DFG Exhibit 5

Weight of Evidence Approach for Developing Delta Flow Criteria and Quantifiable Biological Objectives

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Necessary to Protect Public Trust Resources
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Weight of Evidence Approach for Developing Delta Flow Criteria and Quantifiable Biological Objectives

The Department of Fish and Game (DFG) is required by SBX7 1 to develop flow criteria and quantifiable biological objectives for aquatic and terrestrial species of concern dependent on the Delta. The State Water Resources Control Board (Water Board) is required to develop flow criteria (which shall include the volume, quality, and timing of water necessary under different conditions) for the Delta ecosystem necessary to protect public trust resources. A key factor in developing the flow criteria by each agency is the method to assess the scientific understanding that will underpin the flow criteria.

This exhibit describes a methodology for developing flow criteria based on the weight of the scientific evidence.

Background

DFG is required by Water Code section 85084.5 to develop flow criteria and quantifiable biological objectives for aquatic and terrestrial species of concern dependent on the Delta. DFG is also required to coordinate efforts with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The flow criteria developed by the Water Board and DFG will be used to identify instream flow needs of the Delta and will likely by used in planning decisions that are required to achieve the objectives on the Delta Plan as described in the provisions of SBX7 1.

DFG will use the following principles to guide the development of the Delta biological objectives and flow criteria:

1. Flow criteria and biological objectives will be based on best available data and information including but not limited to existing recovery plans, publications, reports, journal articles, CESA permits and supporting documents, etc.
2. To the extent possible, DFG will use the record developed by the Water Board for its flow criteria development. If new or additional information is developed after the Water Board completes it flow criteria, DFG will consider the new data and information.
3. DFG will participate in the Water Board's informational proceeding on development of its flow criteria. It is DFG's intent to coordinate development of flow criteria and biological objectives with the Water Board's efforts.
4. In developing flow criteria, DFG recommendations will follow guidance in Water Code sections 85084.5 and 85086(c)(1).
5. Species to be covered by the biological objectives and flow criteria may include all federal and State listed species in the Delta (e.g., Delta smelt, longfin smelt, etc.), striped bass, other commercial/recreational fish species, and other species or habitats known to be influenced by Delta outflow.

6. Flow recommendations will be based on current environmental conditions in the Delta with an acknowledgment that conditions may be influenced by California's changing climate.

Even though the Legislature requires that the flow criteria inform future proceedings related to the Delta Plan and BDCP, it is not known presently what is needed to support these yet-to-be-defined efforts (e.g., the scope of the Delta Plan has yet to be developed and the BDCP is evaluating many options in and around the Delta).

Approach

The Water Board should use an approach that acknowledges that uncertainty is inherent in all environmental decision making, that incorporates scientific understanding, and that explicitly presents, to the extent possible, all assumptions and judgments. The methodology should depend on the weight of the scientific information. The goal should be an objective assessment of available scientific information. In this circumstance, "objective" means that many scientists would more or less believe that it is true based on substantial evidence.

This weight of evidence approach should be a narrative process where individual lines of evidence (e.g., scientific understanding of water flow quantity, quality, and timing on fish and wildlife resources) are used in combination to evaluate impacts of flow characteristics on public trust resources. Each line of evidence should be:

1. Applicable to public trust resource beneficial use (e.g., fish and wildlife habitat, migration, spawning, etc.)
2. Protective of the beneficial use.
3. Linked to water flow characteristics (i.e., flow quantity, quality, or timing)
4. Well described.
5. Scientifically based and reviewed (either through peer review or other vetting process).
6. Based, to the extent possible, on studies where causal mechanisms have been identified. A causal link will not always available for all important species or processes.

Each line of evidence should be evaluated separately and combined into a range of suggested flow criteria or biological objectives. Lines of evidence should include data or information that pertains to an important aspect of the Delta related to flow quantity, quality, or timing such as:

1. Life history information (e.g., migration timing, etc.)
2. Season or time period when flow characteristics are most important.
3. Relationships of species abundance or habitat to Delta outflow, Delta inflow, water quality parameters linked to water flow, etc.
4. Species environmental requirements (e.g., dissolved oxygen, temperature preferences, salinity, X2 location, turbidity, toxicity to specific pollutants, etc.)

5. Effect of water flow on species
6. Relationship of species abundance to invasive species, to the extent possible.

The lines of evidence would be combined or judged against one another to make statements about what flow quantity, quality, and timing are needed to support fish and wildlife resources. To minimize any subjectivity, the weight of evidence approach should make explicit the assumptions and judgments in the analysis and to explore the sensitivity of the range of flow criteria and biological objectives to reasonable changes in assumptions and judgments.

This general approach was used by the Water Board in developing the 2002 Clean Water Act (CWA) section 303(d) list (SWRCB, 2003), in the Water Board's Listing Policy (SWRCB, 2004), and the 2006 CWA section 303(d) list (SWRCB, 2006).

Process for Developing Weight of Evidence

1. Identify species to include in the weight of evidence approach (based on ecological, recreational, or commercial importance).
2. Identify critical time(s) of year or seasons when species are most affected by flow characteristics. Identify key quantifiable characteristics linked to water flow (e.g., recruitment success, predation, etc.)
3. Establish mechanisms or hypotheses about mechanisms that link species abundance, habitat, etc. with water flow and water quality variables. To the extent possible, mechanisms that causes or contributes to better understanding of the water flow in the Delta and abundance, habitat, etc. of important threatened and endangered, recreational, and commercial species.
4. Assemble evidence in favor of or against various flow-related hypotheses. This should include all data, information, and analysis that could assist in developing the weight of evidence (e.g., DFG's 1987 and 1992 exhibits to the Water Board on Delta conditions and recommended flows should be included in the record).
5. Organize conclusions, relationships, and numerical/narrative recommendations (based on evidence) into a range of values that could provide a starting point for future proceedings.
6. Identify, to the extent possible, the assumptions, judgments, and strength or persuasiveness of each flow criterion (endpoint) and the concurrence or lack of concurrence between endpoints.
7. The range of flow criteria could be further refined depending on the future proceeding using available published procedures (e.g., Klapow and Lewis, 1979; Smith et al., 1992; MacDonald et al., 2000; Wisconsin Department of Natural Resources, 2003).

References

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