



The picture from newsletter 2013.1 is the Bear Creek Reservoir at normal pool (2,000 ac-ft). During the great flood of September 2013, the pool increased to over 15,000 ac-ft and flooded some of the park roads, trails and recreation facilities.

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 14 states—The Bear Creek Watershed Association is the primary water quality monitoring organization for the Bear Creek Watershed. The Association will cooperate with outside organizations and agencies related to water quality and environmental monitoring. The Association prefers to be a cooperative partner in all monitoring efforts and, as such, is willing to incorporate outside monitoring needs into the Association monitoring program at cost. The Association maintains an extensive data base of water quality and environmental data.

BCWA PINNACLE



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Bear Creek Watershed Association, Colorado

Water Quality Can Change After a Major Flood Event

Bear Creek Reservoir, Bear Creek Park, Morrison

Bear Creek Dam was the last of three dams built to protect the Denver region from floods. Located on the southwest edge of suburban Lakewood at the confluence of Bear Creek and Turkey Creek, construction of the dam was authorized in 1968 and was completed in 1982. The roll-earth dam was constructed in two segments including the main embankment and the south embankment. Bear Creek Lake is less than 1 mile long and has an average depth of 40 feet. The lake drains an area of approximately 236 square miles. The normal multi-purpose pool measures 110-surface-acres and has a storage capacity of 2,000 acre-feet.

Maximum Storage Capacity: 78,000 ac-ft

Maximum Surface Acres (max. pool): 718 acres

In September 2013, the reservoir became a major flood control structure that prevented unimaginable downstream damage. The rains began in earnest on September 9, 2013 in the upper watershed and the resultant great Bear Creek flood has altered streams and reservoirs throughout the watershed. The U.S. Army Corps of Engineers shut the outflow gates on Bear Creek Reservoir on September 13, 2013. The pool rose from 1,817 acre-feet to over 15,000 acre-feet (5 trillion gallons) on September 22, 2013. The surface area was about 500 acres or 70% of surface acre capacity. Bear Creek within Bear Creek Park ran at about 40 cubic feet per second on September

ber 1, 2013, which was about 20 cfs over expected conditions (caused by an earlier single heavy rainfall event). By September 11 Bear Creek was up to 400 cfs and soon after the gaging station in the park washed away. Bear Creek peak stage (UDFCD) was 3,200 cfs in Morrison. Highest September flows in 113-year record. Flows in Evergreen above Evergreen lake exceeded 1,300 cfs. Bear Creek jumped its channel in many locations and caused flood damage throughout the urban corridor. The stream morphology is altered and habitats are changed at most monitoring sites. The flood damage has affected the water quality program. The Association has started a water quality evaluation.

The Flood of September 2013 caused extensive stream erosion



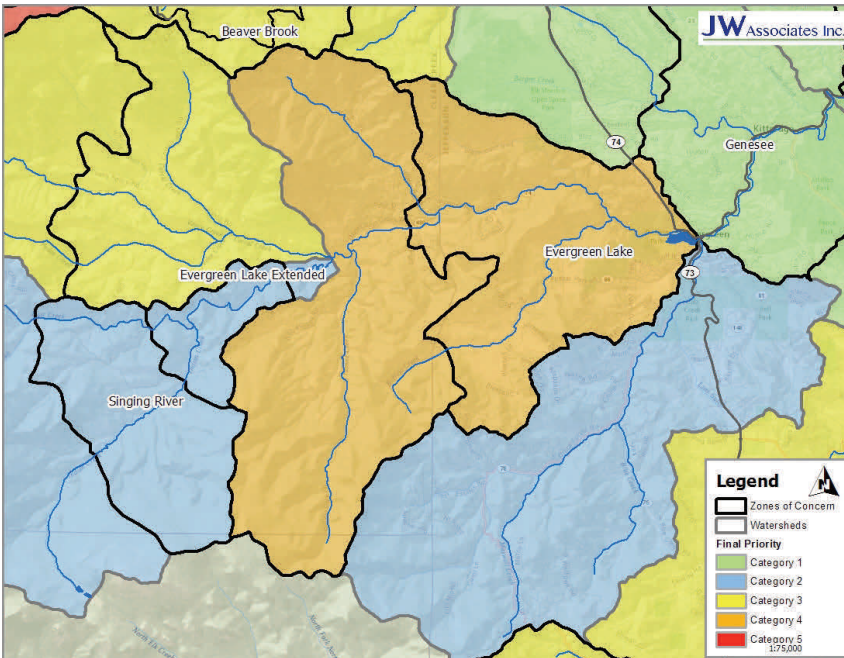


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There are 20 sport fish species in the watershed. #1 Fish—Brown Trout



The U.S. Army Corps of Engineers, Omaha District, master plan for the Bear Creek Dam and Lake Project (Design Memorandum No. PB-10) defines the federal project & Bear Creek Lake Park boundaries, which includes the Fox Hollow golf course and hydrologic extent of the dam project. This boundary defines the lower boundary of the watershed below Bear Creek Reservoir. The lower boundary ends where Bear Creek flows under South Kipling Parkway (west side of road). The lower watershed includes portions of the developments on Green Mountain. The watershed includes the Coyote Gulch drainage from the headwaters into Bear Creek Reservoir. BCWA Policy 13 defines the watershed boundary.

Clear/Bear Creek Wildfire/ Watershed Assessment

Prioritization of watershed-based risks to water supplies (J W Associates, Inc. March 1, 2013). The Association participated in this risk study which identifies the drainage area above Evergreen Lake as a high priority wildfire risk zone (composite factor category 4; wildfire hazard category 5). This watershed assessment is designed to identify and prioritize sixth level watersheds based upon their hazards of generating flooding, debris flows and increased sediment yields following wildfires that could have impacts on water supplies. Evergreen Lake is a direct use water supply. The study expanded on current wildfire hazard reduction efforts by including water supply watersheds as a community value. The Association is currently conducting a follow-up Source Water Protection study of the zone.

For the final report see <http://www.jw-associates.org/clearbearcreek.html>



Macroinvertebrate Sampling at Golden Willow Bridge Site, Upper Bear Creek. This site has a very healthy bug community and good water quality.

Stream Macroinvertebrates (Bugs)

Macroinvertebrates (benthos or bugs) are small aquatic animals that live on, under and in stream-bed sediments throughout the watershed. Mature and immature stages of flies, beetles, mayflies, caddisflies, stoneflies, dragonflies, aquatic worms, snails, leeches and numerous other bugs are an important

fish food-base. Community changes or shifts can serve as biological indicators of stream health. Bug populations are sensitive to pollution. There are expected groups of these bugs in cold mountain waters and transitional (cold to warm) waters. Since 2004, the Association has conducted macroinvertebrate sampling and data

collection at 14 sites. The macroinvertebrate sampling is done in September low flows. Sample collection is done by the state timed-kick net methodology protocol. The sampling design targets fast riffles with various amounts of cobble substrate at the sites. The program provides information on site variation, including both spatial and temporal variation. Low multi-metric index scores are a good indicator or measure of potential water quality degradation within stream segments. In 2012, four sites were below the attainment threshold, but above the impairment threshold for macroinvertebrate standards: Lair O' Bear, O'Fallon Park, Bear Creek Cabins, and Keys on the Green. Little Bear in Downtown Evergreen was below the impairment threshold. Urban runoff is causing this impairment. The macroinvertebrates at the new Golden Willow Bridge site, which is above most urbanization, show no indications of stress.

MMI scores in yellow are stressed but not impaired; MMI score in red is impaired

Sample Site September 2012	BCWA Sites	Total Taxa	Multi-Metric Index	Observed/Expected	Shannon Diversity Index	Hilsenhoff Biotic Index
Transition Biotype						
Attainment Thresholds			>52	>0.5	>2.4	<5.4
Morrison Park	14a	27	72.9	0.79	3.8	4.9
Lair O' Bear Park	13a	24	51.3	0.71	2.5	4.6
O'Fallon Park	12	22	49.9	0.80	3.9	4.4
Idledale	9	33	68.0	0.93	3.7	3.7
Bear Creek Cabin	8	25	44.3	0.79	3.6	2.9
Little Bear Evergreen	5	21	40.0	0.53	3.8	4.2
Mountain Biotype						
Attainment Thresholds			>50	>0.5	>3.0	<5.1
Keys on the Green	3a	31	46.9	0.92	3.5	4.2
Site 58 Upper Bear Creek	58	34	72.5	0.89	3.4	4.6
Golden Willow	2A	31	71.9	0.86	4.0	4.6