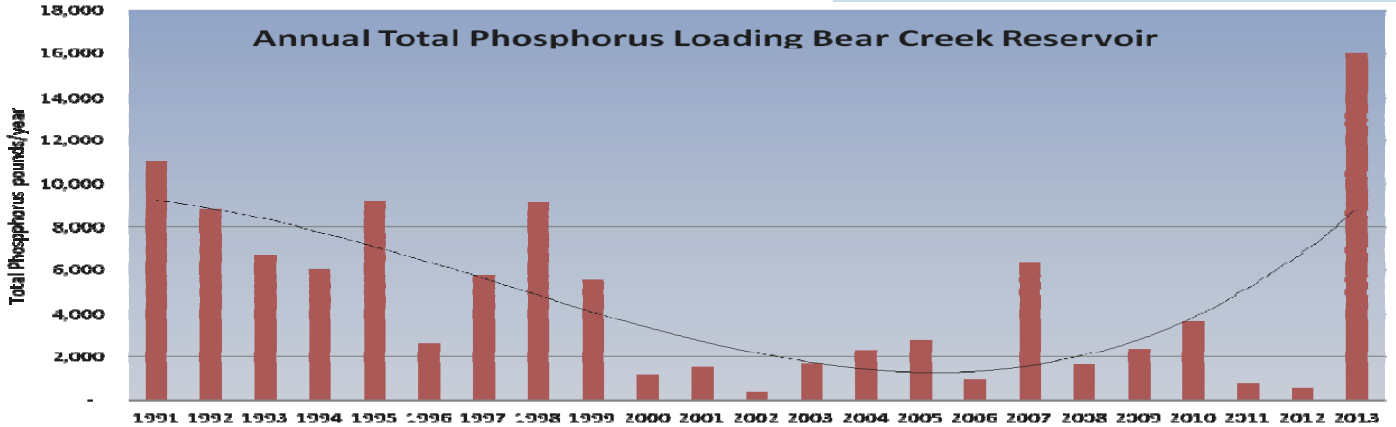


[www.bearcreekwatershed.org](http://www.bearcreekwatershed.org)

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Evergreen Lake was constructed by the City and County of Denver after years of planning beginning in 1926 and completed in 1927. The dam is poured concrete with a notched overflow weir. The lake is 40 surface acres and is a direct use water supply for the community of Evergreen. The Association got the lake designated by the Colorado Water Quality Control Commission as a distinct stream waterbody segment 1d. The recreational facilities are managed by the Evergreen Park and Recreation District.

Cottonwood that was partially submerged in the flooding



In early 2014, the Association will place 10 education and information signs throughout the lower watershed. These signs are a “geocache” locate project, where each sign provides clues to find the other signs. If you find all of the signs, report to the Association and the Association will post you as a Watershed Warrior on the wall of fame. Each sign has a base message, clue words and something specific about watershed management.

Fish populations within the Bear Creek Watershed have been monitored by the Colorado Department of Parks and Wildlife in the watershed since 1988. The monitoring has focused on the trout species (Rainbows and Browns) in the streams. There was no survey in 2012 due to low water flows and the September 2013 flood also caused no surveys due to high water. Drought conditions have affected fish populations and distribution (e.g., 2002). Fishing remains good.

