Coalition for a Sustainable Delta

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VIA E-MAIL

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To whom it may concern:

The Coalition for a Sustainable Delta is a California nonprofit corporation comprised of agricultural, municipal, and industrial water users, as well as individual citizens in the San Joaquin Valley. Coalition members depend on water from the Sacramento-San Joaquin Delta (Delta) for their continued livelihood, and individual Coalition members frequently use the Delta for environmental, aesthetic, and recreational purposes. The Coalition has been materially involved in research, regulatory activities, and court actions for the purpose of advancing its interests in a sustainable Delta capable of supporting native fishes and providing adequate water supplies for water users in the San Joaquin Valley. The Coalition appreciates the opportunity to offer comments on the Draft IEP MAST Report (Draft Report).

The comments below from the Coalition were prepared by the following individuals:

- Dennis Murphy, University of Nevada, Reno
- Melissa Poole, Coalition for a Sustainable Delta
- Paul Weiland, Nossaman LLP

It is apparent that the Draft Report, which spans more than 110 pages and includes more than 25 pages of citations and 50 pages of tables and figures, is the product of considerable effort by the Management, Analysis, and Synthesis Team. At the same time, we are cognizant that the Draft Report is acknowledged to be an incomplete document at this stage; the authors are afforded the ability to make changes to the document before it is finalized in late 2013.

Report Purpose

The MAST Report includes the following statement of purpose:

> *The MAST report is a technical report intended to synthesize the latest scientific data and information on a topic of particularly high relevance to agency managers and decision makers. The topic of the 2013 MAST report is an assessment of delta smelt responses to recent changes in habitat conditions due to hydrology and management actions.*

As the Second Draft Delta Science Plan (Delta Science Program 2013, p.31) indicates, there is a critical need to synthesize available data, analyses, and findings in order to improve conservation planning for delta smelt and other native, at-risk fish in the Delta. That said, it is unclear why the stated purpose is limited to "an assessment of delta smelt responses to recent changes in habitat conditions due to hydrology and management actions." In fact, it appears that this stated purpose is inconsistent with the content of the Draft Report, which addresses changes in habitat conditions due to factors other than hydrology and management actions, such as contaminants. It also addresses changes in habitat conditions, some of which have attenuated and/or uncertain relationships with hydrology and management actions, including predation and algal blooms. For this reason, we believe it is necessary to revise the statement of purpose in order to align it with the content of the Draft Report.

More importantly, we contend that substantial changes to the Draft Report are necessary to fulfill the intended purpose of synthesizing the latest scientific data and information regarding population-level delta smelt responses to changes in habitat conditions. The Draft Report is characterized by the lengthy and uncritical presentation of information -- some of that information from reliable and pertinent published empirical research, some from published material that is demonstrably incorrect, some from previous reports that never received critical evaluation, and some drawn from an unsubstantiated collection of assertions about delta smelt and its habitat. The central challenge that the MAST has taken on by committing to synthesize the latest scientific data and information is the need to integrate data, anaylses, and findings from a wide array of sources and of varying quality into a coherent whole (Delta Science Program 2013). This can only be accomplished through critical assessment of data, analyses, and findings:

> *[I]t is imperative to assess critically the quality and applicability of existing data and analyses (both by assessing discrete data sets, analyses, and findings themselves and by assessing synthetic data and analyses pertaining, for example, to the effects of predation on the abundance of a targeted species), as well as associated findings, and to acknowledge uncertainties and present confidence intervals around findings that are made. The publication of data and analyses on a targeted species and its habitat in scientific journals does not mean that such information is necessarily applicable in conservation planning—and a lack of publication of such data and analyses does not mean that that information is not applicable. Critical assessment of the appropriateness of the underlying data sets and the methods or tools used to analyze those data sets must be carried out through an independent and rigorous process.*

(Murphy and Weiland 2011). Whereas we support the idea of developing a report that synthesizes data and information by critically assessing and integrating available data, analyses, and findings, the Draft Report fails to do so. Instead, it includes limited critical analysis of available data, analyses, and findings (for example, foregoing critical assessment of the findings set out in Castillo et al. 2012, lines 1124-27, and Sommer et al. 2011, lines 906-11) and a multitude of unsupported assertions (for just two examples, lines 898-99, 916-18).

Conceptual Model

The Draft Report is entitled "An updated conceptual model for delta smelt: our evolving understanding of an estuarine fish," which we contend is a misnomer in light of the apparent purpose of the document. The Draft Report does include a conceptual model for delta smelt, and we applaud the MAST for its responsiveness to the admonition of the Delta Science Program Review Panel that it is essential to develop a schematic version of the conceptual model (Reed et al. 2012).

That stated, the form and function of a conceptual model takes more than just a cue from its anticipated application. Its structure and informational substance is defined by its intended uses. There are several immediate needs for a delta smelt conceptual model.

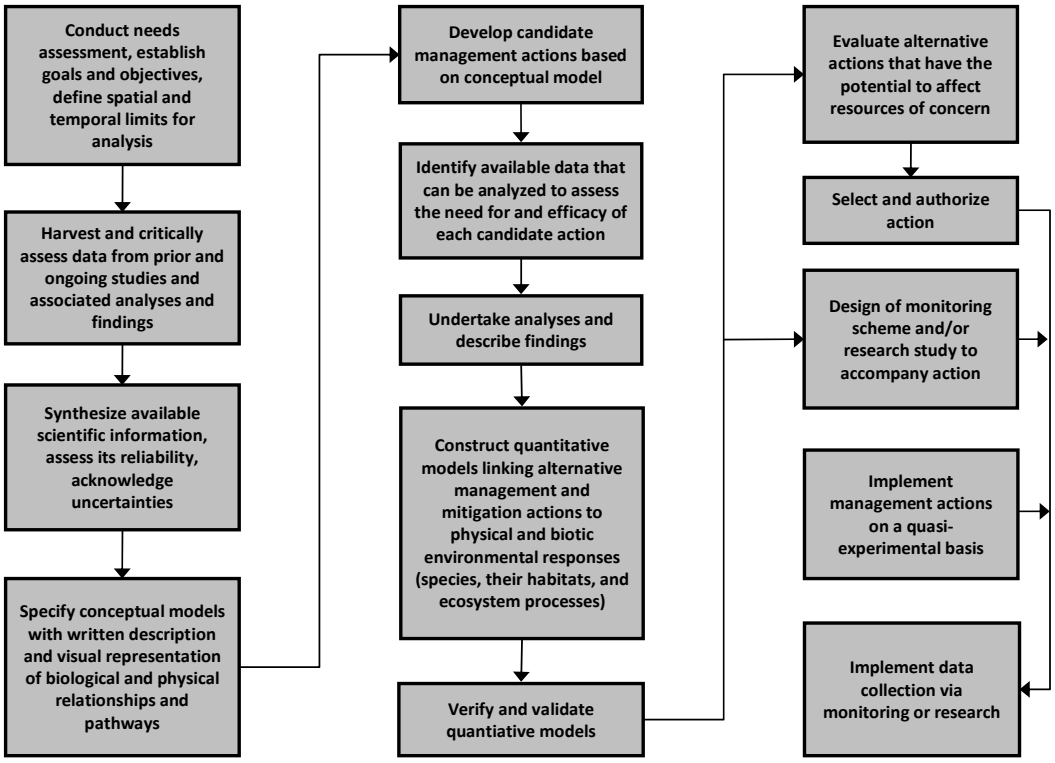

Figure – *The process-steps required to develop a management action intended to protect a target species -- here the delta smelt. Source: Murphy and Weiland,* Adaptive Management and the Future of Science in the Sacramento-San Joaquin Delta, *in review.*

One is the planning effort for adaptive management of the so-called "fall X2 action" targeting delta smelt; it has been required by law for nearly five years, and is being reconsidered under a focused "remand" process. The steps required to inform an effective fall X2 adaptive management action (or actions) include "quantitative modeling of delta smelt responses to varying habitat conditions" and "identifying key 'indicator' variables that can be used to track and predict the status of delta smelt and its habitat" (Draft Report, lines 445, 449-50). In fact, the Draft Report might be interpreted as intending to be the go-to source for the information required in each of the boxes in column one of the figure below, which describes the necessary steps in selecting candidate fall-X2 management actions and modeling likely implementation scenarios (column two). But, the lack of salient information in the conceptual model(s) leaves conservation planners on their own to answer the most fundamental questions that accompany implementation of a fall-X2 action, for example, what are the boundaries of the distribution of delta smelt and the maximum extent of delta smelt habitat in the San Francisco estuary, what is the extent of inter-annual and infra-seasonal variation in the distribution of delta smelt and its habitat, and can the location of X2 or areal extent of the low-salinity zone be used as a surrogate (or proxy) measure of the extent of delta smelt habitat? But the report does not include an objective appraisal of any of these questions; instead it states that the low salinity zone is a valid surrogate for delta smelt habitat by asserting that "[m]ost delta smelt complete the majority of their life cycle in the low salinity zone…" (Draft Report, lines 356-57). A preponderance of evidence shows that to be untrue.

Conceptual ecological models document an understanding of how complex ecological systems function. They are frequently employed to describe in graphical and/or narrative form the essential ecological attributes of a species of conservation concern and the ecological-system components and linkages that support them. Conceptual models allow inferences about how a species and the ecosystems in which it is embedded "work" – thus they constitute an essential first step in efforts to manage a species and its habitats. Conceptual models help to clarify our verbal descriptions of what we have observed in nature, enabling us to visualize and think about ecological interactions between species and their habitats that we might otherwise ignore. The construction of conceptual models forces one to organize empirical information in ways that facilitate the next steps in the development of alterative management actions around which a management program will be established and then implemented adaptively. To that end a conceptual model is not complete as a list of environmental factors that affect a target species, or when such a list is arranged hierarchically with graphically portrayed linkages. A conceptual model is all that, and it clearly identifies the factor or factors that are believed to limit the distribution and abundance of the targeted species, and it explicitly indicates how those limiting factors might be eliminated, controlled, or mitigated via available candidate management actions.

In developing conceptual models, it is expected that the experts involved will have access to all pertinent information regarding the species, including observations, data, analyses, models, reports, and published material, and will consider it all, drawing from it the "best available scientific" information. The authors of the Draft Report should be expected to serve the conservation efforts described in the document (lines 443-51) by identifying reliable knowledge that can be used to inform the conceptual model and can be used directly in predicting of the

effects of candidate management actions being considered, and, ultimately, can be used in developing the adaptive management approaches, including the design of monitoring schema.

To ensure that a conceptual model contributes to the identification of the environmental factors that actually need to be targeted by resource managers (and subsequently measured in a well-designed monitoring scheme), "an assessment of delta smelt responses to recent changes in habitat conditions due to hydrology and management actions" will not suffice. To have any relevance to resource managers the conceptual model must be set in the broader context of historical and contemporary environmental changes and must consider all environmental stressors that conceivably may have direct or indirect effects on delta smelt. The model should be structured to incorporate explicitly the full breadth environmental factors that are affected by ongoing resource management and illustrate how those management activities impact target species and their habitats – that requires that the distribution of the target species and its densities across the occupied landscape be considered. Formulating conceptual models in spatial and temporal context, allows conservation planners to rank the importance of different environmental attributes in determining the status of the target species and the habitats that support it.

A conceptual model that focuses on a listed species should clearly identify key system elements, including the species, the structure of the ecosystem that supports it, and linkages between the species and other biotic and physical elements in the system. The model needs to describe how the system is or may be impacted by environmental stressors (disturbances, perturbations) from both natural and human-generated sources, and how management can intervene to reverse undesirable conditions or trends. Whatever the form of the conceptual ecological model, its purpose is to convey reliable knowledge about the species of concern, the ecological community in which it is embedded, and the ecosystem factors or processes that support it or put it at risk. To convey reliable knowledge most effectively, the authors of the conceptual model should anticipate that it must serve as the template for a quantitative (or operational) model.

Converting a conceptual model into an operational model requires quantification of species responses to (varying) environmental conditions; in so doing, the effort parameterizes elements of the conceptual models to facilitate an analysis of the effects of water project operations and mitigation activities on the listed species. That quantification process allows for a population viability analysis, or some demographic modeling equivalent, to be carried out in order to model the potential impacts of hydrological operations on delta smelt and evaluate the relative effectiveness of alternative management actions, including restoration efforts.

Invoking hypotheses

The Draft Report apparently takes guidance from a review panel's observations, which were translated into direction in a "report process" memo (dated July, 2013) -- "conceptual models and hypotheses should be evaluated through analysis of the available data." The review panel actually stated that the conceptual model "should be designed for routine use by scientists as an organizational tool and for testing hypotheses associated with the AMP" (Draft Report, lines 459-60, quoting Reed et al. 2012). Presumably the panel and report memo invoke hypotheses in recognition that hypothesis testing is universally recognized as the effective and efficient means

of generating reliable knowledge. Invoking hypothesis testing in resolving key uncertainties that limit our ability to produce an effective conservation strategy for delta smelt is both refreshing and laudable.

But the Draft Report does not describe any effort by the MAST to actually test (and seek to falsify) hypotheses; nor does the Draft Report re-purpose available information in a hypothetico-deductive framework as a means of getting to reliable knowledge upon which management can be based. The beneficial effects of hypotheses don't accrue from taking straightforward questions, framing them as statements of fact, then setting out narrative observations intended to support or refute the hypotheses. When outside experts suggest that the MAST report consider hypotheses, they are not asking the authors to frame rhetorical questions as hypotheses, say, to serve as a prompt for the report to offer up information on the use of food resources by delta smelt – "juvenile delta smelt growth and survival is affected by food availability" (Draft Report, line 2365). The invocation of hypotheses in developing conceptual models is for a completely different purpose. A conceptual model pre-considers (anticipates) the hypotheses that must be confronted with data in order to identify an effective management action or regime. One constructs the conceptual model to provide the information for that application. Hypotheses advance understanding when brought to bear in sequential tests in a structured framework where observations, data, and analyses are used to winnow out weaker explanations for phenomena of concern to resource managers; and, under the duress of a collapsing Delta ecosystem, the only defensible hypotheses for the Draft Report to engage are management hypotheses.

The importance of confronting well-framed hypotheses in sequence with the best available information becomes clear when one attempts to confront the issue of entrainment (a stated objective of the Draft Report) and identify the appropriate actions necessary to reduce losses of delta smelt. The hypothesis sequence requires that the distribution of delta smelt and its densities across that distribution be established for each of its life stages. We contend that the Draft Report should, at least, present these hypotheses – (1) delta smelt are entrained in the winter at the south Delta water facilities, (2) delta smelt that are entrained at the water export facilities are part of a single population (demographic unit), or are part of a distinct south Delta population, (3) delta smelt are entrained at the water export facilities in the winter at levels (in numbers) that could cause or contribute to its extinction by causing short- or longer-term demographic perturbation or affecting N(e) and resulting in reductions in allelic diversity in the population, and (4) losses of delta smelt from entrainment in the winter can be reduced to levels that will not cause or contribute to the extinction of delta smelt by manipulating export flow levels.

Getting the "science" right

As we stated previously, the Draft Report could prove valuable if it provides a rigorous synthesis of data, analyses, and findings regarding population-level delta smelt responses to changes in habitat conditions. To do so, it must necessarily draws correct and pertinent information from published work or reports, and integrate that information. But the Draft Report is characterized by recurring problems in the critical assessment and translation of data, analyses, and findings from the scientific literature into management-friendly guidance include (1) incomplete presentation of available information, which can lead to conclusions that would not be drawn if

the complete information base had been considered, (2) misinterpretation and/or misrepresentation of analyses or findings drawn from analyses in published studies, (3) a more emphatic conclusion from published findings than may be justified after explicit consideration of uncertainties and study limitations that attend those findings, (4) mistaken presumption that conclusions presented as part of an empirical study are scientifically valid if (or on the basis that) the study appears in a peer-reviewed, "scientific" journal, and (5) an assumption that conclusions are more robust and defensible when the quantity of data, extent of analyses, or number references are greater. In our view, the MAST has substantial work ahead of it if it intends to avoid the problems set out here. This is only complicated by the composition of the MAST and the fact that many members of the team are also authors of work cited, but not critically assessed, in the Draft Report. It is unreasonable to expect agency scientists to judge the quality of their own work (Meffe et al. 1998), but that it precisely what the Draft Report purports to do.

Specific statements for reconsideration

Below we identify a number of specific statements and assertions in the Draft Report that run afoul of one or more of the problems set out above and should be edited or deleted from the next draft.

Page 18 (start line 403)-- Long-term IEP surveys reveal that the abundance of delta smelt has greatly declined since the first long-term pelagic fish monitoring survey began in 1959. *The IEP surveys show great variation and long-term declines in index values. The same survey-design shortcomings that are recognized in the report compromise translation of the survey index values to abundances.*

Page 20 (452)-- Fall outflow management is currently the only active adaptive management aimed primarily at benefiting delta smelt while also protecting water supply. *The fall outflow action is not intended to protect the water supply. Furthemore, the Bureau has not adopted or implemented a defensible adaptive management plan that targets delta smelt.*

Page 31 (695)– the period 2003-present… reflects the consistently low level of delta smelt in recent years and a useful baseline for identifying years with improved delta smelt abundance indices, which would indicate improved environmental conditions for delta smelt. *The absence of sampling design and survey for fish across salient environmental gradients makes this statement untrue.*

Page 39 (863) – The intent of using X2 as an index was to develop an easily measured, policy-relevant indicator with ecological significance for multiple species and processes (Jassby et al. 1995). *The strength of the analytical presentation in Jassby et al. warrants notice, but the original paper misuses the term" indicator" and does not establish X2 (through quantitative validation) as an indicator of any ecological attribute of the estuary.*

Page 39 (868) – The size and location of the LSZ is a key factor determining the quantity and quality of low salinity rearing habitat available to delta smelt and other estuarine species. *No data exist to support this assertion. The presence of delta smelt in the western portions of Suisun*

Bay even at elevated X2 values and in Cache Slough even at the lowest contemporary values indicates that delta smelt are not tracking the location of the low salinity zone. The mean position of the LSZ is not a proxy for habitat extent and quality for delta smelt.

Page 41 (907) – In the winter, adult delta smelt move upsteam into fresh water for spawning. In the spring and summer, young delta smelt are transported or swim downstream into the LSZ. *Delta smelt distribution data are not consistent with the assertion that delta smelt migrate "upstream," that is, into eastern portions of the Delta, to spawn.*

Page 41 (921) – POD and FLaSH studies focus on the processes that link physics, chemistry, and biology in the LSZ and its habitat value for delta smelt and other native and non-native species. *Those studies are exploring a number physical and biotic attributes of the Delta, but no data are being gathered that will allow an assessment of "habitat value" for delta smelt – an effort that requires delta smelt fitness be determined across salient environmental gradients, which requires fish surveys resolved well beyond those carried out to date or contemplated.*

Page 42 (925) – Turbidity is not a habitat attribute in the sense we use in this report because we do not show delta smelt outcomes directly resulting from responses to turbidity. *The report does not show "outcomes directly resulting" from any physical or biotic variables in the Delta.*

Page 50 (1113) – Kimmerer (2008) calculated that from near 0% to 50% of the adult smelt population can be entrained at the CVP and SWP during periods of high exports. *Considering the assumptions and biases in the Kimmerer modeling exercise, the range presented is tantamount to a blind guess. Given the known distribution of delta smelt in the estuary -- a very small fraction of the population exists within the influence of the export pumps – any value even remotely approaching the upper limit of that range is indefensible.*

Page 50 (1116) – a number of modeling efforts show that high entrainment losses can adversely affect subsequent smelt generations. *Any loss of individual delta smelt at the pumps can potentially adversely affect subsequent generations; no empirically legitimate modeling outcome supports the assertion that levels of loss are having or have in the past had population level effects.*

Page 51 (1142) – Delta smelt are most vulnerable to entrainment when, as adults, they migrate from brackish water into fresh water, or as larvae, when they move from fresh water into brackish water. *The former does not seem to occur. Some survey data suggest that young delta smelt may spread out across the Delta, hence may be vulnerable to entrainment before settling into a rearing distribution across the north and central Delta, where they have virtually no vulnerability.*

Page 52 (1162) – Until recently it was thought… *Moyle et al. (1992) point to "the shallow productive waters of Suisun Bay," but do not invoke an upstream-downstream migration phenomenon.*

Page 52 (1167) – …the timing and extent of downstream movement by young delta smelt is more variable than previously thought. *Young delta smelt do not undertake "downstream movement" per se.*

Page 68 (1520) – Natural selection appeared to favor individuals with a specific set of characters, including relatively slow larval development, but faster than average juvenile growth in July. *That is not a statement based on any data.*

Page 69 (1541) – The importance of food resources as a driver is supported by Kimmerer (2008), who showed that delta smelt survival from summer to fall is correlated with biomass of copepods in the core range of delta smelt. *This statement either misinterprets or misrepresents Dr. Kimmerer's 2008 publication. Furthermore, it is worth noting that the term "core range" has no ecological meaning.*

Page 73 (1633) – In the absence of population estimates, delta smelt population biology has been explored using available abundance indices. *Sampling biases and the absence of samples taken across salient environmental gradients makes any conclusions regarding delta smelt status and trends potentially unreliable.*

Page 74 (1652)– The main utility of these indices is identifying years with relatively high or low survival for a specific late stage transition or life stage transitions with differences in annual variability. *See immediately above.*

Page 77 (1721) – While stock recovery may be possible fairly rapidly via high larval recruitment followed by good survival recovery of genetic diversity is a much slower process which is an important conservation concern (Fisch et al. 2012). *Although this assertion could be true, neither data nor analyses in the Fisch paper support the assertion.*

Page 77 (1727) -- …there may have been selection for smaller, late-spawned larvae as a result of export pumping schedules (2011). *No data, analyses, or findings support that notion.*

Page 78 (1744) – Given the unprecedented low abundance of delta smelt since 2002, serious consideration should be given to evaluation of Allee effects. *Fisch et al. (2012) provides evidence in contravention of this claim.*

Page 79 (1759) -- …the delta smelt is considered a diadromous seasonal reproductive migrant, and in the winter, many adult delta smelt move upstream into fresh water for spawning (Sommer et al. 2011). *Sommer et al. (2011) does not provide data and analyses to support the conclusions drawn in the article and uncritically reproduced in the Draft Report.*

Page 82 (1829) – The annual adult delta smelt abundance indices track the annual abundance indices of sub-adults calculated from the previous year's FMWT survey closely. *In light of the below statement, this is important to explore explicitly. The idea that the several dozen delta smelt captured each autumn (largely outside of areas that appear to provide essential habitat features and resources from the species) track (predict) the species' abundance suggests that the*

FMWT survey might be a credible census tool. As information emerges regarding sampling biases, this seems counterintuitive.

Page 93 (2080) – Even a severely depleted stock can still produce a substantial number of larvae and a rebound in the delta smelt population, albeit with lower genetic variability than before (Fisch et al. 2012). *In light of the accompanying citation, it would seem prudent to note that this has not been shown to occur in delta smelt, nor should it be expected to occur. A review of the data indicates that delta smelt are not genetically depauperate, or apparently headed there.*

Page 115 (2534) – The data generally supported the idea that the lower X2 and greater area of the LSZ would support more sub-adult delta smelt. *Available data do not support the notion that a bigger LSZ (measured in terms of surface area) encourages greater delta smelt productivity.*

Conclusion

The Draft Report should be able to meet its objectives, if it were to synthesize the available pertinent and reliable scientific information on delta smelt. But, in its current form it simply fails to differentiate unsupported suppositions from propositions supported by empirical research, and it fails to distinguish the "best available science" from the poorly differentiated collection of assumptions, assertions, and surmise that make up so much of the current narrative on delta smelt. As a result, it cannot offer useful guidance to agency managers and policy-makers facing immediate conservation decisions. We urge the MAST to make an honest appraisal of the Draft Report, and take the steps necessary to address concerns raised by the Coalition and water-user interests. We would be pleased to sit down with MAST members to discuss our comments in further detail.

Sincerely,

William D. Phillimore
Board Member

Encl.

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