

Water Quality Definitions

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One of the major problems within the water quality management field is a lack of common understanding of water quality-related terminology relative to regulatory requirements and appropriate evaluation of water quality. This lack of understanding, especially as it relates to developing technically valid, cost-effective water pollution control programs, leads to over-regulation of wastewater discharges and stormwater runoff-associated constituents for which there are water quality criteria/standards. It also leads to under-regulation of real significant water quality use impairments caused by the unregulated constituents for which there are no water quality criteria/standards. It is important to use such terms as “pollutant,” “pollution,” “water quality,” “water chemistry,” etc., in accord with legal and technically correct usage to eliminate the inappropriate characterization of a water quality evaluation situation. I have observed where regulatory boards and the courts have issued rulings which affect the expenditure of large amounts of public and private funds to control inert chemical constituents which were incorrectly called pollutants. The adoption of the following terminology would significantly improve the technical quality and cost-effectiveness of managing water pollution.

Pollution. Pollution is defined in the Clean Water Act as an impairment of the beneficial use(s) of a waterbody. Finding chemical constituents in elevated concentrations in the water column or sediments is not pollution unless these constituents are impairing the beneficial uses of the waterbody.

Water Quality. Water quality should be assessed based on the characteristics of the water relative to the beneficial uses of the water. Water quality is not, as frequently used, a list of chemical constituent concentrations. In order to reliably assess whether the concentration of a constituent impairs the water quality - beneficial uses of a waterbody, it is necessary to evaluate on a site-specific basis whether the constituent is present in toxic/available forms at a critical concentration for a sufficient duration to be significantly adverse to aquatic life that is important to the beneficial uses of the waterbody.

Water Quality Assessment. A water quality assessment is an evaluation of the beneficial use impairment that is occurring, or could potentially occur, due to the presence of a particular chemical(s) or other constituent. It is not an assessment of the frequency of exceedance of a water quality standard.

Water Quality Standard Compliance. Water quality standard compliance is based on an assessment of the frequency of exceedance of a water quality standard in ambient waters receiving the discharge/runoff. Such compliance does not ensure that the beneficial uses of the waterbody are being protected or that significant over-regulation is not occurring.

Administrative Exceedance. An administrative exceedance of a water quality standard occurs when concentrations of a constituent are present in waters above the standard without adverse impacts to aquatic

life and other beneficial uses. An example is a situation where non-toxic forms of copper are present in a waterbody above a water quality standard that is based on copper toxicity.

Excessive Bioaccumulation. Excessive bioaccumulation of chemicals occurs when the tissue residue-body burden within edible aquatic organisms exceeds US EPA or FDA regulatory guidelines. It is not an elevated concentration of a chemical constituent relative to background or so-called “NAS” guidelines. As whole organism tissue residue guidelines are developed to protect higher trophic-level fish/shellfish-eating birds and animals, such guidelines may be used to evaluate excessive bioaccumulation.

Aquatic Life Adverse Impact. In order for a chemical constituent to be adverse to the beneficial uses of a waterbody, and therefore be a pollutant, it is necessary that the chemical constituent cause altered numbers and/or types/characteristics of desirable forms of aquatic life.

Cause of Aquatic Life Adverse Impacts. The association of elevated concentrations of a constituent in water and/or sediments with aquatic life toxicity or altered organism assemblages is not a valid basis for assessing the cause of adverse impacts. Site-specific studies involving assessing cause and effect must be used to determine if chemical constituents in water or sediments are responsible for aquatic life-related adverse impacts.

Aquatic Chemistry. Aquatic chemistry involves the physical, chemical factors/reactions that control the distribution of chemical species that impact how a chemical affects water quality-beneficial uses. It includes the transport (advection and mixing) and transformations-reactions (kinetics and thermodynamics) that control the concentrations of chemical species in a waterbody.

Aquatic chemistry is not a list of the concentrations of chemical constituents found in a water or sediment sample. Such a list is a compilation of chemical characteristic, not chemistry.

Toxic Hot Spot. A toxic hot spot should be defined as an area in which there is aquatic life toxicity that is significantly adverse to the beneficial uses of a waterbody. Further, a toxic hot spot is an area which serves as a significant source of a bioaccumulatable chemical that is present in edible organisms at hazardous levels. A toxic hot spot should not be defined based on exceedance of a water quality standard or sediment quality guideline.

One of the designation criteria that is used in the California Water Resources Control Board’s BPTCP Policy is the finding that the concentrations of constituents in a water or sediments exceed a water quality criterion/standard. With few exceptions, the water quality criteria/standards are based on worst-case assumptions. Using exceedance of a water quality criterion/standard as the basis for designating a toxic hot spot is obviously technically invalid and can lead to over-regulation.