The BDCP Effects Analysis:

A Briefing Paper

February 2012

Summary:

After over five years of highly critical reviews of previous analytical products, the latest version of the effects analysis (EA) for the Bay Delta Conservation Plan (BDCP) was released on February 29, 2012. Our preliminary review of this new evaluation and the draft technical appendices on which it is based reveals that:

- According to the EA itself, the proposed BDCP would not only fail to contribute to the recovery of a number of endangered species – it would actually increase the risk of extinction for some of these species.
- Because the technical appendices severely underestimate negative impacts of the proposed BDCP, the net effect on endangered species and habitats is even worse than portrayed.
- The EA's inputs (the technical appendices) fail to meet several minimum requirements for credible technical analysis as they ignore known and likely negative impacts; overestimate potential benefits; employ non-standard or questionable analytical approaches while ignoring proven scientific tools and metrics; "cherry pick" data to support a particular outcome; tailor the presentation of model outputs to reflect most favorably on the project; and misrepresent current scientific research and the professional judgment of experts.

The end result is a product that is neither technically credible nor likely to result in a plan that prevents species' extinctions, let alone provide for their recovery. The need for a Delta solution is urgent, however, and the BDCP process can be successfully transformed if:

- Specific, science-based, enforceable objectives that define meaningful contributions to recovery of endangered species and habitats are described and used to evaluate the plan.

- Plan actions are specifically designed to reduce the highest priority stressors (including flow alteration) that prevent attainment of plan objectives.
- The "DRERIP[1]" process – the most credible approach and set of tools developed specifically to evaluate the magnitude and certainty of positive and negative effects resulting from different Delta management measures – is used to select the most effective and promising actions for inclusion in a scientifically defensible plan .

Background: The Bay-Delta Conservation Plan (BDCP) is an initiative to develop a 50-year permit for operations of the State Water Project and federal Central Valley Project under the auspices of the federal Endangered Species Act (ESA) and California's Natural Community Conservation Planning Act (NCCPA). The proposed plan, whose development is paid for and subject to approval by water exporters before its submission to permitting agencies, is intended to support the State's co-equal goals of recovery of "covered" species[2] and habitats in the Delta and improved reliability of water supply for water exporters. BDCP's primary elements include construction and operation of a new water diversion and conveyance facility (a canal or tunnel) in the North Delta and restoration of Delta wetland habitats.

A well-designed BDCP that complies with federal and state law could contribute to solving the Delta's problems. Since its inception, however, the process has been plagued by serious shortcomings in the quality and scope of the analysis, as noted by numerous independent scientific reviewers. In 2011, a National Research Council panel concluded that:

> *"…much of the BDCP appears to be a post-hoc rationalization of the water supply elements contained in the BDCP" (National Research Council, 2011, p. 23)*

Update: A revised BDCP "Effects Analysis" (EA) was released on February 29, 2012; it is a summary of the "net effects" described in various technical appendices that were released toward the end of 2011. Unfortunately, these new documents continue to ignore much of the wealth of relevant scientific information available about what is required to restore the Delta ecosystem, despite detailed guidance about such information from fish and wildlife agencies and others. In comments on the technical appendices submitted to the California Resources Agency prior to the release of the EA "net effects" document, the NGO community documented numerous major flaws with the EA concluding that the technical analyses fail to provide a credible, balanced

[1] DRERIP is the Delta Regional Ecosystem Restoration Implementation Program. This multi-year project of the California Department of Fish and Game and other Calfed agencies developed a rigorous process for prioritizing proposed restoration actions in the Delta.

[2] The 12 fish species that must benefit from the BDCP, include all four runs of Central Valley Chinook salmon, steelhead, green sturgeon, white sturgeon, two smelt species, two species of lamprey, and the endemic Sacramento splittail; a number of terrestrial species are also covered under the Plan.

assessment of whether the proposed BDCP will actually advance the co-equal goals. Instead, these documents attempt to justify the proposed project by:

- Ignoring likely negative impacts while over-estimating the possible positive impacts of the Conservation Strategy;
- Using non-standard or questionable analytical approaches and unproven or rejected notions of how the ecosystem will respond to change, while ignoring proven scientific tools and well-supported hypotheses;
- Selectively presenting "cherry-picked" models and data, even when it results in internally inconsistent interpretations;
- Tailors model outputs to present results in the light that is most favorable to the proposed project; and
- Misrepresenting current scientific research and the professional judgment of experts.

The EA guides the reader to an apparently pre-determined conclusion about effects of the current BDCP proposal on the Delta environment and water operations; namely, that the Delta's endangered fish and habitats can be restored while at the same time actually increasing the amount of water exported from the Delta. This position is at odds with the finding of several major reviews by leading scientists – including the public hearings conducted by the State Water Resources Control Board in 2010 – and state policy that requires a reduction in reliance on the Delta for water exports.

Three major red-flags of the current BDCP Conservation Strategy and Effects Analysis stand out:

1) ***The Plan, according to the analysis in the EA, fails to contribute to the recovery of a number of endangered species and actually increases the risk of extinction for some of these species.***

Even after thousands of pages spent putting the best face on the current proposed facilities and operations, and underestimating or ignoring potentially significant environmental impacts, the water exporters' own technical consultants conclude that the BDCP will have negligible benefit to several key species and will actually hasten the demise of other imperiled species. Specifically, the analysis suggests that, by diverting still more water from the already over-allocated Delta, implementing the BDCP will push species like longfin smelt, winter-run Chinook salmon, and others towards extinction.

> **Example (1)**: Results of two life-cycle models ("IOS" and "OBAN") show that the current BDCP will not benefit – and may harm – the endangered winter-run Chinook salmon compared to "baseline" conditions. Appendix G of the EA states, "*OBAN predicted that winter-run escapement would be reduced…compared to the [baseline] for each of the time steps..., while IOS predicted little difference between the [BDCP]and the [baseline]...*" (p. G-3). The EA's "net effects" document confirms this finding and attributes it to decreased water flows and increased temperatures upstream that result from reservoir management practices anticipated under the project (EA 2012,

p. 5.1-9). In other words, this "conservation plan" may be worse than the status quo for winter-run Chinook salmon. This is not a "contribution to recovery" by any definition.

Example (2): Some estuary-dependent species would be devastated by significant reductions in Delta outflow during the winter – spring period. Currently, less than half of the freshwater runoff in the Central Valley makes it through the Delta to San Francisco Bay in most years. The EA finds that winter – spring outflows, which are known to drive productivity of many species, would decrease by as much as an additional 33% under the BDCP (Appendix C). In the case of longfin, formerly one of the most abundant species in the Estuary, and now among the rarest: *"…changes in outflow during the larval period have the potential to reduce abundance of older [longfin] by 8–24% in the [first 15 years following operation of the new north Delta diversion facility]*" (Appendix C, Conclusion #11, p. C-1.2). The EA's net effects document confirms this conclusion and indicates that increased exposure to contaminants under the plan may further harm longfin (EA 2012, p. 5.1-9)

2) <u>The actual effect of the proposed BDCP is much worse than portrayed in the EA, because it severely underestimates negative impacts to species and ecosystems.</u>

It's easier to claim success when your standard for success is artificially low. The EA sets an extremely low bar for BDCP success (and one that is not consistent with the minimum requirements for environmental review and permitting) by (a) using benchmarks that are worse than actual conditions, and (b) defining "recovery" in overly narrow terms

a) <u>Setting an artificially low bar for success</u>: The EA repeatedly substitutes a "no additional harm" standard in place of the "contribution to recovery" required under the federal ESA and the "conservation of natural communities" required under the NCCPA. It makes matters worse by comparing conditions expected under the BDCP to a "baseline" that is worse than the status quo.

Example (1): The EA uses computer models to describe water supply and fresh water flow conditions under the plan and then seeks to compare those to current and future "baseline" conditions. But the EA defines the baseline such that "*…the simulated Delta outflow for many months is equal to the minimum Delta outflow requirement for each month*" (EA 2012, p. 5.3-6), ignoring the fact that in the real world conditions are often significantly better than the minimal required protections. Worse, and inexplicably, the EA establishes a baseline for comparison in which only the protections afforded by the federal and state project's water rights permit conditions (D-1641) exist -- other existing regulatory constraints on water export operations are omitted from this

baseline[3]. As a result of this unrealistic comparison, the EA trivializes both BDCP's presumed biological impacts and its water supply benefits. Comparing the BDCP to recent *actual* conditions (conditions that are already driving the collapse of the Delta ecosystem) would reveal that the BDCP would substantially increase water exported from the Delta while severely degrading environmental conditions. Furthermore, the plan should (and must) also be compared to the conditions we *want* to see; in other words outcomes of the plan should be compared to the plan's biological goals and objectives for recovery of endangered species and habitats. These targets are finally being developed and presented in a coherent and justifiable format, but unfortunately, our preliminary review indicates that many of them are insufficient in that they in effect endorse status quo conditions and their attainment would contribute little if anything towards restoration of the species or the ecosystem.

Example (2): The EA treats as optional actions that are required under the current Biological Opinion for delta smelt to increase freshwater outflow from the Delta during the fall of some (particularly wet) years. As a result, the BDCP "baseline" for fall outflows is 57% less than what is actually required today (Appendix C). The federal government has already warned (in a different context) that substantial reductions in delta outflow resulting from BDCP are likely to *increase* the risk that delta smelt will become extinct.

Example (3): As with all planning documents used by the State of California, evaluation of the BDCP must account for the anticipated changes to the environment under global warming. Unfortunately, the EA incorrectly treats all of the negative effects of global climate change as impacts beyond the control of the state and federal water projects; it then claims that BDCP will not make things worse. For instance, the EA's Appendix G states, *"... both climate change and the preliminary proposal may adversely affect the winter-run Chinook salmon population in the future, although the effect of climate change is larger than BDCP*" (p. G-83)". In fact, many impacts of a warmer climate will exacerbate impacts, like warm water temperatures below Central Valley dams that are *directly caused by the water projects already*. Project operations or facilities that increase the risk of jeopardy to covered species can not be permitted. In this case the proposed project would magnify the effects of climate change as well as exacerbate existing impacts of project operations. The EA refuses to acknowledge the plain fact that the cumulative effect of current and proposed project operations will be to increase jeopardy to covered species, especially given the likelihood of warmer

3 The EA "net effects" document reveals that, even against this weak (and incorrect) standard, BDCP may not succeed, stating, "*The required D-1641 X2 locations ... and the minimum Delta outflows were satisfied by the preliminary proposal ..., although CALSIM results reported above may be based on relaxations of the requirements in certain months.*" (EA 2012, p. 5.3-6)

temperatures in the near future. Rather than use BDCP as an opportunity to plan for the future and attempt to solve problems caused by the SWP and CVP, the EA instead settles for a claim that this plan is no worse than the (unacceptable) status quo – again, it's easy for a plan to "succeed" if it is compared to failure.

3) ***The EA fails to meet minimum requirements for scientific and technical rigor in a number of critical areas***

In most cases, the true impacts of the proposed BDCP remain unknown because the EA methodology and its interpretation of analytical results are fundamentally flawed. As noted above, the EA's own results indicate a strong probability that the plan as currently conceived will hasten the decline of covered species and the ecosystem as a whole, but the true impacts could be even worse (or, to be fair, in some cases better) than those presented in the EA. The ways in which the EA biases its results and misrepresents scientific information on the Delta ecosystem are numerous and widespread. (These biases persist despite strong criticism of earlier analyses by numerous scientific review panels, the federal and state fish and wildlife agencies, and the NGO community). For instance, the EA:

a. Ignores known and likely negative impacts

Example: The EA projects that Delta outflow will decrease dramatically in the ecologically critical winter and spring months because of increased water exports (Appendix C). In some cases (e.g. longfin) it acknowledges the well-known, long-established, positive relationship between winter and spring fresh water flows and populations of numerous fish species; so it is striking that the EA does not account in any way for the potential impact of reduced fresh water flows on the production of prey (e.g. shrimp and other zooplankton, small fish) for the covered species. The reduction in Delta outflows described by the EA would be expected to reduce production of key zooplankton species, and thus undermine a main tactic of the Conservation Strategy (increased food production), yet this obvious link is never explored.

b. Overestimates BDCP's possible positive impacts

Example: The Conservation Strategy relies heavily on the tenuous link between restoration of Delta wetland habitats, the production of smelt prey, and recovery of Delta smelt and longfin (Appendices F, G). For example, the EA Appendix G states:

> "*Expansion of floodplain, tidal wetland, and channel margin habitat…is expected to result in…an increase in zooplankton, the food resource for delta smelt…Increasing food supplies through aquatic habitat expansion…therefore would be expected to contribute directly to an increase in delta smelt growth, survival, and population abundance...*" (p. G-4).

The EA's faith in these expectations is in stark contrast to the uncertainty and/or skepticism expressed in several earlier reviews. The National Research Council[4], when considering the suitability of habitat restoration for merely preventing extinction of (and not recovering) the smelt – found that:

> *"…the relationship between tidal habitat and food availability for smelt is poorly understood, and it is inadequate to support the details of the implementation [of habitat restoration]*

This report and others (including a review funded by and produced for BDCP[5]) found that the hoped for link between shallow water habitat restoration and increased food production for covered species was speculative and recommended implementing some of the proposed restoration projects as pilot studies, so that their benefits and potential pitfalls could be better understood and managed. The technical Appendices refer to these documents but never mention their skepticism regarding the beneficial outcome that the Conservation Strategy relies most heavily upon. Instead, the EA "net effects" document asserts: *The BDCP includes substantial restoration that has the potential to produce and export detritus and phytoplankton into the open estuary where fish can consume it* [EA 2012; p.5.3-26]. What the EA doesn't say is that most of the covered fish species do not feed primarily on detritus or phytoplankton – again, the actual effect on many of the covered species of the proposed habitat restorations is highly uncertain. There is no doubt, as many studies show, that restoring wetland habitat creates benefits for a broad range of species and ecosystem values. It is the specific benefits claimed in the EA for some of the covered species that are in question.

c. <u>Applies non-standard or questionable analytical approaches while ignoring proven scientific tools and metrics</u>

The document retains a number of questionable analytical approaches, and at the same time fails to utilize established tools, metrics, and even well-known facts.

Example (1): Despite previous criticisms from the fish and wildlife agencies, the EA persists in estimating salmonid movements and mortality in the Delta with a model that is in the early stages of development--the Delta Passage Model (DPM). Among other shortcomings, DPM is based on very small data set collected on unusually large fish, over

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[4] National Research Council. 2010. *A Scientific Assessment of Alternatives for Reducing Water Management Effects on Threatened and Endangered Fishes in California's Bay Delta*.

[5] In 2008 and 2009, BDCP convened numerous experts in the fish and ecosystem processes in the San Francisco Bay-Delta estuary to review proposed conservation measures (many of which are retained by the current BDCP). These experts applied a rigorous review methodology developed by the Delta Regional Ecosystem Restoration Implementation Program (DRERIP) of the California Department of Fish and Game. Preliminary findings of the reviews, which was never concluded, are summarized here: http://science.calwater.ca.gov/pdf/workshops/workshop_eco_052209_BDCPDRERIP_Summary_with_Appendices1.pdf

the course of just a few years. By relying on DPM, the EA: (1) avoids evaluating mortality and movements of smaller and far more abundant salmon fry; (2) fails to evaluate the effect of water exports on salmon migration during dry or critically-dry years (because DPM's foundational data were not collected under those conditions), and (3) inappropriately projects impacts on the behavior of most winter-run, spring-run, and fall run Chinook salmon.

Example (2): The EA relies on the results of a controversial life-history model to assert that neither fresh water flow rates nor entrainment at the south Delta pumps are important stressors on the Delta smelt population. Flaws with this approach include: (1) the model did not evaluate fresh water flow variables and so is unable to assess their impact; (2) the model actually found that entrainment-related mortality of Delta smelt *did* have a significant impact on Delta smelt populations (though the authors removed this variable from the analysis); and (3) all inputs for the model were generated by non-biologists. Contradictory results of alternative models of Delta smelt life history and behavior, developed by biologists with experience studying these fish in this ecosystem, are not mentioned or are lightly dismissed by the EA.

Example (3): The EA frequently relies on incorrect and undocumented assumptions regarding species' life history and ecology. The technical appendices often use incorrect inputs, even concerning such basic facts as when species are likely to be in the Delta – a practice bound to produce inaccurate or irrelevant results. Even though the EA is supposed to rely on the best available scientific information about species behavior and ecology as summarized in a series of peer-reviewed publications (life history conceptual models) developed for the California Department of Fish and Game[6], these foundational documents are referenced only sporadically and usually only in ways that would tend to reflect favorably on the proposed BDCP.

d. <u>Cherry-picks data to support a particular outcome</u>

The EA and its technical Appendices regularly present results in the light that is most favorable to the proposed project. Sometimes this results in the EA interpreting results in mutually inconsistent and contradictory ways within the span of a single page.

Example: Much of the ecological benefit of building a new North Delta diversion facility is supposed to result from an expected reduction in entrainment of fish at the existing South Delta export facilities. But, despite the wealth of information to the contrary, the state and the water contractors have always claimed that the South Delta export pumps are not an important source of mortality. The Effects Analysis attempts to have it both

6 The Delta Ecosystem Restoration and Implementation Plan (DRERIP) is the California Department of Fish and Game's accepted analytical approach for planning restoration projects in the Delta. Delta conceptual models are available here: http://www.dfg.ca.gov/ERP/conceptual_models.asp

ways. In the space of one paragraph, the new Effects Analysis' Appendix B claims both that: (1) entrainment of juvenile winter-run Chinook salmon and steelhead under the BDCP will decline ~60% compared to existing biological conditions, and (2) although entrainment losses of winter-run Chinook salmon will increase during some periods, overall entrainment is *already well below 1%.* [p. B-6, emphasis added]. Similarly, the new EA states that "it is assumed the entrainment stressor under existing conditions for foraging and migrating juvenile salmonids is of moderately low importance" (p. 5.5-66) while also stating that reduction of salmonid entrainment in some years is a significant benefit of the proposed project and by implication a major justification for constructing and operating an isolated facility (i.e., "a major component of the BDCP conservation strategy is a switch from export pumping solely in the south Delta to dual conveyance...it is anticipated that this would maintain entrainment levels of juvenile salmonids at or below the levels seen in recent years…", at p. 5.5-66). Entrainment can't be both a problem and not a problem, depending on what outcome most favors the project.

e. Presents model outputs in a way that is most favorable to the proposed project

Another common and very problematic "analytical technique" prevalent throughout the document is the inappropriate use of averages, instead of ranges or extreme values, to obscure the potential impacts of the project.

Example: Appendix C calculates the relationship between longfin abundance and the average December-May Delta outflow; this contrasts published studies which use much shorter time periods that are defined based on critical life-stage functions (e.g. January-March flows are those likely to affect longfin spawning; March-June flows are those likely to affect longfin larval success). Averaging, across a half a year those changes in Delta outflows that are expected to occur under BDCP minimizes the impact of larger variations in flow from BDCP that occur within particular months– the effect of averaging is, after all, to downplay extreme values. As a result of this biologically simplistic approach, the EA severely underestimates the potential negative impact of BDCP on longfin (one of very few species that the EA actually admits will be impacted negatively by BDCP).

f. Inaccurately represents current scientific research and the professional judgment of experts.

The EA frequently misrepresents the findings of the researchers and studies it references. These mischaracterizations range from attributing assertions to authors and studies that do not support that assertion (or present contrary hypotheses), to taking statements out of context, to offering unpublished and unreviewed documents as if they were the best available science.

Example (1): In one case, the EA cites a PowerPoint presentation to support a major (and false) assumption regarding endangered Central Valley steelhead despite the facts that the presentation itself was clearly a non-technical "visioning" product which stated,

"*This document is incomplete and not fully vetted*", and that the author (while widely respected) is not an expert in fish biology. Such a document simply cannot be represented as the "best available science" (the standard set by the Endangered Species Act).

Example (2): To support its favored hypothesis that shallow tidal habitat restoration projects will increase the food available to each of the covered species, the EA states:

> *Restoration of tidal wetlands has the potential to increase the availability and production of food in Suisun Bay by exporting organic material by tidal flow from the marsh plain and phytoplankton, zooplankton, and other organisms produced in intertidal channels…This production may contribute significantly to the greater foodweb, ultimately benefitting openwater species such as delta smelt ,,, (Brown 2004* [*sic*]).

The paper referenced here, written by a researcher with the US Geological Service in 2003, actually casts significant doubt on the likelihood of this assertion as it identifies:

> *…a high degree of uncertainty regarding the benefits of tidal wetland restoration for native fishes, including special status species such as delta smelt…*

[and]

> *The importance of freshwater tidal wetlands to the native delta smelt is largely speculative.*

Furthermore, an extensive scientific review commissioned by the BDCP in 2009 (the "DRERIP Reviews") found that most of the BDCP tidal habitat restoration areas would provide "*…minimal to low benefits for delta smelt, longfin smelt, sturgeon, steelhead, and salmonids (all runs) with minimal to low certainty*". Projects in Suisun Marsh scored a bit better as the experts behind the DRERIP reviews expected that they might have a "*minor population level effect*" for splittail, delta smelt, and fall and spring-run Chinook salmon, although the certainty of even this outcome was *"minimal to low*". These findings do not appear to be presented or addressed in the EA.

Example (3): The EA cites numerous studies in a misleading way that suggests that other researchers support BDCP's expectations for habitat restoration projects. For example, the current EA's Appendix F states that the BDCP's proposal to restore shallow tidal habitats in Suisun Marsh are expected to:

> *…increase food resources for rearing salmonids (Benigno and Sommer 2008; Kjelson et al.1982), splittail (Kjelson et al. 1982), delta smelt (Nobriga and Herbold 2008), and longfin smelt (Hobbs et al. 2006; Rosenfield 2008).*

To the best of our knowledge, not one of these studies mentions any particular habitat restoration effort and certainly not the proposal put forward by BDCP for Suisun Marsh. Several of these studies *do* mention the expected benefit of increased fresh water flows

on these species – a fact that is not mentioned anywhere in the EA or its appendices. For instance, writing 30 years ago (well before BDCP's proposal for Suisun Marsh was conceived), Kjelson stated:

> *Survival [of Chinook salmon] though the Delta in June is inversely related to water temperature and directly related to river flow…*

[and]

> *Alteration of the timing, magnitude, and distribution of flow in [this Estuary] has a major impact on juvenile Chinook survival.*

The Path Forward:

The Delta desperately needs a long-term solution. Despite the failure of the EA as a basis for that solution, there is a way forward to "fix" the BDCP and develop and implement a solution that meets the test of good science and the minimum requirements of the ESA and NCCPA. Over the past several years, the NGO community has developed a planning framework – the Logic Chain – that has been broadly supported but not actually applied.

The Logic Chain approach is specifically designed to generate the appropriate questions and comparisons that would be the heart of a valuable Effects Analysis. This process requires development of specific, measureable, and time-bound objectives that actually make a significant contribution to the recovery of endangered species and habitats and against which the plan's projected outcomes (and during implementation, plan performance) can be evaluated – meaningful yardsticks by which we can measure a restoration plan, as opposed to an arbitrary improvement over "baseline conditions" (whether accurately defined or not). Within the Logic Chain, conservation measures are intended to address specific assumed stressors that might prevent attainment of plan objectives, providing guidance about which effects must be analyzed. The Logic Chain also calls for transparent evaluation of both the magnitude and uncertainty of projected positive and negative outcomes of each action (or suite of actions); this leads to the selection of priority actions, direction regarding whether their implementation as full measures or pilot projects is most appropriate, and the identification of critical monitoring and research needs to inform the adaptive management process.

A specific and detailed plan to implement the logic chain exists that could produce (1) a permitable Conservation Strategy; (2) a robust and informative Effects Analysis; and (3) a credible and specific Adaptive Management Plan that would guide future BDCP implementation. To date and despite the fact that it was never completed, the 2009 DRERIP evaluation of BDCP remains the most comprehensive and detailed BDCP Effects Analysis available. That process should be reinitiated, refined, and charged with projecting impacts, uncertainties, opportunities for improved knowledge, and the appropriate application of existing quantitative models. The DRERIP evaluation process (with the addition of appropriate quantitative modeling of certain impacts) would produce many critical attributes of a BDCP effects analysis including the explicit

articulation of benefits, negative effects, outcome likelihoods, time requirements, monitoring metrics, and estimates of reversibility for each measure in the Conservation Strategy. Such a thorough analysis could also identify the performance thresholds and management response decision-trees that are integral to the BDCP's yet-to-be-developed Adaptive Management Plan. Under adequate supervision, Logic Chain Implementation could produce these essential products in less time than either of the previous failed efforts to produce an Effects Analysis.