SCOPING DOCUMENT

Nutrient Policy

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Division of Water Quality
State Water Resources Control Board
California Environmental Protection Agency

Project Description

The State Water Resources Control Board (State Water Board) is proposing a nutrient policy that would establish nutrient water quality objectives and establish methods to control nutrient over-enrichment in inland surface waters of the state (Nutrient Policy). This Nutrient Policy does not apply to ocean, enclosed bays and estuaries. This informational document presents issues and alternatives to elements that may be included in the proposed Nutrient Policy. The four elements subject to scoping consideration are: (1) Water Quality Policy, (2) Water Quality Objectives, (3) Implementation, and (4) Implementation with Monitoring. This document provides a summary of issues that could be addressed and elements that may be included.

Background

Environmental Considerations of Nutrients

Nutrients occur naturally in the environment and are essential for supporting flora and fauna of a waterbody. However, an extremely high (or low) nutrient level is of concern as it can impair the health and beneficial uses of waters of the state. Excess nutrient load can result in excess planktonic algae (and macrophyte) biomass that may increase turbidity, alter the food chain, create nuisance conditions, and alter the dissolved oxygen (DO) balance and pH, leading to fish kills or other impairment of uses.

In contrast to other pollutants, identifying an excessive level of nutrients is not always straightforward. The chemistry, waterbody shape and other secondary factors such as light, morphology, and residence time need to be considered to see if nutrients are causing impairment. Except in extreme cases, nutrients alone do not impair beneficial uses. The nutrient concentration that results in impairment in a high-gradient, shaded stream may be much different from the one that results in impairment in a low-gradient, unshaded stream. The basic issue is to link specific beneficial uses to levels of nutrients that are likely to impair those uses. Establishing this connection is an exercise in risk assessment, for which the techniques developed for ecological risk assessment in particular are highly relevant.

The main beneficial uses affected by eutrophication may be the following:

- Cold Freshwater Habitat (COLD)
- Warm Freshwater Habitat (WARM)
- Water Contact Recreation (REC-1)
- Noncontact Water Recreation (REC-2)
- Municipal and Domestic Supply (MUN)
- Fish Spawning (SPWN)
- Fish Migration (MIGR)

Regulatory Background

The Clean Water Act (CWA) gives states the primary authority, with oversight by the United States Environmental Protection Agency (U.S. EPA or Agency), to establish designated uses (or “beneficial uses” under State law) for waterbodies and to develop water quality criteria (or “objectives” under State law) to protect those designated uses. Each Regional Water Quality Board (Regional Water Board) Basin Plan and statewide plan contains water quality standards, which consist of beneficial uses, water quality objectives to protect those beneficial uses, a program of implementation for achieving the water quality, and an antidegradation policy.

Section 304(a) of the CWA directs U.S. EPA to develop scientific information on pollutants and to publish "criteria guidance," often expressed as pollutant concentration levels, which will result in attainment of a designated use of the waterbody (e.g., fishing, swimming) that is determined by the state. States consider these U.S. EPA "criteria guidance" when they adopt water quality standards for waterbodies.

In the case of nutrients, however, there is a great deal of variability in inherent nutrient levels and nutrient responses throughout the country. Because of this variation, U.S. EPA has determined that recommending a single pollutant concentration number to support a designated use for nationwide application is not appropriate for nutrients. Instead U.S. EPA intends to develop nutrient criteria guidance on a regional, rather than a national, basis. In the meantime, the Agency expects states and tribes to develop water quality criteria and standards for nutrients in their geographic regions based on the guidance provided by U.S. EPA (U.S. EPA, 1998).

Currently, nutrient regulation exists at the Regional Water Board level in California. There is no statewide nutrient policy.

All of the Regional Water Quality Control Plans contain objectives for biostimulatory substances, nutrients and/or algae. While generally consistent, there are slight variations of the narrative or numeric objectives from region to region. A typical example from the San Francisco Water Boards Basin Plan is:

> Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll-a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll-a or phytoplankton blooms may indicate exceedance of this objective and require investigation (pg 3-3, section 3.3.3, 2010).

Two Different Approaches to Nutrients

There are currently two principal approaches under consideration by the State Water Board at this time. The preferred approach is the California Nutrient Numeric Endpoint (CA NNE, or CA NNE Approach). Also being considered is the U.S. EPA 25th Percentile Ecoregion Approach (Ecoregion Approach). These two approaches are described briefly below.

25th Percentile Ecoregion Approach

The Ecoregion Approach was originally developed by U.S. EPA. Under this approach, a nutrient policy would divide California into similar geographic condition sections called ecoregions. Nutrient criteria would be applied to each ecoregion or be modified to reflect conditions at a smaller geographic scale than an ecoregion such as a subecoregion, the state or tribe level, or specific class of waterbodies. This decision would be evaluated in light of the specific designated uses that need to be protected. This Ecoregion Approach proposes that the 25th percentiles of all nutrient data could be assumed to represent unimpacted reference conditions for each ecoregion of California.

California Nutrient Numeric Endpoint (Preferred Approach)

The CA NNE Approach is based on an evaluation of risk relative to beneficial uses. Essentially, the objective is to control excess nutrient loads/concentrations to levels such that

there is a low risk or probability of impairing the beneficial uses due to eutrophication. If the nutrients present – regardless of actual magnitude – have a low probability of impairing uses, then water quality standards can be considered to be met. Achieving nutrient reductions to control downstream impacts may require more stringent restrictions in upstream reaches than would be otherwise necessary for uses within those reaches alone. For instance a stream entering a reservoir may need lower nutrient numeric endpoints upstream, not to protect against upstream secondary impacts but to protect against impacts within the reservoir.

Framework

For many of the biological indicators associated with nutrients, there is no clear scientific consensus that a single threshold can be developed for all waters that represent impairment. To address this issue, the CA NNE Approach designates waterbodies into the three Beneficial Use Risk Categories (BURCs) based on thresholds that describe the probability of impairment due to nutrient loading. This BURC approach uses simple analyses, but considers site-specific characteristics and identifies the waterbodies that will most likely need more detailed analyses. BURC I includes waterbodies that are clearly unimpaired. BURC III includes waterbodies that are clearly impaired. BURC II is the classification for waterbodies that fall in a gray area, where additional monitoring tools and assessment are needed to decipher whether waterbodies are meeting standards and which are not.

The CA NNE Approach sets numeric targets for each of the secondary indicators using literature sources and scientific experts in the field of eutrophication. The CA NNE Approach is based on lines of evidence that incorporates natural background conditions; the status of risk cofactors; and the relationship between secondary indicator response variables. Risk cofactors refer to flow, light/shade, temperature, habitat quality, etc. Secondary biological indicators are benthic algal biomass, planktonic chlorophyll, dissolved oxygen and organic carbon, macrophyte cover, and clarity. These secondary indicators provide a more direct risk-based linkage to beneficial uses than the nutrient concentrations alone.

The CA NNE Approach requires a good understanding of the individual waterbody being evaluated and consideration of all of the lines of evidence.

Scoping Tools

The CA NNE Approach includes two spreadsheet applications called the BATHTUB model (Walker, 1996) and the Benthic Biomass tool (Tetra Tech, 2008). The BATHTUB model establishes screening level nutrient loading targets for lakes and reservoirs by estimating algal response to nutrient loading.

The CA NNE Benthic Biomass spreadsheet tool calculates both algal density under average conditions and benthic chlorophyll a. Both are estimated using a variety of methods. The tool allows the user to supply a target (either algal density or benthic chlorophyll-a), and to select a calculation method; then the tool will display a graph of allowable total nitrogen and total phosphorus to meet the target.

Potential Objectives, Implementation and Monitoring Subject to Scoping Consideration

Objective Alternatives for State Water Board Action

1. No action.

The current language for nutrients within each of the Regional Water Board Basin Plans would remain in place. The Regional Water Board staff would continue to establish nutrient objectives according to the language in each Regional Water Board's Basin Plan. Under this alternative, the Regional Water Boards could choose to adopt U.S. EPA's recommended nutrient criteria or the CA NNE. Regional Water Boards could also choose to use a dynamic model calibrated for nutrients to establish a Total Maximum Daily Load (TMDL) for a particular waterbody. The dynamic model would have to be externally peer-reviewed.

2. Adopt U.S. EPA's recommended nutrient criteria using the Ecoregion Approach.

State Water Board may choose to adopt U.S. EPA's recommended nutrient criteria. Under this alternative, the 25th percentiles of all nutrient data could be assumed to represent unimpacted reference conditions for each ecoregion of California. U.S. EPA's recommendation also proposes that concentrations above the 50th percentile may be considered elevated and impaired. Setting criteria in this fashion may be overly protective in some areas and under protective in others.

3. Adopt a statewide Nutrient Policy with narrative objectives, using the freshwater CA NNE Approach as a numeric translator to set nutrient limits.

The State Water Board could adopt narrative nutrient objectives with translator mechanisms to implement these narrative objectives. The translator mechanisms would use the freshwater CA NNE framework and scoping tools to set nutrient threshold limits. This would serve as a template for all the Regional Water Boards to use in their respective Basin Plans to develop regional targets with site-specific refinements. This would allow for permit writers to come up with secondary indicator targets that can be converted to nutrient concentration targets appropriate for assessment, permitting, and the calculation of TMDLs.

Implementation Alternatives for State Water Board Action

1. No action.

The current language for nutrients within each of the Regional Water Board Basin Plans would remain in place. The Regional Water Board staff would continue to implement nutrient control programs according to the requirements of each Regional Water Board's Basin Plan.

2. Adopt implementation methods under U.S. EPA's Ecoregion Approach.

Regional Water Boards would be required to implement a nutrient control plan, consistent with the requirements of the U.S. EPA Ecoregion Approach. Permit writers would use the 25th and the 50th percentile of all statewide nutrient data to establish effluent limits for both nutrient and response indicators. The length of the dataset, source of the data, and the location in which the data are taken would be considered when using the Ecoregion Approach.

3. Adopt Freshwater CA NNE implementation methods.

Regional Water Boards would be required to implement a nutrient control plan, consistent with the requirements of the CA NNE. The CA NNE framework could be used as a tool for interpreting nutrient objectives in Regional Water Board basins plans. Secondary indicator targets would be converted to nutrient concentration targets appropriate for assessment,

permitting, and the calculation of TMDLs. National Pollution Elimination Discharge System limits would be set at the BURC II/III threshold or at the BURC I/II threshold and call for a site-specific study to confirm this BURC I/II threshold limit.

The Nutrient Policy would work in parallel with the Non-Point Source (NPS) program. At a minimum, waster discharge requirements (WDRs), waivers of WDRs, or basin plan prohibitions covering nonpoint source discharges would require that discharges implement best management practices to reduce pollutant loadings of nutrients.

Monitoring Alternatives for State Water Board Action

1. No action.

The current language for nutrient monitoring within each of the Regional Water Board Basin Plans would remain in place. The Regional Water Board staff would continue to implement nutrient control programs according to the requirements of each Regional Water Board's Basin Plan.

2. Establish statewide requirements for nutrient monitoring based on U.S. EPA's Ecoregional Approach

The Nutrient Policy would include a detailed plan for statewide nutrient monitoring that the Regional Water Boards would be required to use. Depending on the objectives and implementation measures chosen, different monitoring plans would be required.

To support the Ecoregion Approach, monitoring plans could use ambient nutrient concentrations within a waterbody alone to predict eutrophication. Box plots for each available nutrient parameter (ammonia, nitrite, nitrate, total Kjeldahl nitrogen, phosphate and total phosphorus) would be created separately for streams and lakes with data points partitioned for each of the use attainability classes. Yearly and summer-season analyses would be performed.

3. Establish statewide requirements for nutrient monitoring based on the Freshwater CA NNE.

Under the CA NNE Approach, monitoring would take place during the summer season since the freshwater CA NNE framework and scoping tools are developed for this season only.

Monitoring plans would be required to monitor for risk cofactors including flow, light/shade, temperature, habitat quality, etc. In addition to monitoring for nutrient concentrations, plans would also require monitoring for secondary biological indicators including benthic algal biomass, planktonic chlorophyll, dissolved oxygen, dissolved organic carbon, macrophyte cover, and clarity. These nutrient concentrations, risk cofactors and secondary biological indicators would then be inserted into the CA NNE scoping tools to evaluate various nutrient concentration targets to achieve the desired condition for secondary indicators thresholds.

4. Provide narrative guidance.

The Regional Water Boards would be required to develop monitoring plans for their regions based on guidance provided by the State Water Board. State Water Board guidance would include recommendations on the elements that should be included in a monitoring plan, similar to what is described above, but the Regional Water Boards would have final responsibility and authority on what would be required for a monitoring program.

References

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U.S. EPA. 1998. National Strategy for the Development of Regional Nutrient Criteria. EPA 822-R-98-002. Office of Water, U.S. Environmental Protection Agency, Washington, DC.

Walker, W.W., R. 1996. Simplified Procedures for Eutrophication Assessment and Prediction: User's Manual. U.S. Army Corps of Engineers. Water Operations Technical Support Program. Instruction Report W-96-2.