Reasonable and Prudent Alternative in the Delta Smelt Biological Opinion

Service's 2008 Biological Opinion

- BO covered long-term operations of the Central Valley Project and State Water Project
- BO found that Projects resulted in jeopardy to delta smelt and adverse modification of delta smelt critical habitat

Service's 2008 Biological Opinion

- Jeopardy and Adverse Modification Based on:
  - Changed Project Description
  - Adverse Effects to delta smelt and critical habitat
  - Low numbers of delta smelt
- BO includes Reasonable and Prudent Alternative (RPA) to remove jeopardy and adverse modification

RPA Components

- RPA Goal-keep delta smelt away from the influence of the pumps and in suitable habitat
  - Component 1 – Protection of the Adult Delta Smelt Life Stage
  - Component 2 – Protection of Larval and Juvenile Delta Smelt
  - Component 3 – Improve Habitat for Delta Smelt Growth and Rearing
  - Component 4 – Habitat Restoration
  - Component 5 – Monitoring and Reporting

Component 1 - Adults

- Control Old and Middle River flows (OMR) to protect prespawning adults from Dec-Mar
  - Protect upmigrating delta smelt (Action 1)
    - Once turbidity or salvage trigger has been met, -2,000 cfs OMR for 14 days to reduce flows towards the pumps
    - Was not implemented in WY 2009
  - Protect delta smelt after migration prior to spawning (Action 2)
    - OMR range between -1,250 and -5,000 cfs determined using adaptive process until spawning detected

Component 2 – Larval/Juveniles

- Improve flow conditions to allow larval and juvenile delta smelt to rear in the Delta and ultimately migrate downstream
  - Action starts once temperatures hit 12 degrees Celsius at three delta monitoring stations or when spent female is caught
  - OMR range between -1,250 and -5,000 cfs determined using adaptive process
  - OMR flows continue until June 30th or when Delta water temperatures reach 25 degrees Celsius, whichever comes first

Adaptive Process for Components 1 and 2

- Smelt Working Group (SWG) (Service, CDFG, Reclamation, EPA and DWR biologists and Project Operators) use all available information, including real time information to provide recommendations
  - SWG makes weekly recommendation on action needed to protect delta smelt to the Service
  - Includes flow, temperature, salinity, turbidity data
  - Results of delta smelt distribution survey
  - Particle tracking model results
  - Counts of delta smelt entrained at the export facilities

Component 3 – Improve Growing and Rearing Habitat

- Increase fall habitat quality and quantity only during above normal and wet years
  - Additional increment of Delta outflow in September, October, and November
    - Monthly X2 downstream of 74 km in Wet WYs
    - Monthly X2 downstream of 81 km in Above Normal WYs
  - Includes a formal adaptive management process
    - Includes Habitat Study Group (HSG) to monitor action and review new scientific information

Component 4-Habitat Restoration

- Provide benefits to delta smelt habitat to supplement the benefits resulting from the flow actions
- Requires DWR to create or restore 8,000 acres of intertidal and subtidal habitat for delta smelt

Component 5-Monitoring and Reporting

- Requires monitoring efforts in the Delta to continue as well as reporting requirements

Technical Review of the Delta Smelt Biological Opinion

Interagency Technical Team

- Included delta smelt experts from the Service, California Department of Fish and Game, EPA, Reclamation and other academics
- Team provided scientific and technical expertise in the review of the Biological Assessment and the development of the BO

Internal Peer Review of the Draft Biological Opinion

- Included experts on Section 7 and experience with complex consultations
- Included Service biologists with knowledge on Delta issues
- Provided comments throughout the process

External Peer Review of the Administrative Draft Effects Analysis

- Reviewed Administrative Draft of Effects Section of BO
- Panel Members:
  - Dr. Kenneth Rose, Louisiana State University
  - Dr. Wim Kimmerer, San Francisco State University
  - Mr. G. Roy Leidy, PBS&J
  - Mr. John Durand, University of California, Davis

Key Findings of the Panel

- Agreed with analytical approach on how operations affect delta smelt
- Found that Information and literature used was up to date and used the best available science
- Found that inclusion of climate change significantly strengthens analysis
- Additional comments:
  - The Admin Draft effects analysis lacked sufficient organization, clarity, completeness
  - Questioned the accuracy of *Pseudodiaptomus forbesi* analysis
  - Suggested using residence time as metric for possible impacts to phytoplankton biomass

Peer Review of the Service's Actions and DWR Actions

- Review consisted of review of draft Actions from the Service as well as proposed actions by DWR to protect delta smelt

- Panel Members:
  - Dr. Kenneth Rose, Louisiana State University
  - Dr. Wim Kimmerer, San Francisco State University
  - Mr. G. Roy Leidy, PBS&J
  - Dr. William Bennett, University of California, Davis

Key Findings of the Panel for the Service's Admin Draft Actions

- Actions reflected a great deal of thought and examination of data and available information
- Actions appeared "implementable and practical"
- Reliance on OMR in Actions 1-3 is sound
- Panel endorsed idea of considering both mortality (Actions 1-3) and habitat (Action 4)
- Use of near real-time data from multiple sources along with PTM results innovative

Outcomes of the Technical Reviews

- Service revised draft and final biological opinion based on these reviews
  - Service reviewed and incorporated, where appropriate, comments from the review panels as well as from Reclamation and other agencies.

Information Quality Act Review of Biological Opinion

- Review conducted in response to IQA request by the Family Farm Alliance

- Panel Members:
  - Dr. William V. Sobczak, College of the Holy Cross
  - Dr. Ronald T. Kneib, University of Georgia Marine Institute
  - Dr. Ronald M. Thom, Marine Sciences Laboratory, Pacific Northwest National Laboratory
  - Dr. David G. Hankin, Humboldt State University,
  - Dr. John (Jack) H. Humphrey, P.E., Hydmet, Inc.

Key Findings

- Agreed that entrainment related mortality may account for a substantial proportion of the population in some years, and have an important ‘sporadic’ effect on delta smelt abundance
- Project pumping is the primary force acting on delta hydrodynamics
- It is reasonable to conclude that project operations increase the effects of other stressors on delta smelt
- The use of linear or non-linear model for OMR to salvage relationship would have made little difference, and the linear model used in the BO was more conservative (predicted less entrainment mortality)
- Service did credibly employ Rose (2000) by using a multidisciplinary team and by using model results

Key Findings Continued

- Use of the X2 index in the BO highly defensible and consistent with best available scientific and commercial data
- Strongly concurred with use of X2 as an index of delta smelt abiotic habitat
- Supported the use of modeled versus historic hydrologic data in the BO
- Confirmed a reduction in total Delta outflow during all WY types compared to unimpaired conditions
- Strongly supported premise that actions impairing *Pseudodiaptomus forbesi* population are highly likely to negatively impact delta smelt population