

Water Quality Objectives for Clear Lake

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“Since beneficial uses, together with their corresponding water quality objectives, can be defined per federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the state and federal requirements for water quality control (40 CFR 131.20). One significant difference between the state and federal programs is that California’s basin plans establish standards for ground waters in addition to surface waters.”

Source: *Fourth Edition, Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin River Basins, September, 1998.*

I. Assumptions

The following Clear Lake Water Quality Objectives, as stated in the above referenced Basin Plan assume the following:

- All stated objectives apply to “surface water” only.
- That Clear Lake is an inland surface water body “within the Sacramento River Basin.”
- The beneficial uses stated herein apply to Clear Lake and its “tributary streams.”
- When a narrative or numerical objective, does not specifically identify one beneficial use, but generally states that the objective applies to “all beneficial uses,” then it is assumed that the Water Quality Objective applies to all Beneficial Uses.
- Water quality objectives apply to only the Designated Beneficial Uses for that water body, unless otherwise stated.
- The word “nuisance” in the narrative Water Quality Objective, provides a separate water quality objective, whose definition must be determined by case law.

II. Clear Lake Beneficial Uses – existing uses as per Basin Plan

MUN:

Municipal and domestic water supply – Uses of water for community, military, or individual water supply systems including, but not limited to drinking water supply.

AGR:

Agricultural supply – Uses of water for farming, horticulture, or ranching, including but not limited to: irrigation, (including leaching of salts); stock watering, or support of vegetation for range grazing.

REC-1:

Water contact recreation - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to: swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

REC-2:

Non-contact water recreation – Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

WARM:

Warm freshwater habitat - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

SPWN:

(**Warm only**) spawning, reproduction and/or early development - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

WILD:

Wildlife habitat – Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates) or wildlife water and food sources.

COMM:

Commercial and sport fishing – Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

COLD:

Cold freshwater habitat - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates. Designated as a ***Potential*** Beneficial Use under the Basin Plan.

III. Water Quality Objectives

Bacteria – Total and Fecal Coliform

Definitions

Bacteria are unicellular microorganisms, which exist in soil, water, organic matter and the bodies of plants and animals. Bacteria are vital in recycling nutrients, and are classified as either beneficial or *pathogenic*, which cause infectious diseases.

Total coliform numbers can indicate non-fecal bacteria, so additional testing is often done to confirm the presence and numbers of fecal coliform bacteria. *Fecal coliform* is a form of bacteria, usually E.coli, which is an indicator microorganism for pathogens in water and soil.

Source

Total coliform is natural to the environment. Fecal coliform originates in human sewage, animals living in wetlands, and agricultural practices, such as allowing domestic animals to graze near water bodies

BU stated in this Objective

REC-1

Narrative Objective

The Basin Plan states no narrative objective for Region 5 or Clear Lake in this category.

Numerical Objective

In waters designated for **REC-1**, the fecal coliform concentration (based on a minimum of not less than five samples for any 30 day period), shall not exceed a geometric mean of 200/100 ml, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400/100 ml.

Biostimulatory Substances

Definition

Biostimulatory substances include excess nutrients (nitrogen and phosphorus) and other compounds that stimulate excessive aquatic plant growth, for example, algae blooms. Excessive algae growth can degrade water quality.

Source

While algae blooms can occur naturally, they are often exacerbated by sewer waste discharges or non point source pollutants. Biostimulatory substances depress the dissolved oxygen (DO) content of water and can result in fish kills. Such excessive substances lead to problems with taste, odors, color and increased turbidity, which cause an aesthetically unpleasant nuisance.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Standard

Water shall not contain biostimulatory substances which promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.

Numerical Standard

The Basin Plan states no numerical objective for Region 5 or Clear Lake in this category.

Chemical Constituents

Definition

Chemical constituents are the organic and inorganic substances found in water. Currently, the Basin Plan specifies the Tables listed in the Numerical Objective (below) from the California Code of Regulations, Title 22 as the Maximum Contaminant Levels for organic and inorganic chemical constituents; and Secondary Maximum Contaminant Levels (Consumer Acceptance Contaminant Levels and Ranges).

Source

Inorganic chemicals from natural erosion and mining activities (ex: aluminum, mercury);
Organic chemicals from industrial activities and pesticide use (ex: simazine, thiobencarb).

BU stated in this objective

MUN

Narrative Standard

Water shall not contain chemical constituents in concentrations that adversely affect beneficial uses.

Numerical Standard

“At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCL’s) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this Plan:
Tables 64431 – A (Inorganic Chemicals)

Table 64431 – B (Flouride) (This table is listed in the 4th Edition (9/1/1998) Basin Plan. However, according to Footnote 5 to Table 64431 –A, it was later repealed, and Flouride, was added to Table 64431 – A).

Table 64444 –A (Organic Chemicals)

Table 64449 – A (Secondary Maximum Contaminants Levels – Consumer Acceptance Limits)

Table 64449 - B (Secondary Maximum Contaminant Levels- Ranges).”

The above four Tables are attached as Appendix A to these Water Quality Objectives.

The incorporation by reference to the above stated CCR, Title 22, Code Sections, is prospective, including future changes to the incorporated provisions as the changes take effect.

Numerical Objective for Lead

At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain lead in excess of 0.015 mg/l.

According to Adam: This objective applies to all the designated Beneficial Uses for Clear Lake. (TableIII-1, on page III-3.00 does not apply to Clear Lake). However, all the MCL Tables of California Code of Regulations, Title 22 does apply to Clear Lake, as does the Numerical Objective for Lead. 2/4/09

Color

Definition

Color is primarily an aesthetic consideration, although extremely dark colored water can limit light penetration and cause additional water quality problems.

Source

Color in water may arise naturally, such as from minerals, plant matter, or algae; or may be caused by industrial pollutants. Color can impact domestic and industrial uses by discoloring clothes and food. The secondary drinking water standard for color is 15 color units.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Standard

“Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.”

Numerical Standard

The Basin Plan states no numerical objective for Region 5 or Clear Lake in this category.

Dissolved Oxygen

Definition

Oxygen from the atmosphere and photosynthesis dissolves into the upper level of all bodies of water and is vital for the maintenance of aquatic life. The amount of dissolved oxygen (DO) in a water body decreases with depth, rising temperatures and the oxidation of organic matter and pollutants. Dissolved oxygen is the most important health indicator of a water body and its capacity to support a balanced aquatic ecosystem of plants and animals.

Source

Wastewater with higher temperatures than the receiving body of water. Wastewater containing high levels of organic (oxygen consuming) pollutants which depletes dissolved oxygen.

BU stated in this Objective

WARM, COLD, SPWN but this applies to all designated BU as per R5 staff.

Narrative Objective

The Basin Plan states no narrative objective for Clear Lake in this category.

Numerical Objective

“For surface water bodies outside the legal boundaries of the Delta, the monthly median of the mean daily dissolved oxygen (DO) concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation. The dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time:

Waters designated **WARM** – 5.0 mg/l

Waters designated **COLD** – 7.0 mg/l

Waters designated **SPWN** – 7.0 mg/l”

Floating Material

Definition

Floating materials (substances with a density less than water) is an aesthetic nuisance, as well as a substrate for algae and insect vectors.

Source

Litter from recreational activities, wind and landfull materials eroding into a water body.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

“Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.”

Numerical Objective

The Basin Plan states no numerical objective for Region 5 or Clear Lake in this category.

Methylmercury

Definition

A bioaccumulative environmental toxicant.

Source

Natural erosion from volcanic areas and mining activities.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

None stated in Basin Plan for Clear Lake or Mercury TMDL to Clear Lake??

Numerical Objective

“For Clear Lake, the methylmercury concentration in fish tissue shall not exceed 0.09 and 0.19 mg methylmercury/kg wet weight of tissue in trophic level 3 and 4 fish, respectively.”

Oil and Grease

Definition

Any material which leaves a visible film or coating on the surface of the water or on Objects in the water.

Source

Improper municipal storm drain run-off, non- point source run-off, recreational vehicles on a water body.

BU stated in Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

“Water shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on object in the water, or otherwise adversely affect beneficial uses.”

Numerical Objective

None stated in the category.

pH

Definition: A measurement of the acidity or alkalinity in a water body.

Source

???

BU stated in this Objective

WARM, COLD but this applies to all designated BU as per R5 staff.

Narrative Objective

None stated for this category.

Numerical Objective

The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.

Pesticides

Definition

Pesticides are used ubiquitously for a variety of agricultural crops and road side spraying. Their release into the environment presents hazards to non-target aquatic organisms and plants, including humans. The extent of risk to fish, waterfowl and plants, depends on many factors which include: the physical and chemical properties of the pesticide, how long the pesticide persists, whether it accumulates in sediments and bioaccumulates in plants, fish and birds, and the synergistic (combined) effect of many pesticides accumulating in one body of water over a period of time.

Source

Agricultural land run-off, non point storm water run-off.

According to page III-6.00 of the Basin Plan, the specific definition of **Pesticide**, for purposes of protecting all waters within Region 5:

“For the purposes of this objective, the term *pesticide* shall include:

- (1) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or non agricultural environment whatsoever, or
- (2) any spray adjuvant, or
- (3) any breakdown products of these materials that threaten beneficial uses. Note that discharges of ‘inert’ ingredients included in pesticide formulations must comply with all applicable water quality objectives.”

BU stated in Objective

All

Narrative Objectives

No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.

Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.

Total identifiable persistent chlorinated hydrocarbon pesticides shall not be present in the water column at concentrations detectable within the accuracy of analytical methods approved by the Environmental Protection Agency or the Executive Officer.

Pesticide concentrations shall not exceed the lowest levels technically and economically achievable.

Numerical Objectives

Pesticide concentrations shall not exceed those allowable by applicable anti-degradation policies (see **State Water Resources Control Board Resolution No. 68-16** and **40 CFR Section 131.12**).

Waters designated for use as domestic or municipal supply (**MUN**) shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of thiobencarb in excess of 1.0 micrograms/liter.

Radioactivity

Definition

The emission of radiation by unstable atomic nuclei undergoing radioactive decay. During the process of radioactivity, alpha, beta and gamma particles are emitted. All known elements of the periodic chart of the elements with an atomic number greater than 83 (bismuth) are radioactive. Radioactivity is a natural process which occurs on and in the earth's crust and can form in the atmosphere due to cosmic rays.

Source

However, excessive radioactivity can damage human tissue. Artificially manufactured radioactivity can be produced by nuclear reactors, particle accelerators and nuclear medicine, where radioisotopes are used for diagnosis, treatment, and research. It is important to note that radioactive elements are commonly found at Superfund Sites. Radiation is used in food preservation, agriculture and mining. Human produced radioactive materials can be released into the environment, through accident or poor disposal, and therefore cause radioactive contamination.

BU stated in this Objective (MUN) and All

Narrative Objective

Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.

Numerical Objective

At a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan. This incorporation by reference is prospective, including future changes to the incorporated provisions as the changes take effect.”

Salinity

Definition

Salinity is the measurement of the mass of dissolved solids (usually salt) present in a given amount of water.

Source

The **major reason** for high soil salinity is agricultural irrigation because all water contains salt. When water is applied to crops, the salt remains in the soil after evaporation. In the absence of sufficient natural drainage and without a proper leaching and drainage program to remove these salts, they becomes a non point source of run off to lakes and rivers.

BU stated in this WQO

All. Included in CC for Clear Lake, sulfates, chlorides, EC, TDS.

Narrative Objective

None stated in Basin Plan or for Clear Lake.

Numerical Objective

None stated in Basin Plan for Clear Lake.

Sediment

Definition

Sediment is material that has accumulated by deposition in water. Naturally induced sediment is composed of organic matter, mineral grains, rock fragments, carbonates and other precipitates, such as oxides of iron, manganese and aluminium. Human induced sediments can include contaminants, (trace metals and organic / inorganic compounds) which are toxic to aquatic plants and animals.

Source of Sediment Pollution

Human modification of land surface within a watershed dramatically increases erosion to lakes via its tributaries. Unsound planning practices from irresponsible deforestation, agriculture, animal husbandry, and minor disturbances of steep lands near streams, increase the amount of loose soil which erode into lakes and increase sedimentation. In addition, the filling in or dredging of shoreline wetlands removes their important purpose, which is to serve as a natural filter for lakes. Erosion sediments increase the amount of decomposing organic matter. This in turn, decreases dissolved oxygen, which is toxic to aquatic plants / animals and the general health of a water body.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Numerical Objective

The Basin Plan states no numerical objective for Region 5 or Clear Lake in this category.

Settleable Material

Definition

Materials with a density higher than water, so they sink to the bottom of a water body.

Source

Recreational materials (lead sinkers from fishing); storm water run-off from landfills; litter from shoreline residences; illegal dumping into a water body.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.”

Numerical Objective

None stated.

Suspended Material

Definition

Material fine enough to stay suspended in water affecting the clarity of the water body.

Source

Storm water run-off from eroded hillside and improper land use practices.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Numerical Objective

None stated.

Tastes and Odors

Definition

Undesirable tastes and odors in water are an aesthetic nuisance, can impact recreational and other uses, and indicate the presence of pollutants.

Source

Industrial pollutants and illegal run-off from landfills.

BU stated in this Objective

MUN) and All

Narrative Objective

Water shall not contain taste or odor producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.

Numerical Objective

The Basin Plan states no numerical objective for Region 5 or Clear Lake in this category.

Temperature

Definition

The measure of warmness or coldness of a water body, using either C or F as the temperature gauge. Temperature indicates the general condition of a water body and health of the ecosystem it supports.

Source

Industrial waste discharge and wastewater discharge from municipal sewage plants.

BU stated in this Objective

WARM & COLD and all Beneficial Uses.

Narrative Objective

The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.”

Numerical Objective

At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5 (degrees) F above the natural receiving water temperature.”

“In determining compliance with the water quality objectives for temperature, appropriate averaging periods may be applied provided that beneficial uses will be fully protected.”

Toxicity

Definition

The degree to which a substance can harm humans, plants or animals. Toxicity can be: **Acute:** harmful effects from a single or short term exposure;

- **Subchronic:** the ability of a toxic substance to cause effects for more than one year, but less than the life of the organism;
- **Chronic:** a substance (or mixture of substances) which cause harmful effects for an extended period, usually on repeated or continuous exposure, which last for the life span of the organism.

Source

Pesticides, industrial chemicals.

BU stated in this Objective

None but this applies to all designated BU as per R5 staff.

Narrative Objective

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. Compliance with this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests of appropriate duration or other methods as specified by the Regional Water Board.

The Regional Water Board will also consider all material and relevant information submitted by the discharger and other interested parties and numerical criteria and guidelines for toxic substances developed by the State Water Board, the California Office of Environmental Health Hazard Assessment, the California Department of Health Services, the U.S. Food and Drug Administration, the National Academy of Sciences, the U.S. Environmental Protection Agency, and other appropriate organizations to evaluate compliance with this objective.

The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge, or, when necessary, for other control water that is consistent with the requirements for “experimental water” as described in *Standard Methods for the Examination of Water and Wastewater*, latest edition, [21st Edition, September, 2005]. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96 hour bioassay.

In addition, effluent limits based upon acute biotoxicity tests of effluents will be prescribed where appropriate; additional numerical receiving water quality objectives for specific toxicants will be established as sufficient data become available; and source control of toxic substances will be encouraged.

Numerical Objective

The Basin Plan states no numerical objective for Toxicity for Region 5 or Clear Lake.

Turbidity

Definition

The measure of clarity of a body of water.

Source

Increased erosion due to improper land use activities.

BU stated in this Objective

None.

Narrative Objective

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.

Numerical Objective

Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

- Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTU's), increases shall not exceed 1 NTU.
- Where natural turbidity is between 5 and 50 NTU's, increases shall not exceed 20 percent. (This is the numerical objective for Clear Lake).
- Where natural turbidity is between 50 and 100 NTU's, increases shall not exceed 10 NTU's.
- Where natural turbidity is greater than 100 NTU's, increases shall not exceed 10 percent.”

In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected.