October 15, 2010

Department of Fish and Game
Attn: Chad Dibble - Water Branch
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

RE: Comments on the Department of Fish and Game's September 21, 2010 Draft Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta

Dear Mr. Dibble:

On behalf of The Bay Institute and the Natural Resources Defense Council, we are writing to provide comments on the Department of Fish and Game's draft "Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta" ("Draft Report") dated September 21, 2010. In general, Section 9 of the Draft Report provides a relatively accurate summary of the importance to native species of the timing and magnitude of freshwater flows into and through the Delta. However, the Department's flow recommendations in the Draft Report are frequently inconsistent with these findings and inadequately protect public trust resources. We believe the Department's flow recommendations should be consistent with the flow recommendations developed by the State Water Resources Control Board, which were found to be based on the best available science. In addition, while the biological objectives in the report are a good starting point, they are not adequate for devising an effective adaptive management framework and do not meet the statutory requirements in section 85084.5 of the Water Code.

Therefore, we recommend that the Department revise the flow recommendations in the report as described herein and commit to a process of developing quantifiable biological objectives that can be used both as the basis for ecosystem restoration planning and in an adaptive management processes that would guide implementation of restoration actions in the Delta into the future.

On the pages that follow, we provide more detail regarding these recommendations. Please feel free to contact us at your convenience if you have any questions or concerns. Thank you for consideration of our comments.

Sincerely,

Gary Bobker
The Bay Institute

Doug Obegi
NRDC

Ian Wren
San Francisco Baykeeper

I. Section 9 of the Report Adequately Synthesizes the Scientific Basis for Freshwater Flows in the Delta

The Draft Report's summary of the scientific basis for the importance of freshwater flow in Central Valley ecosystems, including, in particular, the Sacramento-San Joaquin Delta, is relatively accurate. Our own analyses, including those submitted to the SWRCB as part of their 2010 Public Trust Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem Necessary to Protect Public Trust Resources generally support the findings described in Section 9 of CDFG's draft report. For example, a wealth of research indicates that:

- Recent Delta flows are insufficient the support native Delta fishes in habitats that now exist in the Delta;
- Water flow stabilization harms native species and encourages non-native species;
- Abundance and productivity of numerous species is related to the quantity and timing of water flows into and through the Delta (including the location of X2);
- Different species rely on the water resources of the Delta during all seasons of the year;
- Many important life history stages or processes consistently coincide with the winter-spring seasons and associated increased flows because this is the reproductive season for most native fishes and the timing of outmigration of most salmonid fishes;
- The source, quantity, quality, and timing of Central Valley tributary outflow affects the same characteristics of mainstem river flow to the Delta and interior Delta water flows. Flows in all three of these areas influence production and survival of Chinook salmon in both the San Joaquin River and Sacramento River basins.
- Some flow regimes in and through the Delta enhance certain invasive species which negatively affect native species abundance.
- Ammonia does not appear to be acutely or chronically toxic to delta smelt and other species. More research is needed on the effects of nutrients on Delta ecosystem and its foodweb. [Draft Report p.95-96].

These conclusions are also consistent with the State Water Resources Control Board's final report on Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem, and numerous state, federal, and independent scientific reviews.

We also agree that the biological goals and objectives of the former CalFed Ecosystem Restoration Program can serve as a starting point for defining future goals and objectives (Draft Report, p. 96), however, we do not believe these objectives, or those contained in the Draft Report are yet specific enough to form a robust framework for restoration of the Bay-Delta ecosystem and its watershed – objectives that are specific, measureable, and time-bound will be required both to plan for restoration and to evaluate progress toward goals for each ecosystem element (e.g. species of concern) and the larger goal of restoring the public trust.

The Draft Report's emphasis on restoration and recovery, rather than mere maintenance of the status quo, is also appropriate given the dire state of the Public Trust fisheries and the meaning of the Public Trust Doctrine.

II. The Report's Flow Recommendations are Inadequate and Inconsistent with the Report's Findings

Although the Department's major findings and emphasis on restoration of the fishery resources of the Bay-Delta are well-founded, many of the Draft Report's flow recommendations are inconsistent with these principles and overarching goals in that the best available science indicates that they would fail to protect, much less restore, each of these species. Also, while the Draft Report describes in detail some of the flow requirements of numerous species, it does not present actual flow recommendations for some of these species. Finally, among those species for which the Draft Report does develop recommended flow criteria, the period or placement of those flows is often incomplete or somewhat inaccurate. Below, we describe these major concerns.

A. Winter Spring Delta Outflows are Inadequate

Unfortunately, the best available science demonstrates that the flow recommendations in the Draft Report relating to Delta outflows in the winter and spring months:

> (1) Are inadequate to sustain and recover fish and wildlife in the Delta, in part because they wholly discount the effects of higher outflows on abundance and productivity of Delta resources, which is inconsistent with the prior findings in the Draft Report, in the State Water Resources Control Board's findings, and in the available scientific literature;
> (2) Are unclear and appear to be inadequately be linked to hydrologic variation; and
> (3) Would in many cases worsen outflow conditions as compared to recent years, which is inconsistent with the Department's findings earlier in the Draft Report that recent Delta flows are insufficient to protect fish and wildlife in the Delta.

Each of these points is discussed in detail below.

First, the winter and spring outflow recommendations in the Draft Report are inadequate to sustain and recover fish and wildlife in the Delta, and are inconsistent with the prior findings in the Draft Report, in the State Water Resources Control Board's findings, and in the available scientific literature. The Draft Report clearly identifies the importance of X2 (the position of the low salinity zone) as a habitat metric and likely driver of pelagic species abundance. In addition, we concur with the Department's finding that more westerly values of "X2" (the distance from the Golden Gate bridge to the position of the 2ppt isohaline on the bottom of the Bay), and increased Delta outflow in general, stimulate the food supply that fish and other species rely upon. Responding to the suggestion that longfin smelt populations are controlled only by prey abundance (as opposed to the multiple potential effects of increased Delta outflow), the Draft Report correctly notes:

> "There is also evidence that longfin smelt is food limited (SFWC 1 as cited in SWRCB 2010). … The spring population abundance of Eurytemora [an important longfin smelt food item] has itself been positively correlated with outflow between March and May since the introduction of Corbula (Kimmerer, 2002a). The positive correlation between Eurytemora abundance and spring outflow provides further support for a spring outflow criterion."

For a number of species (including longfin smelt, *Crangon* shrimp, American Shad, "zooplankton" etc.) the Draft Report recommends winter/spring Delta outflows sufficient to place X2 between 64km (Port Chicago/Roe Island**)** and 75km (Chipps Island). The Draft Report is unclear as to how the Department intends this flow recommendation to be implemented (see below).

The Draft Report's recommendation that winter-spring X2 be positioned within such a wide band fails to acknowledge the differences in population response or ecosystem function that would be expected across that range. As worded, the recommendation implies that positioning of X2 anywhere within the 64km-75km range will have the same effect on the relevant species. In fact, the extremely well-documented relationships between X2 position (or Delta outflow) and abundance of numerous pelagic species and their food resources is a *continuous* function where population abundance increases logarithmically as X2 shifts to the west (*see* TBI/NRDC Testimony to the SWRCB, Exhibit 2). Thus, X2 values between 64 and 75 would be expected to produce vastly different population responses among the species with known X2 (or outflow)-to-abundance relationships. To illustrate the vastly different effects of an 11km shift in winter-spring X2, Table 1 compares the expected populations of pelagic species when X2 is positioned at 75km vs. 64km from the Golden Gate.

TABLE 1: APPROXIMATE DECLINE IN EXPECTED ABUNDANCE OF SELECTED PELAGIC SPECIES RESULTING FROM A SHIFT IN X2 POSITION BETWEEN 64KM AND 75KM FROM THE GOLDEN GATE. [1]

Species/Taxon	**Change in Population expected from an 11km shift in X2**
Longfin smelt	-72%
Crangon shrimp	-40%
Starry Flounder	-50%
American Shad	-28%

The flows implied by the Draft Report's recommendations on X2 are woefully inadequate to maintain, much less restore, important populations of Public Trust species. For example, some attribute the recent decline in Public Trust fisheries to an inadequate food supply, as represented by declines in macroinvertebrates such as the shrimp, *Crangon franciscorum*. Our analysis showed that positive growth of the *Crangon* population was associated with spring outflows >28,000cfs; flows below this level were commonly associated with population declines. We presented a similar analysis of generation-to-generation population response to Delta outflows for longfin smelt and found that positive population growth became likely only when flows exceeded ~45,000cfs during Jan-Mar, ~35,000cfs during March-May. The Draft Report cites these findings [p. 85] yet, without explaining the Department's rationale, asserts that a much lower range of outflows of 11,400 to 29,200cfs would be as sufficient to protect and restore these important pelagic resources.

[1] Estimates based on significant statistical relationships between abundance and winter-spring X2 as documented in Kimmerer et al. (2009).

Although we agree with the general conclusion, that X2 represents a valuable tool for managing populations of Public Trust fisheries in the Delta, it is clear that an 11km range for X2 represents a wide-range of beneficial effects for pelagic species that respond to Delta outflow. By implying that managing outflow such that X2= 75km is as good as managing outflow so that X2=64km, the Draft Report assigns no value to outflows that would place X2 west of Chipps Island. This is not a valid conclusion and, given that flows equal to or greater than those recommended in the Draft Report have occurred a substantial amount of the time, the flow recommendation is inconsistent with CDFG's findings in Section 9, including the finding that:

> "…current Delta water flows for environmental resources are not adequate to maintain, recover, or restore the functions and processes that support native Delta fish."

(Draft Report, first page of executive summary) We recommend that the Department revise the Draft Report to reflect the continuous and high magnitude positive effect of shifting X2 to the west. Rather than choosing single specific values for outflow (or X2), the Department should consider the value of an outflow objective that tracks the supply of fresh water available in the system during any given period. The State Water Resources Control Board offered just such an approach to Delta outflows when it suggested that actual Delta outflows should track unimpaired outflows.

Additionally, the 75-64km range for winter-spring X2 suggests that there is no value to allowing fresh water flows to push X2 beyond 64km when wetter conditions prevail. In fact the well-documented statistical relationships between X2 (or Delta outflow) and pelagic species abundance reveal that this continuous, logarithmic relationship holds for the entire range of X2's measured in the modern period, including X2 values at or near 50km. There is no evidence that populations of public trust species including longfin smelt, splittail, American shad, and starry flounder and their food supply (e.g. *Crangon* shrimp) decline or remain unchanged as X2 moves west of 64km – indeed, study after study demonstrates logarithmic improvement in these resources as X2 shifts west of Port Chicago/Roe Island (*see* TBI/NRDC Testimony to the SWRCB, Exhibit 2) thus, a lower X2 (higher outflow) limit to the Department's Delta outflow recommendation seems ecologically unwarranted and scientifically indefensible.

We recognize that flows which place X2 west of 64km often result from runoff events that are currently "uncontrollable" (i.e. heavy snowpacks that produce flood events which are not substantially contained or diverted by the current hydrosystem infrastructure). However, these massive run-off events may be targeted by future efforts to develop water supplies. New diversions (such as those contemplated by the BDCP) combined with new, off-river storage facilities may well allow humans to capture and store periodic floodwaters and thus impact X2's in years where it would be west of 64km. *Thus, the upper limit on outflow reflected by the 64km X2 threshhold is arbitrary and should be removed from the Draft Report's recommendations. Instead, the Department should recommend higher outflows in wetter conditions, consistent with hydrologic variability and in order to improve flow conditions as compared to recent years (see below).*

Second, the Department's intentions regarding implementation of the outflow recommendations are unclear and appear to inadequately be linked to hydrologic variation. The Draft Report does not indicate how its X2 criteria are to be implemented or evaluated within years. Does an "average" X2 of 64-75km refer to a 14-day running average, monthly average, or on average over a 6 month period? The latter would allow for X2 to move substantially east of 75km for long periods of time (even months) during the winter-spring period as long as it was east of 75Km some of the time; such within-year variations could eliminate any of the intended positive effect of shifting X2 to the east, as recommended by the Draft Report. Another, equally damaging, interpretation of the Draft Report's Delta outflow recommendation is that X2 must remain between 64-75km every day during the winter and spring. This would contradict the Department's important finding that: "[w]ater flow stabilization harms native species and encourages non-native species" [p. 95]; and the stated objective that flow criteria should reflect the natural hydrograph, [p.102]. *We recommend that the Department define the averaging period for its X2 recommendation and construct the recommendation in a way that fully reflects its desire to match flow criteria to the natural hydrograph and combat the ill-effects of flow stabilization.*

Third, the outflow recommendations in the Draft Report would in many cases worsen outflow conditions as compared to recent years, which is inconsistent with the Department's findings earlier in the Draft Report that recent Delta flows are insufficient to protect fish and wildlife in the Delta. If the winter-spring Delta outflow criterion is intended to identify the allowable average X2 for the January-June period, then the proposed flow criteria will provide **worse** conditions than occurred in eight of the past 20 years (i.e., the 1990-2009 period), and better conditions than those that occurred in only five of the past 20 years. Therefore, if the criterion recommends a 6-month average X2 condition, then the Draft Report's recommendation requires Delta outflows that are at best the same and potentially less than what the ecosystem experienced during the past 20 years. This is contrary to DFG's recognition that "[r]ecent Delta flows are insufficient the support native Delta fishes in habitats that now exist in the Delta" [p.95].

Therefore, we recommend that the Department revise the winter and spring outflow recommendations to:

(1) Increase outflow recommendations during wetter conditions, consistent with the scientific literature;
(2) More closely link outflow recommendations to hydrological conditions; and
(3) Ensure that outflow recommendations improve conditions as compared to recent years.

B. Missing Flow Recommendations for Certain Public Trust Species

The Draft Report provides a good overview of the scientific literature that describes a relationship between freshwater flows and the abundance and productivity of many Public Trust species. But, in several cases, the actual flow recommendations do not reflect the needs of those species.

Steelhead:

There appears to be no flow recommendation related to the needs of steelhead in the Sacramento River or its tributaries. This is a major omission, given that steelhead is a federally listed species. The Draft Report suggests [p. 33] that steelhead flow requirements on the Sacramento

River would be met by flow recommendations to protect fall run Chinook salmon (curiously, the Draft Report does not offer the same rationale on the San Joaquin River, though the two species co-exist there as well). This assumption is unlikely to be accurate or provide sufficient flows to support steelhead recovery as the two species have significantly different behavior and ecological patterns in the Central Valley. Unlike fall run Chinook salmon, Central Valley steelhead almost always rear in freshwater for a year or more (Moyle 2002); this means that steelhead have year-round in-river flow requirements. Migration of juvenile steelhead to the Delta happens in the late spring (McEwan 2001; Williams 2006) whereas fall run Chinook salmon migrate downstream as fry in the winter or early spring (Williams 2006). The difference in size at migration and migration season strongly suggest that steelhead will benefit from different flows at different times than those designed to benefit fall run Chinook salmon. In addition, migration of adult steelhead begins earlier (as early as July) and ends later (peak migrations continue through mid-November) than those for Sacramento River Fall run Chinook salmon; the strong implication is that adult steelhead require attraction and migration flows for a longer period than is required by fall run Chinook salmon.

Steelhead and Chinook salmon have different temperature requirements during several life history stages and this suggests that they have different flow needs as temperature and flow rates are related in the reservoir-controlled aquatic habitats of the Central Valley. Optimal incubation temperatures for steelhead occur in a narrower range than those for Chinook salmon. Indeed, Myrick and Cech (2004) warned against managing water temperatures for the upper end of the Chinook salmon thermal tolerance range in waterways and during periods when steelhead are also incubating because incubating steelhead cannot tolerate such high temperatures. Richter and Kolmes (2005) concluded that egg mortality increased as incubation temperatures exceeded 10^{o}C. Similarly, steelhead juveniles are much more sensitive than Chinook salmon to elevated temperatures during the smoltification process (US EPA 1999). Richter and Kolmes (2005) and US EPA (1999) cited studies that present a range of temperatures, between 11-14^{o}C that may inhibit steelhead smoltification. Myrick and Cech (2005) cautioned that smolting steelhead must experience temperatures <11^{o}C to successfully complete this metamorphosis. Smolting Chinook salmon appear to tolerate temperatures as high 17-20^{o}C (Marine and Cech 2004; Richter and Kolmes 2005). These findings indicate that flow recommendations deemed to be protective of fall run Chinook salmon will not necessarily be sufficient (either temporally or in their magnitude) to protect endangered Central Valley steelhead.

<u>Winter-run Chinook salmon:</u>
Some of the flow requirements of winter-run Chinook salmon are well-known. The unique timing of their life history creates a need for cold freshwater flows that differs from those of other Chinook salmon in the Central Valley. Surprisingly, Table 2 omits the late-July through late-October period of peak winter-run juvenile migration nor does it capture the earliest period of winter-run Chinook salmon emigration to the ocean which occurs from September through October. Shockingly, Table 3 makes no reference to the critical temperature-control period (April-September) necessary to protect incubating winter run Chinook salmon eggs and larvae. This latter omission could be because the Draft Report is focused on "in delta flows" and fish migrating in the river are not quite in the Delta; but, other aspects of the table refer to upriver function of flows, so, at best, the table is inconsistent in its focus. *We recommend that the Department revise the Draft Report to explicitly acknowledge and document the particular flow-*

related needs of winter-run Chinook salmon throughout their freshwater and estuarine life-history.

Sturgeon:
The report does not address flows for sturgeon. The apparent explanation for this (p. 33) is that the Department believes beneficial flows for sturgeon are too large and episodic to be controlled or affected by management. This does not seem a reasonable consideration for describing the flows that are known to benefit white and green sturgeon in the system. Even if those flows occur sporadically, the Draft Report can offer a recommended frequency distribution for such flows so that those flows are not instead regarded as "excessive" when hydrology permits them to occur. Even if these flows are "uncontrollable" under the current configuration and capacity of the Delta hydrosystem, this may not be the case in the future.

Restoration of fishes to the San Joaquin River and elsewhere:
In general, the Draft Report gives no attention to the flows required to restore fish to habitats they previously inhabited. For example, to live up to the Department's desire to *restore and recover* Public Trust fisheries, the Draft Report should recommend flows that are necessary to support and restore:

- spring run populations to the San Joaquin River and its tributaries
- floodplain inundation (e.g., for splittail etc) on the San Joaquin River
- tolerable levels of dissolved oxygen in the Stockton ship channel to benefit all migratory fish in the San Joaquin River. This includes those flows necessary to protect populations of fall run Chinook salmon that already reproduce on tributaries of the San Joaquin; our testimony to the State Board (*see* TBI/NRDC Testimony to the SWRCB, Exhibit 3) indicates that increased freshwater flow is a necessary ingredient of any plan to alleviate the low DO conditions in the Stockton Deepwater Ship Channel that may impair fall run Chinook salmon migrations.

C. Omission of San Joaquin River Inflow:Exports Ratio to Protect Salmonids

The Draft Report acknowledges that there is a scientific relationship between San Joaquin River inflow:export ratios and survival and abundance of salmonids, that our testimony to the State Water Resources Control Board demonstrated that a 4:1 ratio of San Joaquin River Inflow to Delta exports would reach population abundance goals (TBI/NRDC Exhibit 4), and states that "this ratio should be implemented in concert with San Joaquin River flows at Vernalis." (Draft Report at pp. 55-56). However, the Draft Report does not acknowledge that the State Board's final report included a 4:1 I:E ratio, nor does this Draft Report include a recommendation for a San Joaquin River Inflow: Export ratio, which is necessary to protect salmonid populations. In addition, the Draft Report also does not discuss the State Water Resource Control Board's recent independent scientific review of VAMP, which concluded that the data from VAMP is inconclusive about the effects of exports on survival because certain flow and export conditions have never been studied, that "these findings should not be interpreted as meaning that exports, especially at high levels, have no effect on survival rates," that export pumping can cause indirect effects and mortality on salmonids, and as a result, the panel recommended that the

export limitations associated with VAMP should remain in effect.[2] *Therefore, we recommend that the Draft Report be revised to include the conclusions of the State Board and the independent peer review of VAMP, and that the Final Report recommend a 4:1 I:E ratio to protect migrating juvenile salmonids and support restoration of the abundance and spatial distribution of salmon and steelhead runs in the San Joaquin River and its tributaries.*

D. Inaccuracies Regarding Timing and Location of Flows

Chinook salmon:

Throughout the report, there are omissions and inconsistencies in the estimated timing and location of different life-history stages of key fish species. For instance, all of the flow periods in Table 3 seem to refer to fall run Chinook salmon -- these are certainly not the relevant times for winter or spring run. Table 4 relies on Moyle and Yoshiyama (1998) for estimates of migration timing. The run timing estimates have been updated and revised by Williams (2006: http://escholarship.org/uc/item/21v9x1t7) in his monograph about Central Valley Salmon. *Tables 2 and 3 should be updated to reflect the most recent knowledge. Also, Williams found that the proportion of spring run Chinook salmon that migrated as fry was much larger than what Moyle (2002) assumed and this would likely have an impact on a spring-run specific flow recommendation.*

In the section on "Chinook salmon (San Joaquin River tributaries) – Adult egg/fry", the Draft Report indicates September-March are the most important times for flow. Consideration of all available sources on run timing in the San Joaquin (including Moyle 2002 and Williams 2006) indicates that the period is more likely to be October through April.

Steelhead:

Similarly, while there is some disagreement in the literature regarding the timing of steelhead spawning migrations, our best estimate from the literature is that late-August through late-March is the most important period for upstream migration of steelhead, not September through April as indicated in Table 3. If these flows are designed to benefit steelhead *spawning* in the upper river, then flows are required through April. Again, the function of these flows relative to the geographical target of the report is confusing.

Longfin smelt

Table 2 of the Draft Report identifies no flows to protect spawning adult longfin smelt. The Department may have intended this to be covered by the flows for "eggs" but flows for adults may be beneficial as early as November and the Department should not overlook the effect of late fall flows on the placement of spawning territories (and related entrainment of gravid adults). By contrast, Table 3 correctly identifies November as a potentially important month to provide flows for longfin smelt.

[2] "The Vernalis Adaptive Management Program (VAMP): Report of the 2010 Review Panel, May 13, 2010 (Prepared for the Delta Science Panel)," available online at: http://www.deltacouncil.ca.gov/delta_science_program/pdf/review_vamp_panel_report_final_051110.pdf.

For longfin smelt larvae, the Draft Report identifies December through May as the critical period. There is no reason to exclude June from this period; Jassby et al (1995) clearly identified June as a month in which flows are important for longfin smelt populations. The first longfin smelt big enough to be caught in the Bay Study's nets are caught in May, but LFS continue to "recruit to the net" throughout the summer and fall and larvae are detected in larval sampling programs long after May (Rosenfield and Baxter 2007). Again, Table 3 indicates that June "may" be important but the Draft Report does not clarify why there is confusion about the importance June flows for the protection of longfin smelt larvae and juveniles.

The Draft Report's recommendation regarding OMR flows to reduce entrainment of Longfin smelt do not cover the entire period when longfin smelt are likely to require protection. This may stem, in part, from inaccurate presentation of our own OMR flow recommendations in our testimony to the State Water Board (TBI/NRDC Exhibit 4). As that testimony documented, entrainment of juvenile longfin smelt is highest during April and May while entrainment of older fish (those preparing to spawn) occurs most often during December-February (TBI/NRDC Exhibit 4; Figure 7, p. 16). Entrainment of longfin smelt larvae is not detected or recorded but, given the timing of spawning adult entrainment and that of early juvenile entrainment, larval entrainment is expected to be high during April and May, at least. We also showed that entrainment of spawning aged longfin smelt is significantly correlated to export rates at the South Delta pumps during Jan-Mar (TBI/NRDC Exhibit 4; Figure 10, p. 19) and that juvenile entrainment is closely correlated with net Delta outflow during March-May. These results comport well with those of Grimaldo et al. (2009) who reported strong relationships between OMR flows and longfin smelt entrainment rates. Peaks in entrainment are not driven by population size; indeed, entrainment is inversely correlated with population size (TBI/NRDC Exhibit 4; Figure 11, p. 20). *Thus, we recommend that exports be managed to produce positive OMR flows (>0cfs) January-March whenever the preceeding FMWT index of longfin smelt abundance drops below 500 and during Mar-May whenever low Delta outflow positions larval and juvenile longfin smelt populations in areas where they experience a high risk of entrainment (i.e. dry and critically dry years). As written, the Draft Report provides very little protection from entrainment for spawning longfin smelt adults or early-hatching larvae from December – March. We strongly recommend that the Department revise its OMR recommendations to reduce longfin smelt entrainment rates throughout the critical spawning and early developmental phases of their life cycle.*

III. The Biological Objectives in the Report Are Insufficient for Adaptive Management Purposes and Fail to Fulfill the Statutory Mandate

We agree that the biological goals and objectives of the former CalFed Ecosystem Restoration Program can serve as a starting point for defining future goals and objectives (Draft Report, p. 96). However, neither these objectives nor those contained in the Draft Report are specific enough to be used within a robust adaptive management framework for restoration of the Bay-Delta ecosystem and its watershed (*see* Draft Report, pp. 18, 99, 102). Objectives that are specific, measureable, and time-bound will be required both to plan for restoration and to evaluate progress toward goals for each ecosystem element (e.g. species of concern) and the larger goal of restoring the public trust.

The Draft Report's emphasis on restoration and recovery of native species, rather than mere maintenance of the status quo, is also appropriate given the dire state of the Public Trust fisheries and the various legal requirements that the Department is bound to uphold, including the California Endangered Species Act, salmon doubling policies, and the Public Trust Doctrine.

In the section on Biological Goals for Terrestrial Species, the Draft Report should include a brief description of the linkage between freshwater flow and the biological needs of these species, as this conclusion is not necessarily obvious from the current draft.

In the section on Biological Goals for Aquatic Species, the goal statements should not include the proposed mechanism (flows). Goals are goals -- they need not prejudge the mechanisms for attaining the goals. As the report itself states, "As used in this document, "goals" are defined as a future desired outcome or state. Goals provide direction and focus on ends rather than means." (Draft Report, p. 11)]

We also recommend that DFG revise its description of Table 2 and acknowledge that all the riverine and estuarine life-stages of Public Trust fish and zooplankton species are affected by both the timing and volume of water flow. The sentence currently reads:

> "Table 2 identifies the priority species life stage most affected by water flow, the mechanism most affected by flow, and the time when water flow is most important to the species (updated from DFG 2010a)." [p31].

The distinction is not a trivial point; the notion that we have documented the flow requirements of all riverine or estuarine life stages of Public Trust species is inaccurate. Those that are identified as "most affected" are really those life stages where we have strong evidence of the flow:abundance or flow:success relationship. This is not the same as saying that other life-stages' or other species' reliance on water flow is "less important" or even that the requirements of those life stages are "less stringent" – in many if not most cases, we simply lack the scientific data at this time. For example, it is well known that Sacramento splittail respond well to floodplain inundation in terms of increased spawning. However, no one has studied how other life stages respond to flow though it is quite possible (even likely) that there is a strong positive relationship between freshwater flow rates in and through the Delta and Sacramento splittail growth and survival in estuarine habitats. We can't simply dismiss the Sacramento splittail's flow requirements outside of floodplain inundation because they are not yet documented. The same critique applies to Table 3.

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