IMPLEMENTATION PLAN – PRELIMINARY DRAFT

Categorical Water Body and Watershed-scale Approach to Support implementation of Narrative Biostimulatory and Biointegrity Water Quality Objectives

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This paper describes a proposed approach to the implementation of narrative biostimulatory and biointegrity objectives at both the categorical water body and watershed scale. This fundamental approach has been discussed for several years and has garnered the general support of numerous stakeholders. The approach is being documented to enable consideration for incorporation into Biostimulatory and Biointegrity policy documents being developed by the State Water Resources Control Board.

Legal and Regulatory Foundation

Under the Clean Water Act, enforceable water quality criteria are adopted to protect designated beneficial uses. Criteria may be either numeric or narrative. The combination of enforceable criteria and designated uses, together with an antidegradation policy, are defined to be water quality standards (WQS). Uses specified in Section 101(a)(2) of the Act include "uses that provide for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water, as well as for the protection of human health when consuming fish, shellfish and other aquatic life. A subcategory of a use specified in Section 101(a)(2) of the Act refers to any use that reflects the subdivision of uses…into smaller, more homogeneous groups for the purposes of reducing variability within the group."

CWA section 101(a)(2) sets a water quality goal to provide for the protection of fish, shellfish, and wildlife and for recreation in and on the water wherever attainable. EPA's WQS regulation at 40 CFR131.10(j) and (k) interprets and implements these provisions through requirements that WQS protect these uses unless states and authorized tribes show these uses are unattainable through a use attainability analysis (UAA) consistent with EPA's regulation. This effectively created a rebuttable presumption of attainability.

Federal regulations at 40 CFR131.3(g) define a UAA as a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological and economic factors as described in 40 CFR131.10(g).

EPA recommends that the analysis involve the following:

- Identifying the current and expected conditions for a water body
- Evaluating the effectiveness of BMPs and associated water quality improvements

- Examining the efficacy of treatment technology from engineering studies
- Using water quality models, loading calculations and other predictive tools

Recent (August 2015) USEPA water quality standards regulations (40 CFR 131, EPA Docket No. EPA-HQ-OW-2010-0606) require that the Highest Attainable Use (HAU) be identified and protected. This concept is consistent with the adoption of subcategories of uses, such as tiered aquatic life uses (TALU), where appropriate. The SWRCB's Science Advisory Panel has recommended consideration of the TALU approach as a way to deal with water bodies in California that will not ever be able to achieve pristine, "reference water body" conditions in terms of algal concentrations, biological condition, and/or water quality condition. [See "Report from June 2015 Meeting of the Nutrient Science Advisory Panel for California Wadeable Streams"] Application of a structured scientific analysis is incorporated into the proposed watershed approach to enable and promote the identification of HAU and TALU values at the watershed scale.

Under the California Water Code, water quality objectives (analogous to federal "standards") are adopted to provide reasonable protection of beneficial uses. Objectives may be either numeric or narrative. Three of the requirements for the adoption of water quality objectives in California are: (a) consideration of past, present and probable future beneficial uses of water (Section 13241 (a)), (b) consideration of the water quality condition that could reasonably be achieved through coordinated control of all factors which affect water quality in the area, and (c) consideration of economics (Section 13241 (c)). The proposed watershed scale approach would address each of these requirements of the Water Code.

The Watershed Scale Approach

The proposed categorical waters and watershed-scale approach to implementation of narrative biostimulatory and biointegrity objectives is designed to be consistent with both federal and state requirements pertaining to beneficial use designation and water quality objectives adoption. While it is geared to the watershed scale, many elements of the following are also pertinent to the implementation of narrative objectives at the categorical water body scale.

At the watershed level, the proposed approach requires stakeholder involvement, watershed-scale assessment of nutrient sources and transformation processes, and development of information to establish the relationship between management options and attainable outcomes. The approach de-emphasizes early adoption of numeric water quality criteria/objectives in favor of the direct assessment of effective management measures.

Under the proposed approach, monitoring and data synthesis would be used to provide necessary source identification and characterization of the watershed loads and biological responses to nutrients and other factors. The monitoring and data synthesis would inform the development of a refined conceptual model for the watershed. Additionally, the monitoring data would be used to develop, refine and utilize modeling tools to enable prediction of watershed response to different management scenarios. Management scenarios would be developed to book end the range of both plausible and extreme management actions that could be implemented to achieve desired biointegrity and biostimulatory outcomes. Those management scenarios would be analyzed using available modeling tools to predict environmental outcomes over a range of management options.

The watershed responses would be evaluated in terms of their benefit to beneficial uses of the waterbodies. The final step would be an identification of highest attainable uses based on consideration of the six factors outlined under 40 CFR131.10(g). Ultimately, this evaluation would enable the development of a holistic management plan for the attainment of appropriate goals for ambient water quality, algal concentrations, biological conditions and beneficial uses at the watershed scale, consistent with federal and state laws and regulations.

The specific actions to be taken under the proposed watershed approach include (1) development of watershed-specific conceptual model of biostimulatory and biointegrity processes, (2) quantification of important physical, chemical and biological factors influencing biostimulatory processes and biointegrity, including nutrient source identification, through watershed-specific data synthesis and monitoring, (3) development of either empirical or mechanistic models to characterize watershed-specific response to nutrient load management and other management actions, (4) development of management scenarios to control ambient nutrient levels and other important non-nutrient factors, (5) use of watershed-specific models to evaluate the ability to impact aquatic life and recreational beneficial uses through implementation of different management scenarios and (6) identification of highest attainable uses based on consideration of the six factors outlined under 40 CFR131.10(g) using the information developed through completion of the first five actions..

The proposed watershed-based approach is presented schematically in Figure 1. Note that this approach may need to be modified for implementation at the categorical water body scale.

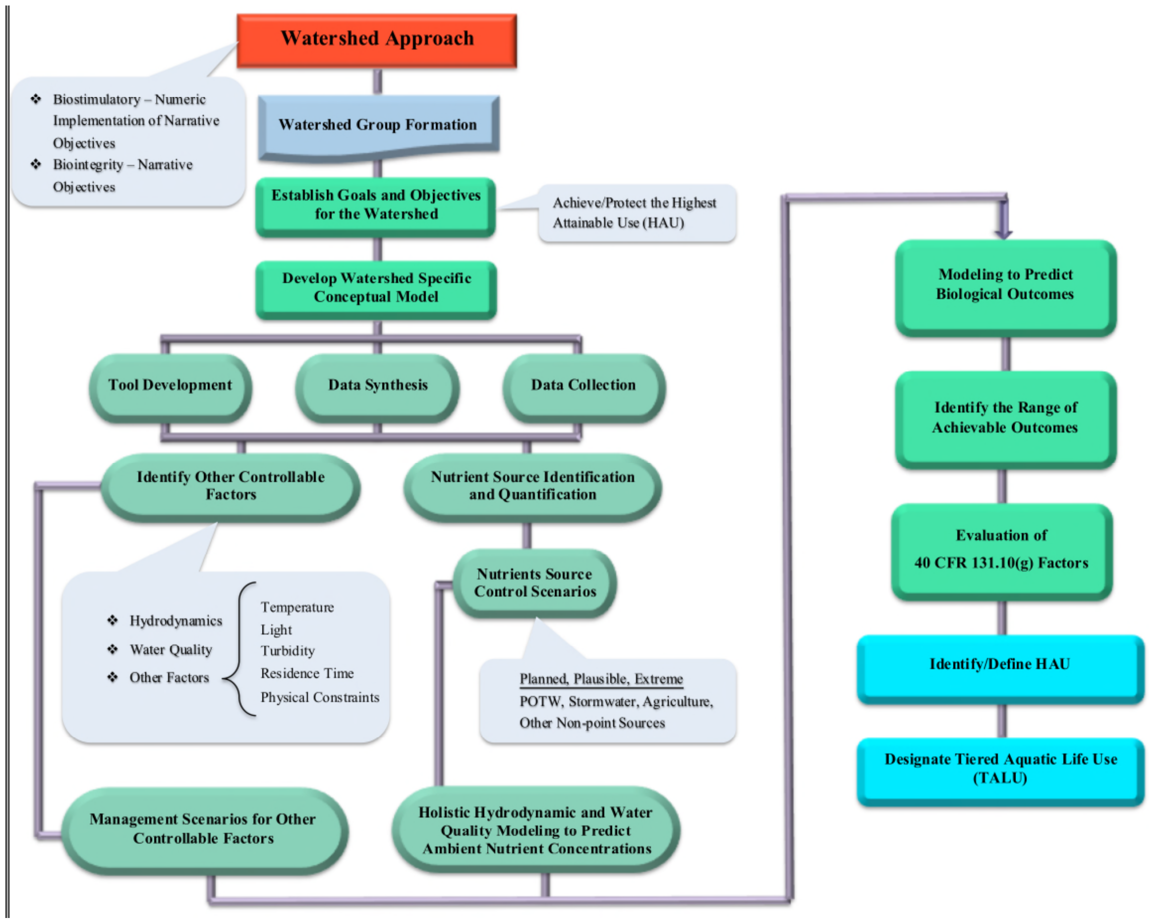

Figure 1. Proposed Watershed-based Approach

Description of the actions depicted in Figure 1 are as follows:

(1) Development of watershed-specific conceptual model of relationships of nutrients and other factors to biostimulatory and biointegrity processes and outcomes

A generalized conceptual model of the relationships of nutrients and other factors to biostimulatory and biointegrity processes and outcomes is shown in Figure 2. The conceptual model includes nutrient sources and sinks, nutrient transformations, hydrologic characteristics, geologic conditions, riparian shading, stream gradients, channel characteristics, climatic conditions, ecologic characteristics, and other factors influencing algal growth and biological conditions.

On a watershed-specific basis, this conceptual model should be tailored to depict important local factors and conditions. This refined conceptual model will form the basis for development of the data synthesis, monitoring and modeling efforts described below.

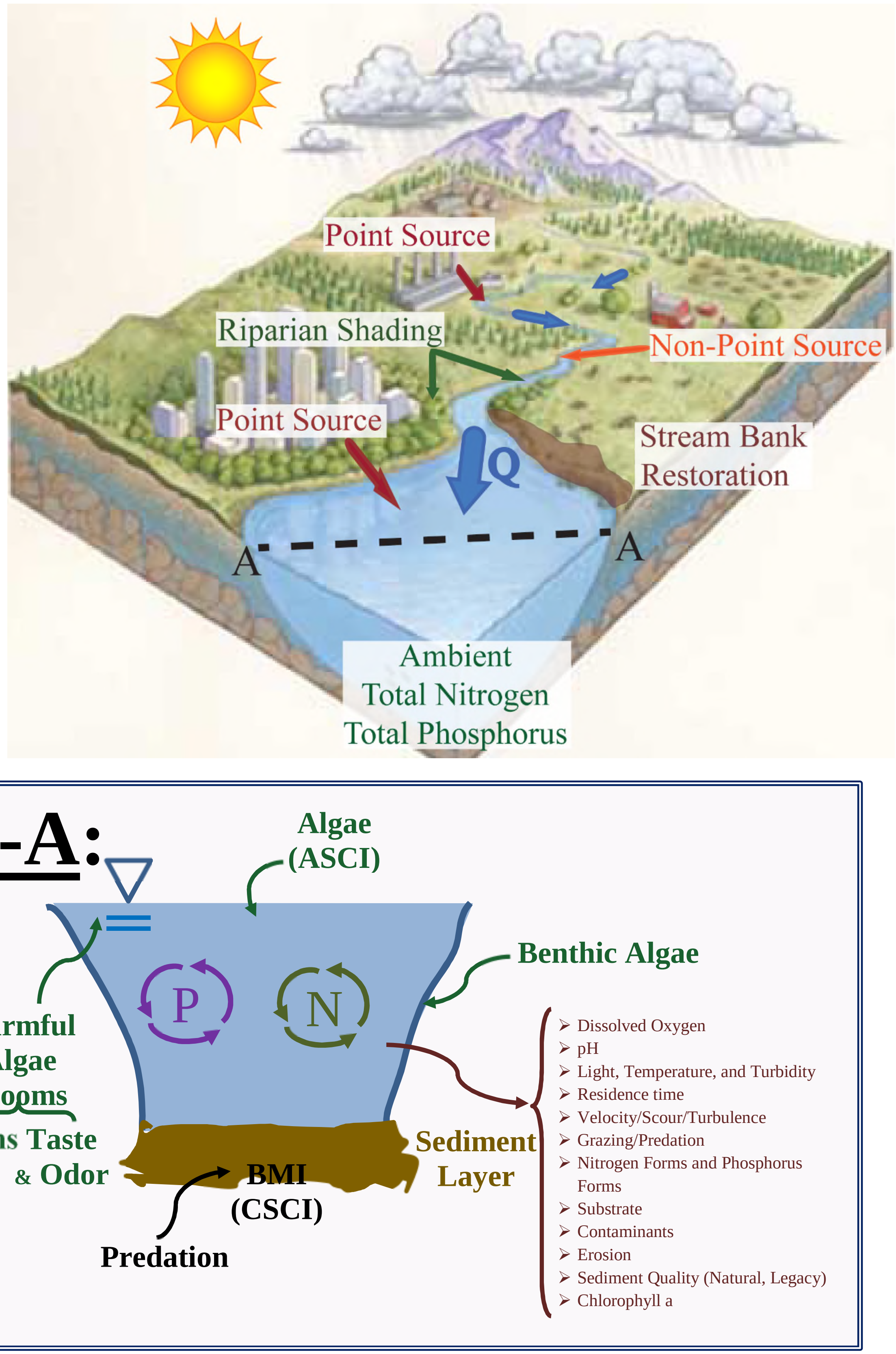

Figure 2. Conceptual Model for Biostimulatory and Biointegrity Processes.

(2) Quantification of important physical, chemical and biological factors influencing biostimulatory processes and biointegrity, including nutrient source identification, watershed-specific data synthesis and additional monitoring.

> Collection and/or synthesis of local data is needed to link ambient nutrient levels and other water quality and physical characteristics to algae concentrations and biological indices. This work is needed to validate models and to develop modeling results to allow implementation of the watershed-scale approach.
>
> The monitoring data is intended to develop information and support for tools to allow the prediction of outcomes resulting from various nutrient conditions and other watershed management scenarios.

(3) Development of either empirical or mechanistic models to characterize watershed-specific response to nutrient management and other management actions.

> The need exists to be able to predict changes in ambient nutrient concentrations within a water body over space and time as a result of various load management scenarios. These predictions should be informed by consideration of the non-conservative behavior of nutrients, e.g. processes such as nitrification, denitrification, adsorption, sedimentation, etc. There is also a need to predict biological responses (in terms of algal concentrations and changes in biological indices) to changes in ambient nutrient concentrations. Finally, the need exists to be able to predict the influence of other factors (flow regimes, temperature, light, invasive species, etc.) on the biological responses associated with ambient nutrient concentration changes.
>
> Mathematical models (either empirical or mechanistic) are needed to be able to perform the above predictive work. The first need described above can be fulfilled by various watershed models that link hydrodynamics to ambient nutrient concentrations. A prerequisite for this effort is the identification and quantification of existing nutrient sources in the watershed and monitoring data for other ambient parameters, as described above.
>
> The prediction of biological response to changes in nutrient concentrations and other factors requires use of either empirical or mechanistic modeling tools. As one option, use of the statistical approaches employed in the derivation of statewide default values may be considered for application at the categorical water body and/or watershed scale.

(4) Development of a range of management scenarios to control ambient nutrient levels and other important non-nutrient factors.

> A range of management scenarios should be developed based on input from local stakeholders and subject matter experts. In establishing the breadth of the measures to be considered, it is important to consider both plausible and extreme management alternatives for the controllable nutrient sources in the watershed and also plausible management measures for non-nutrient factors, e.g. shading, erosion control, flow management, invasive species control, etc. For instance, the range of scenarios for POTW nutrient controls should include varying levels of nitrogen and phosphorus

removal through nitrification and denitrification, phosphorus removal, enhanced biological nutrient removal (Limit of Technology), and biological treatment followed by membrane treatment. Water recycling should also be considered as part of the load management scenarios.

(5) Use of watershed-specific models to evaluate the ability to create improved aquatic life and recreational beneficial use conditions through implementation of different management scenarios.

Once management scenarios are identified, the modeling tools described in Task 3 above should be used to identify a suite of the anticipated changes in physical, chemical and biological outcomes that could be achieved in the watershed. These changes would include changes in ambient nutrient concentrations, changes in light and flow regimes at different locations in the watershed, and the resulting change in algal concentrations, biological condition (as measured by benthic community and algal indices), etc.

Information obtained through evaluation of various potential management scenarios should be summarized and synthesized to determine impacts to beneficial use attainment.

(6) Identification of highest attainable uses and appropriate watershed-scale metrics based on consideration of the six factors outlined under 40 CFR 131.10(g) using the information developed above. These are:

1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low-flow conditions or water levels prevent the attainment of the use, unless these conditions can be compensated for by a sufficient volume of effluent discharge without violating state conservation requirements to enable uses to be met; or
3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied, or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; or
5. Physical conditions related to the natural features of the water body preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those requires by Sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

The above procedures would be used to inform the identification of the HAU at the watershed scale. Site-specific criteria would be used to support the level of aquatic life use that is attainable. The criteria would protect the highest, but limited, aquatic life use (e.g. "limited warm water aquatic life use").

Notes

Note 1: From 2015 USEPA WQS regulations: “the HAU is the attainable use that results from the process of determining what is not attainable”…”does not necessarily mean that the use with the most numerically stringent criteria must be designated as the HAU”

Note 2: From 2015 USEPA WQS regulations, Preamble. An example where a state adopted new statewide subcategories to protect the HAU was related to a class of waters that the state defines as effluent dependent waters. The state conducted a UAA to justify removal of the aquatic life use in those waters. It was not feasible for these waters to attain the same aquatic life assemblage expected of waters assigned the statewide aquatic life use. The state identified the highest attainable use for these waters and created two new sub-categories (effluent dependent fisheries and effluent dependent non-fish bearing waters) with criteria that are sufficiently protective of those uses. State can tailor site-specific criteria to protect the HAU as determined by a UAA. State can adopt a broad “Limited Use” which includes the same water quality criteria as the state’s fully designated uses for recreation and fish and wildlife protection, except for any site-specific alternative criteria that have been established for the water body. Such site specific criteria are limited to criteria for nutrients, bacteria, dissolved oxygen, …biological integrity. The state limits application of the Limited Use to waters with human induced physical or habitat conditions that prevent attainment of the full designated uses.