



BEAR CREEK RESERVOIR

Fact Sheet 53 BCR 2015 Regulation #38 Update

October 2, 2015

Bear Creek Reservoir Total Phosphorus and Chlorophyll a Standards

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
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
Tiny Town Foundation, Inc.
West Jefferson County Metropolitan District
Evergreen Trout Unlimited
U.S. Army Corps of Engineers

The site-specific standards for chlorophyll *a* and total phosphorus have been revised by the Colorado Water Quality Control Commission in response to US EPA's disapproval of the Commission's 2009 action. The purpose for the revised standards remains consistent with the Commission's original goal of shifting the trophic condition to the mesotrophic-eutrophic boundary. The numeric values for chlorophyll and phosphorus have changed because the data set has been expanded by several years and an improved methodology has been applied. As before, the standards were developed using only data from Bear Creek Reservoir. Each standard is defined for average summer concentrations and has an allowable exceedance frequency of once in five years.

A. Chlorophyll Standard: The Commission revised the chlorophyll standard to 12.2 µg/L. If summer average chlorophyll concentrations in the reservoir exceed 12.2 µg/L more than once in five years, it would be firm evidence that the trophic condition goal of the pre-existing narrative (mesotrophic-eutrophic boundary) was not being met. The exceedance threshold of 12.2 µg/L was derived with a "translator" developed with data from Bear Creek Reservoir. The translator connects the concentration at the allowable exceedance frequency (once in five years) to the typical concentration at the mesotrophic-eutrophic boundary (8 µg/L).

B. Phosphorus Standard: The Commission revised the phosphorus standard to 22.2 µg/L. The standard is calculated in two steps based on the methodology used to develop statewide nutrient criteria for the 2012 Nutrient hearing. The first step involves the creation of a statistical "linkage" between phosphorus and chlorophyll based on summer average concentrations measured in Bear Creek Reservoir. The linkage is used to define the phosphorus concentration corresponding to the mesotrophic-eutrophic boundary in this reservoir; that concentration is 16 µg/L. The second step involves a translator for phosphorus that performs the same function described for the chlorophyll translator described above. The concentration at the exceedance threshold is 22.2 µg/L.

C. Assessment: The phosphorus and chlorophyll standards are defined as seasonal averages. Samples are to be collected at a site in deep water near the dam and should be representative of conditions in the mixed layer. Past monitoring has resulted in 5 or 6 samples during the summer months (July, August, and September); it is anticipated that the same level of effort will be applied in the future. For assessment, the average (arithmetic mean) is calculated for the summer samples in each year.

D. Independent Applicability: The chlorophyll and phosphorus standards are considered independently applicable. That is, impairment can be determined with either parameter without confirmation by the other parameter. Although the parameters are linked biologically – algae require phosphorus to grow – the linkage is "noisy" in a statistical sense because phosphorus cannot compel algae to grow (i.e., other limiting factors complicate the relationship). Independent applicability establishes a more sensitive basis for assessing departures from the target trophic condition since regulation of phosphorus cannot be used to guarantee attainment of the chlorophyll standard. Independent applicability is a practical way to adapt regulation to a complex natural relationship where neither constituent is toxic (at least not at the target levels).

E. Adoption of a Temporary Modification for Chlorophyll and Phosphorus: The underlying standards are not attained presently due to the seasonal augmentation of phosphorus concentrations from internal sources. A temporary modification set at "current conditions" to expire 12/31/2020, is adopted in order to recognize the uncertainty regarding how soon the internal load will be reduced. The Division, in conjunction with the Bear Creek Watershed Association, is working on studies to determine what management strategies might be feasible for reducing or controlling internal phosphorus release. Progress on resolving uncertainty will be reviewed in the annual temporary modification hearings in December 2018 and 2019.