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Dr. Clifford Dahm
Delta Science Program
Delta Stewardship Council
980 Ninth Street, Suite 1450
Sacramento, California 95814

Dear Dr. Dahm:

On December 17, 2010, NOAA's National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (FWS), and the U.S. Bureau of Reclamation (Reclamation, collectively the Federal Agencies) sent you a letter with an initial response pursuant to the independent review panel's report titled, "Report of the 2010 Independent Review Panel (IRP) on the Reasonable and Prudent Alternative (RPA) Actions Affecting the Operations Criteria And Plan (OCAP) for State/Federal Water Operations." This letter is provided as a follow-up to the Federal Agencies' December 17, 2010, letter. The enclosure provides responses to the IRP's recommendations and comments, and also provides adjustments to the implementation of NMFS' and FWS' respective biological opinions on the long-term operations of the Central Valley Project and State Water Project, in support of real-time decision making in water year 2011.

The Federal Agencies appreciate the Delta Stewardship Council's (DSC) and IRP's assistance in fulfilling a critical component of adaptive management within NMFS' RPA, and also the Secretaries of the Interior's and Commerce's commitment to undertake an integrated annual review of the Services' respective biological opinions and RPAs.

If you have any questions regarding this letter, please contact
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Sincerely,

Maria C. Rea
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Sincerely,

Michael Hoover
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Sincerely,

Michael Chotkowski
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U.S. Bureau of Reclamation

Enclosure

Joint Department of Commerce and Department of Interior Response to the Independent Review Panel's (IRP) 2010 Report of the Reasonable and Prudent Alternative (RPA) Actions Affecting the Operations Criteria and Plan (OCAP) for State/Federal Water Operations

Independent Review Panel Members:
James J. Anderson, University of Washington
Ronald T. Kneib (Chair), RTK Consulting Services & Univ. of Georgia (Emeritus)
Stacy A. Luthy, University of the Pacific
Peter E. Smith, U.S. Geological Survey (Retired)

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I. Introduction

NOAA's National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (FWS) have each issued Biological Opinions on long-term operations of the Central Valley Project (CVP) and State Water Project (SWP, hereafter CVP/SWP; OCAP Opinions) that include Reasonable and Prudent Alternative (RPA) actions designed to alleviate jeopardy to listed species and adverse modification of critical habitat. NMFS' RPA requires the U.S. Bureau of Reclamation (Reclamation) and NMFS to host a workshop no later than November 30 of each year to review the prior water year's operations and to determine whether any measures prescribed in the RPA should be altered in light of information learned from the prior years' operations or research (NMFS' OCAP Opinion, section 11.2.1.2, starting on page 583).

Under direction from the Secretaries of Commerce and Interior, the NMFS review has been expanded to include a review of the implementation of the FWS OCAP Opinion. The intent of the annual review is to inform NMFS and FWS as to the efficacy of the prior year's water operations and regulatory actions prescribed by their respective RPAs. The review process is intended to determine whether a technical basis exists for amending specific measures in the RPA to reflect new information, provided that such amendments are consistent with the OCAP Opinions' underlying analyses and conclusion, and do not limit the effectiveness of the RPAs in avoiding jeopardy to listed species or adverse modification of critical habitat. Outcomes of this process may include changes to monitoring and data used for decision-making (*e.g.*, improvements in monitoring), or refinement of the criteria, thresholds and/or other indicators used by the technical teams in making recommendations for management actions. The goals of this process will also be to develop lessons learned, incorporate new science, make appropriate science-based adjustments to support the subsequent year's real-time decision making, and identify strategies to better integrate the NMFS and the FWS' RPAs as they are currently implemented.

The Delta Stewardship Council convened an Independent Review Panel (IRP) on November 8-9, 2010. This workshop provided the IRP a forum for presentations and discussion of previously submitted technical reports. The IRP Report was finalized on December 9, 2010. What follows is a unified response by NMFS, FWS, and Reclamation to the comments and recommendations of the panel. In the following pages, we have excerpted the salient portions of the IRP' comments *in italics* and provided our responses in standard font. The agencies focused on comments relating to science and technical issues. We did not respond to comments that pertained to the regulatory process of interagency consultation.

The agencies thank the IRP for their time and diligence in completing what we hope is the first in a series of reviews that will improve both the scientific basis and the overall implementation of the OCAP Opinions on the effects of water project operations. The IRP's willingness to engage on the science issues is the foundation of an improved collaborative process. We also thank the Delta Stewardship Council for its efforts in developing and facilitating the review process.

II. Response to Narrative Notes for Table 2, Letters C-G: IRP Report Pages 10-12

B. Action is a physical compliance – it needs to be related to presence and bioenergetic responses of fish.

All of the actions in the NMFS RPA were intended to meet the objective of the action or action suite, which include the species' presence and expected responses of the fish. As explained in the approach to the RPA (NMFS OCAP Opinion page 576), "NMFS concentrated on actions that have the highest likelihood of alleviating the stressors with the most significant effects on the species, rather than attempting to address every project stressor for each species or every [primary constituent element] of critical habitat." NMFS agrees that much of the information provided within the technical team annual reports, and presented to the IRP, focused on physical compliance. We will increase our efforts to monitor and report on the species' responses.

C. Improved temperature predictions were demonstrated by the NOAA/NASA study which should replace the concept of temperature compliance points with continuous spatial temporal predictions of temperature in the river and tributaries of the Central Valley. Linking the predictions from models with temperature and precipitation across seasonal and yearly scales should vastly improve the efficacy of within year and across year decisions on allocations of cool water resources in the system.

D. Need to link better forecasting of seasonal flow with down stream temperature modeling and then link effects of temperature on fish vital rates: egg, juvenile, and adult survivals, egg incubation time, juvenile growth. Strongly encourage implementation of the temperature forecasting and assessment program described by NOAA.

NMFS intends to integrate the improved temperature predictions from the work presented by Eric Danner into the temperature planning process on the Sacramento River, as this technological tool becomes available. We agree with the ISP that more finely resolved spatial and temporal temperature predictions will be useful in temperature management, and expect that the Sacramento River Temperature Task Group (SRTTG) will consider this information (as available) when setting temperature compliance points during 2011. NMFS also agrees that with further development of (and experience with) new temperature management tools, it may become easier to operate to a more sophisticated performance measure for RPA compliance. However, NMFS does not propose, for 2011, any adjustment to the use of temperature compliance points in the RPA for management of Sacramento River temperature.

NMFS agrees that there should be a better linkage of temperature effects on fish vital rates. This is consistent with the ISP's recommendation made elsewhere in the report that we should monitor the biological responses of fish to physical compliance and achievement of physical targets. The technical teams currently evaluate biological responses in a qualitative sense, and provide advice on operations based on literature and professional judgment. NMFS supports modeling efforts and studies that evaluate and correlate fish responses to various operational scenarios.

E. It is not known why the compliance point was established downstream (Jelly's Ferry) when aerial redd surveys in 2010 indicated redds were upstream of Airport Road Bridge.

Typically, the temperature compliance point is set in May utilizing information from the aerial redd surveys to determine winter-run Chinook salmon spawning distribution. In 2010, the aerial redd survey data were not available to the SRTTG until approximately July 15. These data indicated that winter-run Chinook salmon were spawning above the Airport Road compliance point. Due to the difficulty in detecting salmon redds from a fixed wing aircraft (higher altitude), and the poor visibility, the SRTTG left the temperature compliance point at Jelly's Ferry in the event that there were undetected redds located downstream, between Airport Road and Jellys Ferry.

Preseason temperature planning is unclear. The documentation was inadequate to assess the efficacy of coordination in real time or the effectiveness of the action on fish.

NMFS agrees that documentation and rationale for establishing the temperature compliance point, and effectiveness of the action on fish, need to be bolstered.

F. Compliance points should be re-evaluated and possibly moved to better match actual fish habitat usage.

The Clear Creek Technical Group is working on a proposal to establish water temperature criteria and a temperature compliance point that better matches Central Valley steelhead spawning distribution and fish habitat usage.

G. While "fish population data" was listed in the presentation as a priority for data collection, the panel was not presented much about this topic, though the potential for competition and/or interbreeding of transported fish with native (or put and take fisheries) populations is of importance. We hope that risk assessment for major habitat degradation (e.g., the Cantara loop metam sodium spill in the Sacramento River in 1991) is also being considered.

NMFS agrees that the potential for competition and/or interbreeding of transported fish with native fish (or put and take fisheries) populations are important. The Interagency Fish Passage Steering Committee, and its subcommittees, in their implementation of NMFS RPA Action V, the Fish Passage Program, will be considering and addressing these issues. Risk assessment will definitely be considered as part of implementing the Fish Passage Program.

III. Response to Narrative Notes for Table 3, Letters H-M: IRP Report Pages 13-14

H. While there are likely important reasons to know the identity of specific fish (i.e., where, when or by whom it was tagged), the presence or changing numbers of tagged fish at a specific location provides information on timing of emigration that can be useful in implementing RPAs.

At some times of the year, when few hatchery releases are in the system, NMFS agrees that simply knowing the numbers of tagged fish can provide useful information on emigration timing. However, the surrogate releases of coded wire-tagged (CWT) Chinook salmon (two to three releases of late fall-run Chinook salmon from Coleman National Fish Hatchery in December and January as surrogates for yearling spring-run Chinook salmon; a release of winter-run Chinook salmon from Livingston Stone National Fish Hatchery in February), which are the basis for the third trigger of RPA Action IV.2.3 relating to managing flows in Old and Middle Rivers, appear at the Federal and state fish facilities along with tagged fish from other releases (for example, slower emigrating individuals from the late fall-run Chinook salmon production release). Differentiation between release groups cannot be made until CWT data have been extracted. These data are necessary for accurate determination of action triggers under RPA Action IV.2.3. In 2010, the Delta Operations for Salmonids and Sturgeon (DOSS) group used "tag fraction projections" provided by the California Department of Water Resources (DWR, see Table A) to implement the third trigger, given the lag time in reading the CWTs. During 2011, DOSS will likely need to project out some number of unread tags, but hopes to decrease the CWT-reading lag time.

Table A: Example of "tag fraction projection" table provided to DOSS during 2010.

Coleman Hatchery Late-Fall and Livingston Stone WinterChinook Loss at the Delta Fish Facilities, 2009/2010, BASED ON DWR EDITS TO FWS CWT DATA

Release Date	Cwtrace	Release Site	Loss	Release Number	% Loss	First Concern Level	Second Concern Level	Date of First Loss	Date of Last Loss
12/16/2009	LF	BattleCreek	938.175	904699	0.104	n/a	n/a	12/26/2009	2/8/2010
12/28/2009	LF	BattleCreek	56.73	75676	0.075	0.5%	1.0%	1/22/2010	2/2/2010
1/14/2010	LF	BattleCreek	799.885	174386	0.459	0.5%	1.0%	1/24/2010	2/8/2010
2/10/2010	W	Redding	0	198100	0.000	0.5%	1.0%	*	*
		Lost tag/No tag	0.00						
		Non-Read Tags	122.28						
	since 2/8/2010 12:00		**159.12**						
		Unknown	**281.40**						

For Chinook lost 10/1/2009 through 2/7/2010
SWP Tags read 10/1/2009 through 2/8/2010
CVP Tags read 10/1/2009 through 2/8/2010
***Livingston Stone winter-run Chinook release**

Revised 2/12/2010

DWR ESTIMATE OF NON-CONFIRMED TAGGED LOSS AND NEW TOTAL TAGGED LOSS THRU 2/11/2010

Release Date	Confirmed TagLoss	Proportion Confirmed TagLoss	Proportion NON Confirmed TagLoss	New Total	Released	%Loss
12/16/2009	938.175	0.522721321	147.09378	1085.269	904699	0.119959
12/28/2009	56.73	0.031608155	8.8945347	65.62453	75676	0.086718
1/14/2010	799.885	0.445670524	125.41169	925.2967	174386	**0.530603**

I. As stated in the DOSS Technical Report (page 19), the formulation of the second trigger was mathematically incorrect.

NMFS agrees with the recommendation, and is currently developing a second trigger.

J. Adequate for salmon but action not currently coordinated with delta smelt program – coordination will require completion of work on delta smelt studies.

The Smelt Working Group (SWG) and DOSS provide advice regarding OMR flows for the management of delta smelt and salmonids, respectively. Currently, there is overlapping group membership. That is, there are scientists that participate in both the DOSS group and SWG proceedings. Information is passed between the groups on a weekly basis regarding actions being considered. While maintaining less negative OMR flows provides benefits to both smelt and salmonids, each group considers current operations and provides advice based on the needs of "its own" species.

The agencies recognize that good coordination between the SWG and the DOSS is necessary, but has at times been difficult. The SWG meets (Monday morning) before the DOSS does (Tuesday morning). Any recommendations or advice from the SWG and DOSS are discussed at Tuesday afternoon WOMT meetings, at which time FWS and NMFS determinations on any recommendations or advice are made, and the more protective action takes precedence at the time. The FWS agrees that the SWG can and

should then consider the NMFS determination when it next meets. This may mean that the SWG will have to meet a second time during the week in some cases.

K: The management of Export/Import (E/I) program and impact on fish entrainment is uncertain.

More information will become available as the six-year acoustic tagging experiment (its objective is to "confirm proportional causes of mortality due to flows, exports and other project and non-project adverse effects on steelhead smolts out-migrating from the San Joaquin basin and through the southern Delta") is implemented. NMFS will also continue to review data from other studies, such as the VAMP study, that provide information on survival and route selection of salmonids migrating from the San Joaquin River basin.

L. The current approach to behavioral barriers in the Delta has been largely trial and error in which a system is envisioned and then deployed for testing; tracking trajectories or final destinations of tagged fish encountering the barrier. This approach has been used for decades in the Columbia River system at great cost and with limited success (Anderson 1988). Current studies in the Delta appear to be on a similar path.... Linking the environment to fish behavior requires a detailed description of the flow environment, the sensory signals relevant to the fish and knowledge of the fish's response to the sensory information. Linking these elements in a predictive model has been done in other systems (Goodwin et al. 2006) and the approach can be readily applied to the Delta.... We understand that the VAMP review panel (Hankin and others, 2010) strongly recommended a return to a physical barrier at the HOR for the reason of routing more flow down the main stem of the San Joaquin River to improve outmigrant survival. Therefore, the GS barrier, to be implemented for the first time this winter (WY 2011) may have the greatest potential.

NMFS recognizes the importance of these and other barriers to salmonid management and will review and consider the results of ongoing studies, as appropriate, when formulating new management strategies. As presented at the workshop, the California Department of Water Resources is currently implementing a non-physical fish barrier at Georgiana Slough. We will consider the IRP's (in support of the VAMP review panel) recommendation to return to a physical barrier at the HOR.

M. The panel recommends further collaboration between the water and fish agencies in assessing the variable efficiency of [salmonid] salvage as related to water operations....

NMFS agrees with the ISP on the benefit of ongoing collaboration with Reclamation and DWR on these issues. As indicated in the NMFS Opinion, NMFS believes changes to the infrastructure of the fish facilities or in the operations and management protocols are important avenues to pursue in order to increase the overall efficiency of fish salvage and survival.

IV. Response to Narrative Notes for Table 4, Letters N-T: IRP Report Pages 14-18

N. The new delta smelt studies, which are coordinating sampling with the temporal patterns of tides and turbidity, represent a major advancement in research on this species and potentially for management of the Delta.

FWS supports well-designed studies relating to the delta smelt and its habitat requirements, including those intended to better define the conditions correlated with movements of delta smelt. The studies, currently underway, are in their first year and will continue for several more. FWS looks forward to discussing results from the first year with the Panel during the 2011 review. As studies are completed and peer reviewed, the FWS will consider and incorporate appropriate findings into new management strategies in general and the RPA in particular.

O. In short, any rectified behavior, which moves fish upstream on the flood tide without realistically expressing the actual cues that induce the behavior, is simply inadequate. The goal should be to develop, from first principles, a behavioral model for how multiple species in the Delta, not just delta smelt, respond to their local environment.

FWS agrees that neither the current version of the RMA Smelt Behavior Model nor the DSM-2 Particle Tracking Model is adequate for addressing questions of adult delta smelt movement. FWS would welcome the development of a delta smelt behavioral model suitable to aid management of the species.

P. During 2010, Action 1 was never triggered because the average daily turbidity at Victoria Canal did not exceed 12 NTU for three consecutive days.

FWS agrees that the close proximity of the Victoria Canal station to the export facilities limits its usefulness in detecting first flush conditions, as by the time smelt would occur there, it would likely be too late to avoid or minimize entrainment. We also agree that adjusting both the stations and the criteria used for detecting first flush may be needed. In WY 2011 the SWG will monitor several turbidity stations in addition to the three criterion stations; in particular, the SWG will focus on turbidity at False River, Dutch Slough at Jersey Point, and Old River at San Joaquin River. These station data will be compared to (a) data from the three criterion stations and (b) flow conditions on the Sacramento and San Joaquin Rivers to determine their efficacy in detecting the first flush.

During the first flush of 2010, OMR flows were already curtailed to be no more negative than -5,000 cfs by the salmon Biological Opinion (RPA Action IV.2.3). That level of OMR flow was sufficient to prevent turbid Sacramento River water from being drawn down to the Victoria Canal station and triggering the Action. Without the salmon Action, however, it is likely that OMR flows would have been higher, and the delta smelt Action would have been triggered. The delta smelt Action should not rely on the salmon Action. The panel feels it would be wise to adjust slightly the trigger for Action 1 so that it gives an earlier warning for first flush.

The implementation of Action 1 for smelt does not rely upon the implementation of the NMFS Action for salmonids, but relies entirely upon meeting or exceeding the criteria set forth in the FWS RPA. It is entirely appropriate, however, for the SWG to consider *all* factors affecting the Delta environment, including the implementation of the NMFS RPA. We are less certain than is the Panel of the conditions that may have prevailed at Victoria Canal absent the salmonid action. This uncertainty highlights the need for monitoring turbidity at additional stations, reviewing outcomes and, potentially, developing new criteria.

> *Adjusting the trigger to be a three-day average of the monitoring stations at Prisoners Pt, Holland Cut, and Victoria Canal might be adequate, although some analyses should be done to confirm this and determine whether a trigger of 12 NTU is the appropriate magnitude. The SWG has suggested five alternative sites for use in WY 2011, which can be considered also. The SWG has acknowledged this and has already proposed to incorporate peak turbidity on the incoming tides as a consideration in their evaluation process of entrainment risk level for delta smelt.*

FWS agrees with the Panel. A pilot study of turbidity and delta smelt movement was conducted last winter by the USGS and U.C. Davis' Bodega Bay Marine Lab, in collaboration with the California Department of Fish and Game. The follow-up study planned for this year will attempt to more precisely characterize the migratory response of delta smelt to the pulse of high water turbidity associated with the first large freshet of winter. It is well-known that delta smelt tend to prefer areas of elevated turbidity, but the role turbidity dynamics play in the timing of migration is not as well understood. Increased knowledge of the timing of delta smelt migratory movements in the presence of early turbidity plumes could be quite valuable. It may aid in better predictions of delta smelt distribution early in winter. Since smelt distribution is a primary factor in assessing entrainment risk, there could be a reduction in the water cost of RPA Actions 1 or 2. FWS is also hopeful that the additional turbidity stations established by the Projects and the USGS will help improve predictions of entrainment risk.

> *The turbidity data from 2010 did show that an OMR flow objective as restrictive as -2,000 cfs may not be necessary in years of average or below average hydrology in order to keep turbidity in the south Delta low (below 12 NTU) and delta smelt entrainment minimal. In 2010, for example, OMR flows of -5,000 cfs proved adequate with a first flush of 57,000 cfs (on the Sacramento River at Freeport). These data suggest that the OMR flows objective required in Action 1 should really depend on the size of the first flush. The larger the first flush, the less negative the OMR flow objective that will be needed. The panel recommends that this idea be further investigated as additional years of turbidity data are collected and improved numerical models of sediment transport are developed and become capable of accurate turbidity prediction.*

The FWS biological opinion states:

"Total entrainment depends on precipitation patterns, ambient air temperature, controlled and uncontrolled releases from waterways feeding the Delta, specific operations of facilities such as the DCC, and condition of the year's pre-spawning cohort based on current year habitat quality. All of these factors may affect the distribution of delta smelt adults as and after they migrate into the Delta – and *it is the migration into the entrainment risk zone and the area of that zone based on operational conditions at the time that determines ultimate mortality.*" (OCAP p 331, italics added)

Implementation of FWS RPA Action 1 is intended as a proactive measure to reduce entrainment during a period (first flush) following which, historically, take has occurred. It is also intended (see italicized statement above) to prevent residual flows caused by project operations from creating adverse migratory conditions or confusing migratory cues during their initial migration.

Scaling a reduction in negative flow to the size of the first flush does not comport with the second intended function of the Action. However, we appreciate the panel's comment and intend to continue to study the issue. As noted above, delta smelt migration is an active research area. Future findings may cast new light on the role of migratory cues in delta smelt management.

> *Q. In as far as salvage of delta smelt reached a level of concern (92) but did not exceed the incidental take limit of 123 fish, it could be concluded that the Action contributed to reducing take. However, it is also possible that the apparent success was due in part to the generally low abundance of delta smelt in the system*

FWS agrees with the Panel that "the apparent success [of RPA implementation as measured by salvage] may have been due in part to the generally low abundance of delta smelt in the system." However, authorized take is presently scaled to abundance as indexed by the Fall Mid-Water Trawl (B.O. pp 286-288). Authorized take is based simply upon an estimate of how much take *is expected to occur* as result of Project operations. That take did not exceed the concern level indicates that the FWS was successful in estimating the cumulative take of adults, given the implementation of the RPA.

> *The process by which the recommendation of the SWG was rejected is unclear even though the outcome appeared to be favorable (i.e., an anticipated level of jeopardy was avoided while export flows were not unduly affected). In fact, according to Table 2 of the SWG Report to the IRP, the FWS determination of allowable export flows exceeded that recommended by the SWG on 4 out of 17 times.*

FWS agrees that the process can, at times, be unclear, and will work to improve communications in WY 2011. In particular, we will work to improve the clarity of our linkages between the recommendation and the determination. **The panel should note that a few SWG reports have been accompanied by dissenting opinions prepared by a minority of the work group in cases where the minority has a different take on the nature or significance of the risk information. FWS considers all information contained in SWG reports before drawing conclusions.**

> *The same Table 2 also shows that the observed OMR flow range exceeded the range allowable under the FWS Opinion in 4 of 15 cases. However, it should be noted that the amount by which flows exceeded allowable limits was usually – though not always – minimal. It is also notable that observed flow ranges tended to be in the upper end of the allowable range on most occasions. This is partly due to the use of a 14 day running average in determining OMR flow ranges, but operating near the upper end of the allowable range does tend to invite incidents that exceed the set limits.*

The apparent discrepancy between observed OMR flow and RPA-determined flow ranges stems to some extent from the as-yet-incomplete transition protocol that is intended to ensure the Projects' compliance with the RPA (B.O. p 295). As previously stated, while the B.O. clearly states the standard for meeting flow requirements, the protocol by which exports are adjusted has not yet been fully

resolved. However, it should also be noted that OMR is allowed under the B.O. to be no more than 25% more negative than the requirement (B.O. p 281).

> *Lacking accurate real-time information on the population size and locations of vulnerable sub-populations, the SWG recommendations are based largely on historical patterns, salvage numbers and the individual experience/expert opinions of the individuals within the working group. The potential problems here are that while historical patterns might predict general trends, they are usually not sufficiently sensitive in predicting events in any given year, and composition of the SWG will inevitably change over time, as will the level of first-hand experience with studying delta smelt and the Delta ecosystem.*

FWS acknowledges this difficulty, and notes that a method for estimating population parameters from survey data is currently in development, as are at least three life cycle models. In the meantime, historical experience remains the best available guide to interpreting PTM runs, trawl results, and other indicators of risk. It is also worth noting that the SWG retains members with experience dating back to 2004. Turnover has occurred gradually, and as former members have been lost, new members with considerable existing expertise are recruited to succeed them. Because experience *per se* cannot be retained, the biological opinion included the Delta Smelt Risk Assessment Matrix (DSRAM; B.O. pp 311-323), which was developed by the Delta smelt Working Group to improve decision-making by capturing the major risk factors for delta smelt and summarizing the tools available. The DSRAM includes extensive footnotes to further support the retention of institutional knowledge.

> *R. Salvage is certainly a qualitative indicator of mortality that can be linked to water operations, but it remains a questionable quantitative measure of population jeopardy.*

In determining whether an action is likely to cause jeopardy, FWS considers (1) the status of the species, (2) the environmental baseline, (3) all effects of the proposed action, and (4) the cumulative effects of other anticipated actions. The final analysis considers whether the species can be expected to survive, framed in terms of the species reproduction, numbers, and distribution in the wild. Thus, salvage *per se* is only a part of the determination, and not the deciding factor.

> *Until more refined methods relating delta smelt population dynamics to variation in the quantity and quality of its Delta habitat, there may be ways to develop an incremental improvement in the use of available information. For example, sophisticated refinements to tools are not necessary to recognize – even at the most basic level – that not all individuals salvaged represent an equal amount of jeopardy to the population. The expected lifetime contribution to reproduction in a population (i.e., Fisher's reproductive value) varies in a manner that can be calculated from age-specific survivorship and per capita fecundity at a given age (Kozlowski 1993). A pre-spawn adult female delta smelt or one containing mature or maturing eggs is a much greater loss to the future population than a larva, an adult male, or a spent female. Consequently, a scientifically defensible ecological connection between salvage and jeopardy would weight the protection afforded to different life stages in the population. In practical terms, it is advisable to adjust the allowable incidental take of delta smelt for different life stages.*

FWS agrees that this is useful information. That is why the analysis examines both adult and juvenile fish and take is authorized separately by life stage.

FWS agrees that linking RPA actions and vital rates would improve their effectiveness; however, much needed data is either not complete or not available, such as a widely-accepted delta smelt life cycle model and sediment transport model. The FWS agrees that linking RPA actions to vital rates in a more quantitative way is very important to our understanding of how Project operations affect delta smelt, both in terms of entrainment and impacts to critical habitat. However, until models and studies are completed, reviewed, and generally accepted, the FWS must utilize the tools that are currently available.

> *S. There is no metric by which to evaluate the effectiveness of the action on early life stages, which are not accurately counted among the salvage values.*

FWS agrees with the Panel, and notes that further research in combination with ongoing larval sampling is likely to clarify this issue.

> *T. The 2010 Water Year was considered below – but close to – average. Drier years are likely to present greater problems related to demand for proportionally higher exports and a greater pressure for legal remedies. Successful legal challenges to any of the actions have potential to: (1) inhibit the actual effectiveness of the action, (2) preclude any evaluation of efficacy, and (3) inhibit agency coordination (if agencies are on different sides of proceedings). Consequently, linking vital rates and the population dynamics of delta smelt to the physical flows targeted by the RPA actions needs to be a high priority for future studies involving delta smelt.*

FWS agrees with the Panel and has made this a high priority. DOI agency staff scientists are working on a planning-level life cycle model for delta smelt that uses CALSIM II and DSM2 outputs and recent species-specific information in a life-cycle context. This will create a simple model intended to allow a more explicit comparison of the effects of Project alternatives to natural sources of mortality and their interactions. A second quantitative life-history model for delta smelt is also currently under development by DOI staff in collaboration with others. This model is a hierarchical time-series model with at least two levels, a state process model and an observation model, which are fit to existing data using statistical methods. The state process model will be used to predict abundances of delta smelt at different life history stages (e.g., spawning adults, post-larval stage fish, and pre-spawning adults) and in two or more regions, including the western Delta, north and eastern Delta, and southern Delta. The observational model is intended to link data collected from multiple aquatic surveys (at least the Spring Kodiak Trawl Survey, the Fall Mid-Water Trawl Survey, the 20-mm Survey, and the Summer Tow-Net Survey) to the corresponding unobserved abundances by life stage. These quantitative tools will allow us to model population dynamics of these fish, to quantify the effects of different factors on dynamics, and to predict the effects of management decisions.

V. Response to Proposal Adjustments of OCAP RPA Actions: IRP Report Pages 18-30

NMFS presented several preliminary proposals at the 2010 Integrated Annual Review of the OCAP Opinions that suggested possible adjustment to RPA implementation. FWS will continue to participate in discussions with NMFS and project agencies to develop a flow transition protocol and improve compliance monitoring in conjunction with the proposals. Based on the panel's comments, DWR's comments, and initial discussions with other management and project agencies, some of the proposed RPA adjustments have emerged as more promising than others. Below is a summary of those proposals, categorized according to NMFS' assessment of the likelihood that the proposed RPA adjustment will be further discussed and pursued in 2011:

Promising: very likely to be discussed further in 2011:

Proposal I.A (part 1): OMR Flow Management: Formula used for managing OMR flow

Proposal I.A (part 2): OMR Flow Management: Export reduction floor

Proposal 1.C: 2nd OMR Trigger for OMR flow management

Proposal III: Adjust the Shasta Reservoir February forecast (currently based on the 90% exceedance forecast) to include data from NOAA's NWS' new tool that can predict climate over the next 90 days.

Proposal IV: Adjust Stanislaus Operations to improve flexibility.

Somewhat promising: may be discussed further in 2011:

Proposal V (part 1): Increase survival/reduce predation during Delta migration (consider opportunities for a more successful barrier at the Head of Old River)

Less promising: probably will not be discussed further in 2011:

Proposal I.B*: calendar based OMR trigger [NMFS proposed no change; DWR in their comments asked panel to consider whether this action is appropriate]

Proposal II: San Joaquin Inflow-to-Export Ratio Action

Proposal V (part 2) -- Increase survival/reduce predation during Delta migration (screen predators from entering the Clifton Court Forebay)

Proposal V (part 3) -- Increase survival/reduce predation during Delta migration (accelerate the timing for implementation of RPA Actions IV.4.1-IV.4.3

**The panel, in its response to the NMFS proposals, wove in several recommendations for further research – for example, a recommendation in the response to Proposal I.B. for more acoustic tag studies that would provide information on how the migration routes and timing of salmonids are influenced by flow patterns in the Delta. Our categorization of Proposal I.B. as less likely to be discussed in 2011 is focused on any likelihood of a change to the RPA implementation in 2011 (which we judge unlikely), and is NOT intended to dismiss the possibility of discussions regarding the studies suggested by the panel, which NMFS agrees could provide some very useful information.*

VI. Next Steps

FWS and NMFS will continue to support ongoing studies and, as appropriate, work to incorporate new information into RPA implementation. Below is a summary of planned 2011 activities following IRP's 2010 Report.

Joint FWS and NMFS Activities:

1. FWS, NMFS and the Projects will continue to develop an adjusted flow transition protocol for implementing actions related to Old and Middle River flows, including a possible adjustment to compliance monitoring.
2. FWS and NMFS will work with the technical teams to establish a more standardized format for future reports and presentations.
3. FWS, NMFS, and the agency participants on the technical teams will review findings from any relevant completed study and, as appropriate, integrate them into new management strategies in general and RPAs in particular.

FWS Activities:

1. FWS will ensure the SWG meeting notes better reflect steps taken by SWG in formulating their recommendations.
2. FWS will work to improve the clarity of the linkages between the recommendation and the determination.
3. FWS will review and, as appropriate, integrate any newly released operational delta smelt or multi species behavioral model into future management strategies.
4. FWS will continue to monitor turbidity at additional stations, review outcomes and if deemed appropriate, will develop new criteria.

NMFS Activities:

1. NMFS is in the process of preparing formal adjustments to the RPA through the section 7 process with Reclamation.
2. NMFS has already coordinated with DOSS on corrections to the second trigger in Action IV.2.3 and will provide an adjusted RPA through the appropriate Endangered Species Act section 7 process.
3. NMFS will discuss with the SRTTG ways to improve documentation of temperature management decisions.
4. NMFS-Protected Resources Division staff will continue to work with the NMFS-Southwest Fisheries Science Center (SWFSC) to utilize improved temperature prediction tools for Sacramento River temperature management.
5. NMFS expects the Stanislaus Operations Group will initiate discussions and coordinate with the Vernalis Adaptive Management Plan technical team regarding options to better integrate implementation of the NMFS RPA flow requirements on the Stanislaus River with the timing of other springtime flows from the Merced and Tuolumne Rivers.
6. NMFS will continue to explore options to improve the turnaround time of salvage and loss data from the fish facilities, including the reading of coded wire tags.
7. NMFS will consider information from the Clear Creek Technical Group regarding possible adjustments to temperature management on Clear Creek.