

**POTENTIAL OPTIONS TO IMPROVE CONDITIONS FOR FISH AND
WILDLIFE IN ESTUARY.**

Results of DWR/DFG Brainstorming October/November 1993.

Institutional Measures

1. Coordinate mitigation banking opportunities. (Facilitate mitigation banking opportunities)
 - ◆ Provides a catalyst for entities to participate in banking efforts
 - ◆ Assures that mitigation efforts are coordinated and that these efforts are not duplicated at the same location
 - ◆ Allows for the implementation of preserve planning to benefit a multiple array of species and preserve and improve biological diversity.
2. Evaluate and make recommendations on impact of Growth Management policies on States's water supply.
 - ◆ Will ensure that decision makers are fully aware of the status of the State's water supply and the State's ability to provide good quality water
 - ◆ Will reduce the risk of increased detrimental impacts to the Estuary and to the natural environment of service areas of the State and Federal water projects.
3. Reassess risks associated with changing the flood control reservations to benefit fisheries with required releases.
 - ◆ Changes in the methods for managing flood reserves can be used to enhance flows at key times for fishery resources, especially during drier periods or during critical life stages.
4. Increase flexibility with implementation of the Endangered Species Act.
 - ◆ May provide benefits to a broader array of species rather than improve conditions for one or two species at the expense of other non-listed species.
 - ◆ Allow literal interpretations to be overridden for otherwise lawful activities when low probability of harm to species.

5. Set take limits at fish facilities for species other than endangered species.
 - ◆ Protects fish species that are of concern but not yet listed as endangered or threatened.
 - ◆ Reduces the risk of other species declining statewide such that listing is warranted.
6. Develop standards and facilities in Suisun Marsh to protect a wider array of species.
 - ◆ Provides for protection and improvement of wetland habitat such as tidal emergent wetland not presently fully protected by the existing Suisun Marsh Standards or proposed Plan of Protection facilities.
 - ◆ Provide protection to endangered and threatened species.
7. Create a Delta Levee Protection Authority.
 - ◆ Will provide a more uniform approach to levee maintenance to ensure protection of the Delta's levee system while allowing for beneficial fish and wildlife habitat.
 - ◆ With adequate funding of the Agency, local Reclamation Districts would have a dependable, adequate source of routine and emergency levee repair and maintenance funds. In the case of levee failures and island floodings, adequate funds would be available to immediately begin levee restoration and island reclamation.
 - ◆ Would provide a uniform set of levee maintenance standards.
8. Address definitions of baselines.
 - ◆ Assures that all projects are evaluated on an equal basis.
 - ◆ Use of current conditions instead of projecting and evaluating future conditions and demand levels.
9. Enhance and expand DBEEP (Delta-Bay Enhanced Enforcement Program)
 - ◆ Provides a greater force of wildlife protection officers in the Delta to increase public contacts and deter violations.
 - ◆ Provides greater protection of the existing resources.

- ◆ Allows for the geographic expansion of the DBEEP concept to areas upstream that are important to fishery resources that also depend on the Estuary. For instance, better protection of upstream spawning salmon that are susceptible to poaching.

10. Manage ground water more efficiently.

- ◆ Use ground water supplies at times which reduce the need to use surface supplies when that shift would avoid impacts to fishery resources or improve condition for those resources.

Demand Management

1. Reduce demand through land retirement south of the Delta as well as in the Delta.

- ◆ Would reduce the need for both State and Federal export of water from the Sacramento-San Joaquin Delta.
- ◆ This will help in the Delta by reducing subsidence and improving overall wildlife value.

2. Water marketing - encourage intra-south of Delta transfers and discourage transfers to south of Delta from north of Delta.

- ◆ Create improved water flow conditions through the Delta.
- ◆ Reduce exports
- ◆ Reduce entrainment related impacts at the state and federal fish facilities.
- ◆ Reduce risk of removing habitat of high value to wintering water birds such as rice to provide water to users south of the Delta.

3. Reduce demand through water conservation, especially in agriculture.

- ◆ Develop alternative improved methods of irrigation for agriculture to reduce water demands and make more water available for fish and wildlife use.
- ◆ Reduce agricultural drainage problems especially in the Tulare Basin.

4. Reduce demand through water reuse of agricultural and urban water; gray water.
 - ◆ Reduce export related impacts at the fish facilities.
 - ◆ Increase Delta inflows and outflow which in turn improves conditions for the Estuary's fishery resources.
5. Change crop patterns to less intensive water using crops.
 - ◆ Reduce export related impacts at the fish facilities.
 - ◆ Increase Delta inflows and outflow which in turn improves conditions for the Estuary's fishery resources.
6. Implement conjunctive use programs to recognize needs and provide benefits to biological resources.
 - ◆ Dedicate a portion of the water saved using conjunction use programs to provide water for fish and wildlife especially in drier years.
7. Purchase lands with water rights - dedicate both to fish and wildlife.
 - ◆ In the Delta this would allow more water to flow through the Delta, thus enhancing conditions for fish and wildlife.
 - ◆ Reduce export related impacts at the fish facilities.
 - ◆ Provide in-stream flows.
8. Provide economic incentive for farmers that reduce water use and disincentive for farmers that use excessive water amounts.
 - ◆ Would encourage farmers to develop alternative irrigation practices.
 - ◆ Increase Delta inflows and outflow which in turn improves conditions for the Estuary's fishery resources.
 - ◆ Increase in-stream flows.

Hydraulic Related Facilities and Actions

1. Construct a peripheral canal with an intake in a low risk area (such as Hood) and operate to benefit fish and wildlife.

- ◆ Would reduce the fishery and wildlife impacts currently associated with State and federal water pumping activities.
2. Bypass pumping out of Clifton Court Forebay by direct pumping out of Italian Slough at certain times of year to benefit fisheries.
 - ◆ May reduce impacts to Delta fishes, such as striped bass when this diversion method is used.
 - ◆ Would provide a more direct approach to the fish salvage facility and reduce predation exposure.
 3. Increase in-Delta storage to provide operational flexibility for fisheries.
 - ◆ High quality water can be stored during periods of low vulnerability for Delta fish resources and released when improved water flows would have the greatest fishery benefit.
 - ◆ Impacts to Sacramento River salmon such as winter-run chinook salmon, could be reduced by exporting water released from Delta reservoirs rather than water released from Shasta or Oroville reservoirs.
 - ◆ Reduces export related impacts at the fish facilities.
 4. Divert fish out of Sacramento River by an acoustic barrier into the Sacramento Deep-water Ship Channel, Steamboat or Sutter sloughs.
 - ◆ Would remove fish from the influence of the Delta Cross Channel and Georgiana Slough during critical migration times and allow for pumping to continue.
 - ◆ Acoustic barrier may be a much better alternative than a structural barrier which eliminates important flow into the central Delta.
 5. Provide flows sufficient to maintain salinity in proper range for estuarine species.
 - ◆ Assures that the entrapment zone is maintained in areas where maximum productivity can occur.
 6. Use Sacramento Ship Channel as a peripheral canal with in-Delta reservoirs and siphons.
 - ◆ Would remove fish from the influence of the Delta Cross Channel and Georgiana Slough during critical migration times and allow for pumping to continue.

- ◆ Reduces export related impacts at the fish facilities.
7. Increase south of Delta storage to provide operational flexibility to benefit fisheries and to provide dedicated yield to fish and wildlife.
- ◆ Allows water exports to occur during times less critical to Delta fisheries.
 - ◆ Allows for storage to be dedicated to south of Delta fish and wildlife needs.
8. Water storage on ricelands.
- ◆ Would provide upstream storage for water to be released during critical periods for fish.
 - ◆ Releases could be coordinated to reduce impacts to migrating fish.
 - ◆ Water stored on rice lands, if done properly, could enhance conditions for wintering waterfowl in the late-winter and early-spring.
9. Shift pumping from times of large impacts on fisheries to times of lower impacts.
- ◆ Allows water exports to occur during times less critical to Delta fisheries.
10. Increase San Joaquin River flows during times beneficial to fish.
- ◆ During upstream migration and outmigration of salmon it assures that proper water conditions would be present to facilitate successful migrations of San Joaquin fall-run chinook salmon.
 - ◆ Increased flows would improve Q-west conditions and would reduce export related impacts at the fish facilities.
 - ◆ Increased Delta inflows and outflows which in turn improve conditions for the Estuary's fishery resources.
11. Improve flows in San Joaquin River downstream from head of Old River.
- ◆ Would provide for better salmon migration through the lower San Joaquin River.
 - ◆ Would reduce or eliminate the water quality problems that occur in the Stockton Turning Basin.

12. Reduce reverse flows in lower San Joaquin River.
 - ◆ Would reduce the drafting of salmon and other fish species into the State and Federal pumping facilities.
 - ◆ Increased Delta inflows and outflows which in turn improves conditions for the Estuary's fishery resources.
13. Construct off-stream storage in Delta watershed dedicated exclusively to fish and wildlife.
 - ◆ Increased Delta inflows and outflows which in turn improve conditions for the Estuary's fishery resources.
 - ◆ Reduce export related impacts at the fish facilities.
 - ◆ Provide in-stream benefits.
14. Mandated releases on San Joaquin system.
 - ◆ Provides for possible restoration of San Joaquin River salmon stock.
 - ◆ Increased Delta inflows and outflows which in turn improve conditions for the Estuary's fishery resources.
15. Provide reservoir carry over storage for fish and wildlife benefits.
 - ◆ Provides for improved conditions during periods of drier water years.

Habitat Management

1. Remove predators in Clifton Court Forebay as long as forebay is open to the Delta.
 - ◆ Would reduce the impacts associated with fish entrainment into the forebay.
2. Eliminate Clifton Court Forebay to help San Joaquin Salmon.
 - ◆ Would allow salmon to be drafted directly into the fish salvage facility instead on being subject to increased predation in the forebay.

3. Bring in dredge material for Delta Islands.
 - ◆ Bringing in clean dredge material can help reinforce Delta levees and maintain Delta islands for wildlife habitat.
 - ◆ Material can be used to raise the elevation of island or portions of islands that can be reopened to tidal action to improve spawning habitat for species such as Sacramento splittail and Delta smelt.
4. Improve water quality by reducing toxic substances entering the estuary.
 - ◆ Controlling city street and agricultural run-off into Delta waters will help reduce the adverse effects of toxic substances on fish, wildlife, and plant resources.
5. Implement better Delta farm water management practices and farming practices to benefit fish and wildlife.
 - ◆ Pattern after Staten Island farm management practices and benefits to wildlife.
 - ◆ Modified water management could reduce the entrainment of fish onto Delta islands through irrigation systems and pumps.
6. Restore riparian and shaded riverine aquatic habitat.
 - ◆ Provide escape cover for outmigrant salmon.
 - ◆ Provide stream and river side vegetation for terrestrial species to use as hunting and nesting perches
 - ◆ Provide an important source of detritus for the aquatic ecosystem.
 - ◆ Will help regulate water temperatures.
7. Develop Best Management Practices (BMP) for levee management to increase riparian habitat.
 - ◆ Development and implementation of the levee BMPs will help ensure that wildlife habitat values are maximized to the extent possible consistent with levee stability.
8. Increase area of seasonal wetlands and modify wetlands for use as spawning areas for aquatic species and water related wildlife.
 - ◆ Increase available spawning habitat for Sacramento splittail and Delta smelt and other native species.

- ◆ Increase habitat for waterfowl species.
 - ◆ Increase wetland habitat values.
9. Provide incentives to private landowners to manage wetlands for wider diversity of species.
- ◆ Will result in overall substantial improvements in the availability of higher quality wildlife habitat.
10. Manage public wildlife management areas for wider diversity of species.
- ◆ Develop a natural community conservation type plan that would provide for species diversity and diverse public use.
11. Restore intertidal areas in San Francisco Bay system and adjacent upland buffer areas and drainage systems such as in Suisun Bay and Suisun Marsh, and salt ponds around the Bay.
- ◆ Halts the encroachment of urban development into the San Francisco Bay System.
 - ◆ Will improve overall fish and wildlife value in the Estuary especially in the restricted tidal areas of the system.
 - ◆ Provides suitable refugia for endangered species such as the salt marsh harvest mouse.
12. Improve upstream spawning areas by improving management of gravel removal and sediment control.
- ◆ Will improve key spawning areas in the upper tributaries of the Sacramento and San Joaquin rivers.
 - ◆ Would establish improved regulations on gravel operations in the tributaries above spawning habitats.
13. Limit urban encroachment into Delta and Suisun Marsh.
- ◆ Reduces or eliminates encroachment into the Delta and Suisun Marsh that would reduce habitat quality and space available for plants and animals.
14. Provide flows for tributaries into Suisun Marsh for instream flows and downstream water quality.

- ◆ Would restore the water quality in Suisun Marsh and aid plant and animal populations.
15. Establish large preserves managed for multi-species in the Estuary.
 - ◆ Provides the best most comprehensive approach to restoring and maintaining the biological diversity and ecosystem functions of the estuary.
 16. Increase shallow water habitat in Delta.
 - ◆ Provide spawning habitat and escape cover for juvenile fish
 - ◆ Would provide food sources for terrestrial wildlife.
 - ◆ Provide areas of increased productivity.
 17. Reduce in-bay dredge disposal.
 - ◆ Reduces negative impacts associated with dredge disposal on fishery resources especially the Bay's benthic resources.
 18. Improve fish passage through taking out small dams that block fish migration.
 - ◆ Allows fish access to historic spawning habitat.
 19. Reduce indirect losses before fish get to fish facilities.
 - ◆ Would substantially improve the status of the estuary's fishery resources by reducing one of the largest sources of mortality indirectly related to export pumping in the Delta.

Fish Passage Facilities

1. Evaluate and employ new techniques for screening large or small diversions, i.e. acoustic barriers, self-cleaning rotary screens, modular incline screens at existing Fish Facility or at new Clifton Court Forebay intake.
 - ◆ Reduces export related impacts at the fish facilities.
2. Screen intake to Clifton Court Forebay.
 - ◆ Would place the fish salvage facility in front of the forebay.
 - ◆ Reduces the predation loss rates associated with the operation of the exporting facilities.

3. Install physical barriers where appropriate.
 - ◆ Reduces export related impacts at the fish facilities.
4. Reconfigure existing agricultural diversions.
 - ◆ Reduce the losses of fish to agricultural water diversions in the Delta.
5. Screen all agricultural diversions where effective in the Delta, Sacramento River, San Joaquin River and Suisun Marsh.
 - ◆ Would protect juvenile fish from agricultural diversions.
6. Consolidate agricultural diversions.
 - ◆ Would lessen impacts of water diversions on juvenile fish.
 - ◆ Reduces the costs associated with screening agricultural diversions.
7. Install screen or barrier at Georgiana Slough, Delta Cross-Channel, and/or Three-mile Slough.
 - ◆ Would reduce fish entrainment off of the Sacramento River and into the Central Delta.
 - ◆ Increase the survival of outmigrant Sacramento River system fish to Chipps Island.

Other

1. Build new hatcheries.
 - ◆ Would increase the overall abundance of key species in the system such as chinook salmon.
 - ◆ If implemented properly could be used to recover listed species such as winter-run chinook salmon and fish whose status has declined such as spring-run chinook salmon and San Joaquin fall-run chinook salmon.
2. Eliminate introduction of new exotic species.
 - ◆ Eliminating the source of new introduction such as through ballast water releases in the Sacramento-San Joaquin Estuary will reduce the incidence of new exotic species.

- ◆ If successful, will allow for a faster restoration of the Estuary's ecosystem.

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