FISHBIO

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State Water Resources Control Board
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Subject: Comment Letter – Board Workshop: Recommendations for Developing Instream Flow Criteria for Priority Tributaries (Phase 4).

Ms. Townsend:

FISHBIO and Mr. Thomas Payne (Normandeau Associates, Inc.) thank you on behalf of the San Joaquin Tributaries Authority (SJTA) for the opportunity to respond to the workshop held on March 19, 2014. This group is committed to continuing its collaboration with the State Water Resources Control Board (State Water Board or SWRCB) to manage California's water resources through scientific balancing public trust resources and beneficial uses.

Below are FISHBIO and Mr. Payne's comments to the California State Water Board on the report from the Delta Science Program titled, "Recommendations for Developing Instream Flow Criteria for Priority Tributaries (Phase 4)" (Report). This comment letter is submitted by the SJTA, which consists of Merced Irrigation District, Modesto Irrigation District, Turlock Irrigation District, Oakdale Irrigation District and South San Joaquin Irrigation District. These districts irrigate hundreds of thousands of acres of prime farmland and represent a cornerstone for supporting municipal water needs. Additionally, this comment letter is submitted on behalf of Stockton East Water District (Stockton East). Stockton East comprises approximately 143,000 acres, of which 103,000 acres is irrigated prime farmland and serves municipal uses of over 300,000 residents. Collectively, these Districts represent all the major water users of the Merced, Tuolumne, Stanislaus, and Calaveras rivers. In this comment letter, we address concerns with the proposed hybrid Instream Flow Incremental Methodology (IFIM) and Environmental Limits of Hydrologic Alteration (ELOHA) approach, and provide detailed explanations of these concerns.

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Current State of California

California's Central Valley is a complex water management system with many diversions that transport water statewide, and no single model can incorporate the high degree of variability between rivers in this region. The Central Valley Project, an area of California that stretches between the Cascades Mountains in the north and Kern River in the south, has 20 dams and reservoirs, 11 hydropower plants, and 500 miles of diversions (USBR 2008). Management of the Central Valley's water supply is not any easy task considering the numerous interested parties, and the balancing of public trust resources and beneficial uses. Over the past 30 years, however, IFIM applications alone have been instrumental in the development of a scientifically sound framework to maximize returns of target species within the limits of public trust resources and beneficial uses.

Overview and General Background

The State Water Board is currently beginning Phase 4: The development and implementation of policies for water quality control, including the development of flow criteria and flow objectives for priority tributaries to the Bay-Delta, with a focus on the Sacramento watershed. In a document dated July 2013, the SWRCB requested the Delta Science Program review at least two methods for developing flow criteria. The SWRCB stated that methods needed to be cost-effective, able to be implemented in a timely fashion, scientifically defensible, and applicable to the bulk of each tributary's watershed (SWRCB 2013). While the SWRCB did not limit the maximum number of methods to be reviewed, it only suggested two methods: IFIM and ELOHA. In response to the SWRCB's request, the Delta Science Program provided a written review to the SWRCB on February 2014, which analyzed the two suggested methods and recommended adoption of a hybrid IFIM-ELOHA approach to develop flow criteria for priority tributaries (Dahm et al. 2014).

On March 19, 2014, at the SWRCB workshop, several representatives from interested parties including FISHBIO (Mr. Douglas Demko) and the Delta Science Program (Clifford Dahm, Ph.D.) provided comments and summaries of relevant material to establishing instream flow criteria. Clifford Dahm, Ph.D., provided an outline of his review of IFIM and ELOHA and recommended the SWRCB adopt a hybrid of the two methods. Dr. Dahm provided seven recommendations to the SWRCB (Dahm et al. 2014):

1. Stream and river classification based on geomorphic, hydrologic, geographic, and/or faunal characteristics;
2. Hydrologic analyses that separate the hydrograph into flow regimes (blocks) and examine historical changes;
3. Assessment of whether any site-specific field work is required in the catchment or river reach to address specific information gaps;
4. Extrapolation of understanding of flow-ecology relationships from other sites to the study catchment or segment;
5. Production of an environmental flow regime that meets the needs of species and ecosystem processes in the system;

6. Assuring clear and transparent dialogue and interaction between scientists and stakeholders; and
7. Designing an effective adaptive management protocol with robust implementation measurements to support the decision-making process.

Because the hybrid recommendation and the seven steps do not provide specific details regarding which components of the IFIM and ELOHA approaches would be used in the hybrid, it is difficult to provide a detailed critique. However, in an effort to guide further development of the approach, we provide the following comments:

IFIM and ELOHA Comparison

The IFIM is a decision-making framework designed to evaluate the effects of flow alteration, and has a long history of success in establishing flow criteria and objectives. Developed by the United States Fish and Wildlife Service (USFWS) in the late 1970s, it has become an extremely important tool in the management of water internationally, in the Pacific Northwest, and throughout California. There have been at least 38 flow studies conducted on 23 streams throughout the Central Valley (SWRCB 2013). The IFIM begins with problem identification, scoping, and potential study design, continues with study implementation and analysis, and concludes with results interpretation, negotiations, and flow recommendations (Bovee et al. 1998). Optional elements of IFIM can include physical habitat simulation (PHABSIM) use measurements of depth, velocity, substrate, and cover for hydraulic and habitat modeling. The PHABSIM concept assumes a relationship between these variables and aquatic resources. The IFIM is comprehensive, because it can incorporate other habitat components including water quality, sediment, temperature, and other variables that may affect aquatic habitat (Geller 2010) as well as be incorporated into other models.

Because IFIM is designed to be site-specific, it is more scientifically defensible than other approaches that regionalize or extrapolate whole watersheds or regions (Dahm et al. 2014). The site-specificity of the IFIM provides a better understanding of river and facilitates management dependent on the target species, public trust resources, and other beneficial uses.

The ELOHA has a structure similar to the IFIM, and it also relies on the premise that there are predictable flow and ecological response relationships. However, ELOHA is a regional, not a site-specific approach to aquatic resource protection recommendations. The ELOHA method was developed quite recently through a collaboration of multiple scientists (Poff et al. 2010). There are four key concepts that comprise this method: hydrologic foundation, classification of rivers, determining degree of flow alteration, and developing flow-ecology relationships. The ELOHA method attempts to find relationships between ecological variables of interest (e.g., fish species diversity, aquatic vegetation) and various flow metrics.

We evaluated approximately 20 ELOHA method studies; unfortunately, most of the studies only used parts of the ELOHA method or were still in the early stages of

implementation. Both Davies et al. (2013) and McManamay et al. (2013) express the need for testable hypotheses, and Arthington et al. (2006) expresses the need for long-term studies to evaluate any incorporated flow-ecological relationships. Only two ELOHA studies tested the applicability and efficacy of the entire ELOHA framework. Both studies (Arthington et al. 2012; McManamay et al. 2013) indicated that while some of the ELOHA process was successful, the ELOHA framework failed when applying flow-ecology relationships to rivers that were similarly grouped. Additionally, Arthington et al. (2012) determined that each dam altered downstream flow regime and behaved differently even when the watershed was assigned to the same hydrologic category. California has numerous dams and diversions and would likely have the same result from Arthington et al. 2012 study. Additionally, Poff, one of the founders of the ELOHA method, expressed that there was variability in the flow-ecology relationships (Poff et al. 2010: Poff and Zimmerman 2010). To the extent flow-ecology relationships cannot be applied to similarly classified rivers or waterways with consistency, the ELOHA method has serious and potentially fatal limitations.

Critique of IFIM-ELOHA Hybrid

Both the IFIM and ELOHA depend heavily on the formation of stakeholder groups that guide all elements of their implementation, not only what is studied, but how those studies are combined to develop recommendations. The recommended hybrid approach does not contain a process for the creation nor the composition of such critical stakeholder groups. Within both the IFIM framework and the ELOHA framework, creation and collaboration within a technical group is a foundational tenant of the process. A collaborative workgroup represents all interests ranging from water management and power generation to recreational, fisheries, and agriculture. Ensuring that this type of group is able to function in a manner that best reflects the priority of interests and key areas to maintain and protect is integral. Providing sufficient technical representatives to inform and guide any process, especially a relatively new framework such as ELOHA will be critical. The foundational process of developing the participation and collaboration requires time and resource investment.

The seven-step approach does not provide the necessary detail to establish flow criteria, and the framework does not meet the four goals of the SWRCB. The panel recommended a seven-step conceptual framework for the implementation of the proposed IFIM-ELOHA hybrid approach. However, the lack of detail provided by the panel raises many concerns. The failure to include more detail limits progress toward establishing flow criteria, the ultimate goal of Phase 4.

The hybrid approach has not previously been used or recommended. For this reason, defining and developing this approach will require time and resources investment. Further, because the approach is based on flow-ecology relationships, it is likely to be contentious, and uncertain efficacy applied over a larger geographical area. These relationships have been shown to be weak and have not yet been developed rigorously in California. Each step proposed in the panel recommendations (Dahm et al. 2014) is

addressed below, and we provide a critique on each step including how it fails to meet the SWRCB goals and the concerns related to each step.

The panel's recommendation for Step 1 (stream segment classification) lacks the necessary details on stream classification for the implementation of this hybridized method. Instead of providing detail, the panel simply provides descriptions of both the Montgomery and Buffington (1997) and Rosgen (1994) stream classification systems. Dahm et al. (2014) stated that the Montgomery and Buffington (1997) classification scheme could be easily adapted into this classification step; however, the panel does not provide any detail on how it could be adapted. This step could potentially be data intensive, and would likely result in the finding of few to no group classifications (i.e., there may be no discernible differences in groups or all rivers may be so unique that there is no grouping). The complexity amongst numerous different streams suggests that this not a simple process.

The panel's recommendation for Step 2 (hydrologic analysis) lacks the necessary details to conduct hydrologic analysis for the implementation of this hybridized method, advocates for unspecified flow-ecology relationships (some of which have been proven to be variable and unreliable), and proposes full rather than limited flow ranges be considered despite the goal of timeliness and cost effectiveness. The panel states that the ELOHA method will be used for the basis of the hydrologic analysis; however, the panel fails to provide additional information on hydrological modeling. The panel states the SWRCB should consider multiple species, but does not provide a mechanism by which to prioritize target flow-ecology relationships. Additionally, Arthington et al. (2012) and McManamay et al. (2013) showed that their flow-ecology relationships were not applicable across wider geographical areas, which is a core concept of both the hybrid and ELOHA method. The panel states a full range of flows should be considered. The panel is correct, however, this comprehensive analysis is not consistent with the SWRCB goals of timely and cost-effective implementation, because it would require additional modeling time to determine flow-ecology responses to a larger suite of flow alteration, and may seriously conflict with existing uses of water. Results from hydrologic analysis may provide little insight into classifying these streams, because there may be little to no discernible differences between groups or rivers may be so unique that grouping fails. Without the ability to group streams, there is not a means of extrapolating results from one system to another and therefore, no benefit to creating efficiencies for time or cost.

The panel's recommendation for Step 3 (site specific field work) states that the proposed method's regionalized approach will save time and money; however, their proposition will likely require equal or more time and money than site-specific field studies that may be conducted under the IFIM. The panel stated that the Pennsylvania and Maryland Method (PMM) required considerable data collection (Dahm et al. 2014). PMM that have been completed included the collection of site-specific data from each studied stream. While the SWRCB stated there was not sufficient "resources or time to conduct site-specific studies without a regional approach" (Dahm et al. 2014), the panel

recommended that additional studies would likely be required on multiple aspects of flow, species, and assemblages; all of which require additional money and time. The panel also suggested use of co-locating studies (i.e. using previously established fish and aquatic sampling sites and flow transects). Co-location may not be practical in certain systems because of river channel change over time.

The panel's recommendation for Step 4 (extrapolation) will not result in viable flow criteria, because extrapolation is based on unreliable or unknown flow-ecology relationships. Dahm et al. (2014) specifically warn that extrapolation is limited to general processes and warns that specific target flow metrics should be extrapolated to larger areas. While the panel was charged to find a methodology that could save time and money by extrapolating results from a subset of rivers to a larger whole, the complexity of the Central Valley's waterways does not lend itself to this method. Both Arthington et al. (2012) and McManamay et al. (2013) showed that extrapolating their flow-ecology relationships to a larger set did not provide consistent results. Furthermore, Arthington et al. (2012) revealed that the degree of downstream change might be influenced by other factors including dimensions of the dam and management. It is likely that California's dams will not allow flow-ecology relationships to predict responses of the ecosystem to flow alteration when extrapolated to other rivers. Dahm et al. (2014) also noted extrapolations are further limited to general applications and should not be applied to developing specific targets or numbers. Without providing actual and specific flow requirements to dam operations and managers, "extrapolating processes" does little to guide water management.

The panel's recommendation for Step 5 (production of an environmental flow regime) states the annual hydrograph should be divided into blocks to better address a species lifestages and associated life history; however, the panel does not provide detailed information on how this will be done. The panel's lack of detailed information on how life history and important flow-ecology relationships will be developed and how the hydrograph will be divided further emphasizes the inability of this proposed hybrid approach to be easily implemented to reduce time and money. While there is extensive information on some California species (e.g., Chinook salmon), investigating these relationships for all life stages of multiple species for specific reference streams may be cost and time prohibitive, especially if there are multiple classes of rivers from Step 1.

The panel's recommendation for Step 6 (interaction between scientists and stakeholders) does not adhere with the SWRCB's goals because collaboration, while an effective tool, is time and cost intensive. While collaboration can be a powerful tool and it allows many interested parties to be represented, it can be challenging and contentious, and results are often unpredictable. Collaboration in the FERC process is the primary cause for long, drawn out, processes and has resulted in rigorous regulatory guidelines such as those in the Integrated Licensing Process. The authors indicate that collaboration would ideally start at the earliest stages (Dahm et al. 2014); however, the suggested collaboration at multiple steps will likely result in much more time and money

than expected from using this hybrid method, especially with such a contentious subject as flow criteria. The panel has also neglected to define the framework under which collaboration would occur and this, by itself, will require substantial time and money.

The panel's recommendation for Step 7 (an adaptive management protocol) lacks the necessary detail to differentiate it from the collaborative interactions between scientists and stakeholders. The panel does not provide details of how adaptive management will fit within the context of the 2013 Delta Plan. It appears from the panel recommendation (Dahm et al. 2014) that Step 7 will mimic the adaptive management protocol; however, as stated by the National Research Council (2011), this process is not easy, timely, or cost-effective.

Conclusions

The panel's recommended hybrid approach does not provide sufficient information to analyze whether this approach will be scientifically defensible, timely, or cost-effective. The panel recommendations from the Delta Science Board indicate that they suggest use of flow-ecology relationships; however, studies such as Arthington et al. (2013) and McManamay et al. (2013) show that their relationships did not hold up when applied to similarly classified rivers. If this hybrid approach oversimplifies the concept of the driving forces of a stream and its ecosystem, it could have disastrous results. Arthington et al. (2006) stated that over simplified methods could result in dewatering of some streams during low-runoff. **Currently, use of the many IFIM applications conducted on individual rivers allows management to specify protective flows for many species within each specific river.** While classifying rivers based on their physical characteristics can be a scientifically sound process, it would be irresponsible to disregard anthropogenic influences such as land use, requirements to fulfill public trust resources and beneficial uses, and the variability in dam releases required to meet such needs. Davies et al. (2013) indicated that land use could highly affect river function, and other variables unrelated to flow play important roles in a river's function (McManamay et al. 2013). In previous workshops, FISHBIO has stated that predation is a primary driver of juvenile survival in the San Joaquin watershed, and predation by striped bass and other piscivorous fishes may have a large impact on juvenile outmigration. During the March 19, 2014 workshop, Dahm stated that, "restoration of native functionality may have no effect on rivers where non-native species dominate the system."

Given the large amount of uncertainty and the deficiency of information provided to alleviate these uncertainties, we urge that the SWRCB take a more measured pathway forward. Addressing informational voids regarding the highlighted points from our review, reconsidering the real financial and time requirements of what's proposed, and providing a new assessment with these clarifications, would greatly improve the current landscape of this proposed framework.

Thank you for your time and consideration in this matter. If you have any questions, please feel free to contact us.

Sincerely,

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References

Arthington, A.H., Bunn, S.E., Poff, N.L, and R.J. Naiman. 2006. The challenge of providing environmental flow rules to sustain river ecosystems. Ecological Applications 16(4):1311-1318.

Arthington, A.H., Mackay, S.J., James, C.S., Rolls, R.J., Sternberg, D., Barnes, A., and S.J. Capon. 2012. Ecological limits of hydrological alteration: a test of the ELOHA framework in south-east Queensland. Waterlines Report Series No. 75, March 2012. Canberra, Australia.

Bovee, K.D., Lamb, B.L., Bartholow, J.M., Stalnaker, C.B., Taylor, J., and J. Henriksen. 1998. Stream habitat analysis using the Instream Flow Incremental Methodology. Information and Technology Report USGS/BRD/ITR-1998-0004. Fort Collins, CO. United States Geological Survey.

Dahm, C., Winemiller, K., Kelly, M., and S. Yarnell. 2014. Recommendations for determining regional instream flow criteria for priority tributaries to the Sacramento-San Joaquin Delta. A report to the California State Water Resources Control Board. Retrieved from http://deltacouncil.ca.gov/docs/2013-11-15/potential-methods-develop-flow-criteria.

Davies, P.M., Naiman, R.J., Warfe, D.M., Pettit, N.E., Arthington, A.H., and S.E. Bunn. 2013. Flow-ecology relationships: closing the loop on effective environmental flows. Marine and Freshwater Research.

Geller, L. 2010. Frequently asked questions on IFIM: an overview of the Instream Flow Incremental Methodology. Publication Number Q-WR-95-104. Department of Ecology, State of Washington.

McManamay, R.A., Orth, D.J., Dolloff, C.A., and D.C. Mathews. 2013. Application of the ELOHA framework to regulated rivers in the Upper Tennessee River Basin: a case study. Environmental Management 51:1210-1235.

Montgomery, D.R., and J.M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. Geological Society of America Bulletin 109:596-611.

NRC [National Research Council]. 2011. A review of the use of science and adaptive management in California's Draft Bay Delta Conservation Plan. Washington, DC: National Academies Press.

Poff, N.L., Richter, B.D., Arthington, A.H., Bunn, S.E., Naiman, R.J., Kendy, E., …. and A. Warner. 2010. The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards. Freshwater Biology 55(1):147-170.

Poff, N.L., and J.K.H. Zimmerman. 2010. Ecological responses to altered flow regimes: a literature review to inform the science and management of environmental flows. Freshwater Biology 55(1):194-205.

Rosgen, D.L. 1994. A classification of natural rivers. Catena 22:169-199.

SWRCB [California State Water Resources Control Board]. 2013. Potential methods to develop flow criteria for priority tributaries to the Sacramento-San Joaquin Delta. Retrieved from http://deltacouncil.ca.gov/docs/2013-11-15/potential-methods-develop-flow-criteria.

USBR [United States Bureau of Reclamation]. 2008. Water supply and water yield. Bureau of Reclamation – Mid Pacific Region, United States Department of the Interior. Retrieved from: http://www.usbr.gov/mp/cvp/docs/Water%20Supply%20and%20Yield%20Study.pdf.