

APPENDIX L

*CALFED Bay-Delta Program
Appendices - Phase 1 Summary Report*

DRAFT June 21, 1996

20 Draft Alternatives

Introduction

This appendix contains descriptions of the 20 draft alternatives. Each draft alternative was a *combination of actions* – such as operational and policy changes, habitat restoration, and water flow adjustments – that together form a comprehensive solution to problems in the Bay-Delta's four critical areas: ecosystem health, water quality, water supply, and vulnerability to disaster.

These draft alternatives resulted from considerable technical analysis, as well as interaction with the public, including agricultural, environmental, and urban water users. Far from being final products, the draft alternatives were subject to significant change based on further public input and technical analysis, including the possibility of combining portions of several alternatives to develop a new alternative. These 20 draft alternatives represent only a step, albeit an important one, in the process of developing a short list of supportable Bay-Delta solutions.

Alternative 1

Reduce Delta Diversions with Demand Management

Overview

This alternative reduces fish entrainment losses by decreasing diversions from the Bay-Delta watershed. Demand management actions will produce substantial water savings, expanding supply flexibility. Total Delta export volume will be reduced, allowing increases in spring Delta outflow to benefit fish transport and enhance ecosystem productivity. This alternative also includes basic levels of habitat restoration and actions to improve levee reliability and water quality.

*reduce fish
entrainment by
decreasing
diversions*

Various demand management methods including water conservation, water reclamation, and land retirement will be employed to sustain supplies for existing water users and provide alternative supplies for other users. An aggressive program of urban "Best Management Practices" and agricultural "Efficient Water Management Practices" will save approximately 500,000 to 1 million acre-feet of water per year. Substantial water reclamation investments will produce approximately 2 million acre-feet of new urban water supplies. Finally, approximately 800,000 acres of land would be permanently retired, reducing evapotranspiration by over 2.5 million acre-feet per year in normal water type years. Land retirement would focus on marginally productive lands, especially those that contribute substantially to regional drainage and water quality problems.

*demand
management
saves water*

To allow Delta diversions to be shifted away from the spring (February-June) period, this alternative includes actions to increase conjunctive use and groundwater banking in the southern San Joaquin Valley. In addition, market mechanisms and incentives will be used to facilitate water transfers. Groundwater storage will be filled in wet periods and withdrawn in dry periods, sustaining water supplies to users during dry periods without increasing fish entrainments. To further reduce entrainments at existing diversion locations, fish screens will be installed on high priority diversions throughout the Bay-Delta system, behavioral fish-movement barriers, or equivalent structures will be operated at the head of Old River and Georgiana Slough, and export forebay operations will be modified to reduce fish losses at the export pumps.

*shift diversions
away from
environmentally
sensitive periods*

This alternative includes basic habitat restoration both upstream and in the Delta. Suisun Bay tidal wetlands will be restored to provide habitat for Delta smelt and salmon. Levees will be rebuilt to improve flood protection and increase the extent of shallow water, riverine, and riparian habitats. These actions will focus on islands considered critical for water quality and having both regional infrastructure facilities and valuable habitat. Delta water quality will be addressed through the standard set of core actions.

*basic level of
habitat
restoration*

By continuing use of existing water management facilities in combination with substantial reduction in demands for Delta exports, this alternative increases fish populations and environmental quality while simultaneously sustaining water supplies.

increases fish populations while sustaining water supplies

Alternative 2 Drought Water Management Program

Overview

This alternative focuses on increasing the predictability of water supplies during drought conditions only. It develops institutional mechanisms to implement long-term contracts for drought water supply. Conjunctive use, groundwater banking, and demand management programs reduce demand for Delta water during dry years and produce water for drought transfers.

increase water supply predictability

During dry and critically dry years, many water users experience significant supply shortages. This alternative establishes a long-term drought water bank to improve supply reliability. The bank will enter into long-term contracts to acquire dry-year water from willing transferors. The bank will then contract with transferees to deliver dry-year water. Transferors will reduce their dry-year need for surface water through demand management and conjunctive use programs, and will use groundwater to make surface water available for drought year transfers.

water transfers for dry years

An in-lieu groundwater program will convey surface water to users currently relying on over-drafted groundwater basins. In wet years, these users will curtail groundwater pumping. In dry years, the resulting stored groundwater will be pumped and delivered to users in lieu of surface water deliveries. This will make the surface water available for transfers.

in-lieu groundwater program

This alternative includes a variety of demand management actions. Best management practices (BMPs) for urban water conservation will be expanded and implemented uniformly. Inclining block rates will encourage reduced landscape irrigation use, and new BMPs such as increased water-use efficiency in home appliances may be adopted. In the agricultural sector, efficient water management practices will be implemented and expanded to include water use measurement and water pricing that encourages greater efficiency. Feasible and affordable urban and agricultural wastewater reclamation efforts will be targeted. While emphasizing local projects, water reuse and demand management programs could be state and federally co-sponsored in water project service areas.

demand management water reclamation

Basic levels of habitat restoration and levee improvements are included in this alternative. Habitat actions include restoring riparian, wetland, and terrestrial

basic level of habitat

habitat on Delta and channel islands, and restoring tidal wetlands in Suisun Bay. These efforts will support increased survival and productivity of key fish species. Fish screens on high priority diversions and water storage dedicated for environmental uses will also provide benefits for fish. Flood protection will be provided by upgrading levees to a basic level. Other protection actions include levee maintenance and stabilization using berms, modification of agricultural practices to reduce subsidence, setback levees, and funding for maintenance and an emergency levee management plan.

restoration

*basic level of
levee
improvements*

Through institutional mechanisms to improve drought year water supply, this alternative provides benefits for all users of Delta water, while providing a basic level of levee improvements.

*benefits in four
objective areas*

Alternative 3

Ship Channel Conveyance

Overview

This alternative emphasizes a combination of habitat restoration, system reliability improvements, and actions to improve water supply. A portion of Delta export diversions will be relocated to one location upstream of the Delta to improve export water quality. State-of-the-art fish screens will be installed to protect fish from entrainment at the diversion. Water storage facilities will be constructed in the Delta, increasing the capacity to capture, store, and use flows for environmental and water supply benefits.

*relocate portion
of Delta export
diversions*

High quality water will be diverted from the Sacramento River upstream of the Sacramento Weir and above the identified "Critical Habitat for Delta Smelt". Water would be transported through an isolated conveyance facility that connects to the Sacramento Ship Channel. The ship channel will be converted to a water transport facility, or will work in concert with a parallel facility in the Yolo Bypass. Locks and/or fish barriers will be added to prevent fish from entering the channel. At the channel's southern terminus, the water would be conveyed by siphons and canals across the Delta to the southern pumps.

*diversion
upstream of
"critical habitat
for Delta smelt"*

New storage totaling approximately 200,000 acre-feet will be constructed along the northern section of the channel. This stored water can be used for export or direct release into the Sacramento River to transport fish out of the Delta. Direct connections could be made to the North Bay Aqueduct, Contra Costa Canal, and the South Bay Aqueducts. This would allow exchanges that could improve operational flexibility of the Delta pumps in order to minimize fish impacts. Water storage will be constructed on Delta islands to better manage water transfer and capture unregulated flows. This storage will also minimize storage constraints on exports, and help to provide water to users during critical periods while avoiding adverse effects on fish. In addition, water will be purchased from

*new storage has
multiple uses*

San Joaquin River users to improve transport of fish through the Delta and improve south Delta water quality.

This alternative combines water supply actions and environmental restoration with actions to improve levee stability and protect land uses and infrastructure in the Delta. Upstream of the Delta, screening of high and moderate priority diversions will increase fish populations. In the Delta, levees will be improved to protect critical western islands and islands with important local and regional infrastructure or important habitat. Restoration of riverine and riparian habitat and Suisun Bay tidal wetlands, in combination with substantial levee improvements, will provide environmental and system reliability benefits. Water quality improvements in the Delta are achieved through pollutant source control actions. By providing a new upstream diversion point and an isolated conveyance facility for a portion of Delta exports, this alternative provides better diversion management, reduced fish entrainment and improved export water quality. Additional water storage further maximizes system flexibility to meet Delta and export needs, while combined levee and habitat improvements provide increased system reliability and environmental benefits.

Alternative 4

Habitat Restoration

Overview

This alternative emphasizes increasing fish populations by making habitat improvements. Substantially increased fish populations can reduce the frequency and duration of Endangered Species Act constraints on water diversions, improving supply flexibility and reliability. In addition, the purchase of San Joaquin basin water and new in-Delta island water storage will improve fish transport through the Delta.

Currently, limitations on fish entrainment (take limits) are set to avoid jeopardizing fish populations. When these limits are approached, diversions are curtailed or stopped, creating a high degree of uncertainty for water users. Fish populations are affected by many factors including diversion effects, flow, and other habitat conditions. As habitat is improved, leading to greater fish populations, the effect of diversions on population should be reduced. This should consequently lessen take limit constraints on diversions, providing improved water supply reliability.

Restoration of habitats in the Sacramento River downstream of Sacramento will improve spawning and survival success of fish, while channel features will be restored to provide habitat. In the Delta, restoration of shallow riverine and riparian habitat will provide spawning areas for native fish and increase forage areas and escape cover for juvenile salmon, Delta smelt, splittail, and other species. Substantial areas of shallow tidal habitat will be developed in Suisun Bay for wet-year spawning and rearing of Delta smelt and the migratory needs of salmon. New habitat will be constructed along Delta channels.

*improve habitats
on Sacramento
River and in-Delta
to improve fish
populations*

*provides improved
water supply
reliability*

*75-125 miles of
habitat along
levees*

*750-1,250 acres of
tidal wetlands in
Suisun Marsh*

*fish screens on
highest priority
diversions*

Fish screens and barriers will be installed on highest priority diversions to reduce entrainment effects.

A new water storage facility will be constructed in the Delta, storing water for environmental uses. This facility will be filled through screened diversions when water is available and when fish entrainment can be avoided using real-time monitoring. Water from this facility will be released to improve fish transport conditions in the Delta and to shift the timing of diversions to avoid entrainment.

100 TAF of new environmental water storage in Delta

This alternative provides a basic level of levee improvements to reduce system vulnerability. Levee improvements will also incorporate habitat features. Water quality will be improved by controlling mine drainage entering the Delta.

basic level of levee protection linked to habitat restoration

By linking habitat restoration with levee improvements, this alternative increases fish populations while reducing system vulnerability. The conditions resulting from increased fish populations provide benefits to water supply reliability, predictability, and flexibility. Delta water quality is improved.

Alternative 5 Habitat Restoration with Dedicated Environmental Water

Overview

This alternative emphasizes increasing fish populations by making habitat improvements. Moderately increased fish populations can reduce the frequency and duration of Endangered Species Act constraints on water diversions, improving supply flexibility and reliability. In addition, the purchase of San Joaquin basin water and new in-Delta island water storage will improve fish transport through the Delta.

improved habitat on Sacramento & San Joaquin Rivers and in-Delta to improve fish populations

Currently, limitations on fish entrainment (take limits) are set to avoid jeopardizing fish populations. When these limits are approached, diversions are curtailed or stopped, creating a high degree of uncertainty for water users. Fish populations are affected by many factors including diversion effects, flow, and other habitat conditions. As habitat is improved, leading to greater fish populations, the effect of diversions on population should be reduced. This should consequently lessen take limit constraints on diversions, providing improved water supply reliability.

provides improved water supply reliability

75-125 miles of habitat along levees

Restoration of habitats in the Sacramento River downstream of Sacramento and channel improvements in the San Joaquin River will improve survival of fish. In the Delta, restoration of shallow riverine and riparian habitat will provide spawning areas for native fish and increase forage areas and escape cover for juvenile salmon, Delta smelt, splittail, and other species. New habitat will be constructed along Delta channels. Moderate areas of shallow tidal habitat will be developed in the Suisun Bay, providing wet-year spawning and rearing areas for Delta smelt and rearing areas for salmon. Fish screens on moderate and high priority diversions and barriers will be installed to reduce

fish screens on moderate and high priority diversions

1,500-2,500 acres of tidal wetlands in Suisun Marsh

entrainment and keep migrating fish in the main river channel.

restored

A new water storage facility will be constructed in the south Delta, storing approximately 100,000 acre-feet for environmental uses. This facility will be filled through screened diversions when water is available and when fish entrainment effects can be avoided using real-time monitoring. Water will be released from this facility to improve fish transport conditions in the Delta and to shift the timing of diversions to avoid entrainment effects. Water will be purchased from willing San Joaquin basin water users and released to transport fish through the Delta and improve water quality in the San Joaquin River and south Delta.

100 TAF of new environmental water storage in Delta

This alternative includes a moderate level of levee improvements and an emergency management plan to reduce system vulnerability. Levee improvements will also incorporate habitat features. Water quality will be improved by controlling pollutant discharges at the source, and by supporting land retirement of agricultural lands with drainage problems.

100 TAF environmental water purchased on S.J. River

By linking moderate habitat restoration and levee improvements, this alternative increases fish populations while reducing system vulnerability. The conditions resulting from increased fish populations provide benefits to water supply reliability, predictability, and flexibility.

moderate levee improvements and control of pollution sources

Alternative 6 Extensive Habitat Restoration with New Storage

Overview

This alternative emphasizes increasing fish populations by making extensive habitat improvements. Substantially increased fish populations can reduce the frequency and duration of Endangered Species Act constraints on water diversions, improving supply flexibility and reliability. In addition, the purchase of San Joaquin basin water and new in-Delta island water storage will improve fish transport through the Delta.

habitat improves fish population

Currently, limitations on fish entrainment (take limits) are set to avoid jeopardizing fish populations. When these limits are approached, diversions are curtailed or stopped, creating a high degree of uncertainty for water users. Fish populations are affected by many factors including diversion effects, flow, and other habitat conditions. As habitat is improved, leading to greater fish populations, the effect of diversions on population should be reduced. This should consequently lessen take limit constraints on diversions, providing improved water supply reliability.

75-125 miles of habitat along Delta levees

4,000 - 6,000 acres of tidal wetlands in Suisun Marsh

Restoration of upstream habitats in the Sacramento and San Joaquin river systems will improve spawning and survival success of fish, while channel features will be restored to provide habitat. In the Delta, restoration of shallow riverine and riparian habitat will provide spawning areas for native fish and increase forage areas and escape cover for juvenile salmon, Delta smelt, splittail, and other species. New habitat will be constructed along Delta channels. Moderate areas of shallow tidal habitat will be developed in the Suisun Bay for wet-year spawning and rearing of Delta smelt and the migratory needs of salmon. Fish screens on all priority diversions and barriers will be installed to reduce entrainment and keep migrating fish in the main river channel.

improve habitats in upper Sacramento and San Joaquin Rivers

about 100 TAF environmental purchased from San Joaquin

This alternative constructs a new water storage facility in the south Delta, storing 300,000 to 400,000 acre-feet for environmental purposes. The facility will be filled through screened diversions when water is available and when fish entrainments can be avoided using real-time monitoring. Water will be released from this facility to improve fish transport conditions in the Delta and to shift the timing of diversions to avoid entrainment effects. Water will be purchased from willing San Joaquin basin water users and released to transport fish through the Delta and improve water quality in the San Joaquin River and south Delta.

300-400 TAF of new Delta storage for the environment

fish screen all priority diversions

This alternative provides a high level of levee improvements, an emergency management plan, and a long-term subsidence program to permanently reduce system vulnerability. Water quality will be improved by controlling pollutant discharges at the source.

By linking extensive habitat restoration and levee improvements with additional storage dedicated for environmental purposes, this alternative increases fish populations while reducing system vulnerability. The conditions resulting from increased fish populations provide benefits to water supply reliability, predictability, and flexibility. Delta water quality is also improved.

extensive habitat restoration linked with extensive levee improvements

Alternative 7

Water Management with Environmental Storage

Overview

This alternative constructs in-Delta water storage facilities dedicated to environmental purposes and improves Delta channels for conveyance. These structural improvements will allow changes in the timing of Delta export operations to benefit fish populations while maintaining annual export volumes. Delta diversions will be shifted away from the February - June period to allow

change diversion timing to protect fish

increases in spring outflow, providing benefits to fish transport and ecosystem productivity.

Water diverted to the new in-Delta storage during periods when fish are not vulnerable will be later released to aid transport of fish from the Delta. This storage can also be used to supply export diversions at times when fish are not vulnerable. The in-Delta storage will be operated by environmental resource agencies. Increased conveyance capacity in Delta channels will allow the export pumps to operate at full capacity when fish are not vulnerable to entrainment. Diverting at full capacity during these times makes it possible to curtail diversions when fish are vulnerable without reducing water supply reliability.

*in-Delta storage
and increased
Delta channel
capacity*

Changes to Delta water operations will be implemented to substantially reduce effects on fish and habitats. Real-time monitoring will be used to curtail diversions to avoid entrainment during sensitive periods and to allow increased diversions during other nonsensitive periods. To further reduce entrainments at the existing diversion locations, fish screens will be installed on high priority diversions throughout the Bay-Delta system. Behavioral fish barriers will be operated at the head of Old River and Georgiana Slough, and export forebay operations will be modified to reduce fish losses at the pumps. Finally, the Delta Cross Channel will remain closed during November-June to prevent diversion of Sacramento River salmon outmigrants to the central Delta. Environmental agencies could allow gates to be opened when salmon smolts are not present or the barriers should remain open to reduce reverse flows.

*divert water
during less
environmentally
sensitive periods*

This alternative also includes various demand management actions to enhance water supplies for water users. Demand management will focus primarily on water conservation, water reclamation, and land retirement actions, producing substantial savings in water use and alternative supplies for other users. Land retirement would focus on marginally productive lands, especially those that contribute substantially to regional drainage and water quality problems. To facilitate shifting of Delta diversions away from the spring period without reducing total exports, this alternative also includes actions to increase conjunctive use and groundwater banking in the southern San Joaquin Valley, and uses market mechanisms and incentives to facilitate water transfers.

*demand
management
and conjunctive
use/groundwater
banking help
diversion timing*

Alternative 8

Chain of Lakes Isolated Facility

Overview

This alternative substantially restructures the Delta system to reduce entrainment effects on fish. Diversions will be relocated and habitat restored in ways that improve water supply reliability and reduce system vulnerability.

*diversion relo-
cations reduce
fish impacts*

Currently, the SWP and CVP operations modify natural flow patterns, moving fish into the South Delta where many of the fish are entrained and killed. Under the ESA, limits are set on fish entrainment (take limits) to avoid jeopardizing fish populations. When these limits are approached, pumping is temporarily reduced or stopped. The constant threat of a temporary pumping reduction or shut-down makes it difficult for export water users to predict or rely on their water supply. This alternative moves the SWP and CVP diversions to multiple points in the Delta and on the Sacramento River. This will reduce flow modifications and eliminate fish being drawn into the South Delta and killed at the export pumps. Complementary habitat improvements and fish screening will improve overall ecosystem health and further increase fish populations. Consequently, as fish populations recover and become more stable, ESA take limits should become less of a threat to water supply operations, not only for the SWP and CVP, but for all water users in the Sacramento and San Joaquin Basins.

*reducing
impacts on fish
improves water
supply reliability*

A chain of contiguous islands from the Sacramento River in the North Delta to the existing SWP and CVP pumps will be converted into water storage reservoirs. Each reservoir will be connected to adjacent reservoirs by large inverted siphons (pipes). At its northern end, this "chain of lakes" will be fed by a screened diversion from the Sacramento River. Other screened diversions will feed the chain of lakes at various points in the Delta. The chain of lakes, which will be isolated from Delta channels, will convey water to the SWP and CVP pumps. The chain will also deliver water to Delta water users. At any given time, the diversion or diversions that will least impact fish will be used to fill the reservoirs. At times when fish could be most impacted, diversions will be reduced or stopped, and water users will draw on stored water. The reservoirs may be filled and emptied several times each year. Organic soils will be removed or sealed from the reservoirs to avoid potential water quality problems with the stored water.

*a chain of
islands will be
connected into
water storage
reservoirs*

This alternative will restore moderate amounts of habitat in the Delta and upstream in the Sacramento and San Joaquin River systems by restoring channel features to improve survival of anadromous fish. In addition, the conversion of Delta islands into storage reservoirs is designed to incorporate substantial aquatic and terrestrial habitat improvements. Extensive levee improvements will incorporate habitat improvements. A moderate level of shallow tidal habitat will be developed in Suisun Marsh to benefit migrating salmon and provide spawning and rearing areas for Delta Smelt.

*moderate habitat
restoration
upstream, in the
Delta, and in
Suisun Marsh*

*extensive levee
improvements*

With the SWP and CVP diversions relocated, fresh water inflow to the Central and South Delta will be reduced, threatening water quality. Therefore, this alternative includes a supplemental water supply purchased from San Joaquin basin water users. This supplemental supply will increase the flexibility of environmental releases of water, improving water quality in the Central and South Delta while improving fish transport through the Delta. Additionally, overall water quality will be improved by pollutant source controls.

*water purchases
to protect water
quality and
improve fish
transport*

By increasing fish populations and improving aquatic habitat, ESA take limits

that affect pumping operations should be less constraining, thereby improving water supply reliability and predictability. Habitat restoration simultaneously reduces system vulnerability and protects overall water quality.

Alternative 9

Expand Export Capacity and South of Delta Storage

Overview

This alternative shifts the timing of a large portion of Delta diversions to periods of reduced impact on the Delta environment. The timing of diversions together with increased water storage, increases water supply reliability, improves water quality, and supports environmental needs.

increase water supply availability

This alternative increases the reliability of Delta water by increasing the permitted export pumping capacity to the physical capacity of the facilities during high flow winter periods (November-February). Export timing would be managed through a new, off-stream storage facility on the west side of the San Joaquin Valley, conjunctive use north and south of the Delta, and through in-lieu groundwater banking programs.

increase pumping capacity

Increased permitted pumping capacity at the export pumps would be used to fill new and existing off-stream storage south of the Delta. This would shift Delta exports to more environmentally acceptable periods, reduce Delta export needs during periods critical to fish species and water quality, increase Delta export flexibility, increase the capacity for transfers during the summer and early fall periods, and increase the availability of water for environmental needs.

1 - 1.5 million AF new south of Delta storage

An intensive in-lieu surface water - groundwater and conjunctive use program in the southern San Joaquin basin would be developed. Surface water in-lieu of groundwater extraction would be provided to irrigators who currently rely on groundwater in over-drafted areas. Without pumping, the groundwater would be allowed to recharge. During periods of drought, these irrigators and others would return to groundwater use thereby resulting in reduced demand for the available surface water. Water purchased from San Joaquin river users and additional water storage will be used to improve fish transport through the Delta and south Delta water quality.

in-lieu groundwater banking

This alternative would incorporate a moderate level of demand reduction activities in areas upstream of the Delta as well as in the export areas to further increase availability and reliability of water supply. Demand reduction would include expanding water conservation best management practices (BMPs) and efficient water management practices (EWMPs).

moderate level of habitat restoration

Moderate levee improvements will be implemented in the Delta to protect land use, infrastructure, and water supply. Levee protection would include riparian and shallow water habitat improvements. Habitat improvements in the Delta, some upstream areas, and Suisun Marsh, will promote increased natural production and success of key Delta species. Fish screens will be installed on high and moderate priority diversion to improve fish production and survival. In addition, source control of pollutants will be implemented to improve Delta water quality.

*moderate level
of levee
improvements*

*pollutant source
control*

In summary, through modifying the timing of diversions and providing additional water storage, this alternative increases supply availability for all uses with physical modifications in the Delta limited to levee and channel improvements to protect system functions from catastrophic failure.

Alternative 10

Small East-Side Conveyance

Overview

This alternative will reduce fish entrainment in the Delta and upstream by restructuring the Delta system. Some diversions will be moved to a less environmentally sensitive location, reducing fish losses. Moderate habitat restoration will further increase fish populations.

*diversions are
relocated to
protect fish*

Currently, the SWP and CVP pumps create reverse flows that move fish into the South Delta, where many of the fish are entrained. Under the ESA, limits are set on fish entrainment (take limits) to avoid jeopardizing fish populations. When these limits are approached, pumping is temporarily reduced or stopped. The constant threat of a temporary pumping reduction or shut-down makes it difficult for water users to predict or rely on their supply. This alternative moves a portion of the SWP and CVP diversions to the Sacramento River. This will reduce reverse flows and cause fewer fish to be drawn into the South Delta and killed. Also, moderate levels of habitat restoration and fish screening will improve overall ecosystem health and further increase fish populations. Consequently, larger fish populations will make ESA take limits less of a factor in water supply operations, not only for the SWP and CVP, but for all water users in the Sacramento and San Joaquin Basins.

*protecting fish
improves water
supply reliability*

A new partial SWP and CVP diversion will be located on the Sacramento River near Hood. The new diversion will be equipped with state of the art fish screens and real time monitoring to minimize entrainment of fish. A new canal, which will be isolated from the Delta, will be constructed to convey water from the new diversion to the existing Banks and Tracy Pumping Plants. The isolated facility will be sized to provide water service to users in Sacramento County, San Joaquin County and the Bay Area as well as the CVP and SWP. While the

*small diversion
moved to the
Sacramento
River and
connected to the
existing pumps
with a new canal*

new diversion location will improve water quality for most users, certain Bay Area users may find this water quality unacceptable.

This alternative will restore habitat along the Sacramento River downstream of Sacramento and restore channel features to improve survival of anadromous fish on the San Joaquin River. Moderate habitat restoration in the Delta will include improvement of shallow riverine and riparian habitats to improve conditions for anadromous fish. Levee improvements will incorporate habitat restoration. Shallow tidal habitat will be developed in Suisun Marsh to benefit migrating salmon and provide spawning and rearing areas for Delta Smelt.

moderate habitat restoration in the Delta and in Suisun Marsh

Water storage facilities with a total capacity of 1 to 2 million acre-feet will be constructed upstream of the Delta, in the Delta, and south of the Delta to increase the capacity to capture, store, and use flows for environmental and water supply benefits. Increased upstream water storage can be used to provide pulse flows to transport fish through the Delta. Water storage totaling 300,000 to 400,000 acre-feet will be constructed on Delta islands to better manage water transfers, capture unregulated flows, and minimize storage constraints on exports. This storage also allows water to be provided during critical periods while avoiding adverse effects on fish. Water will be purchased from San Joaquin River users to improve transport of fish through the Delta and improve south Delta water quality.

new storage upstream, in the Delta, and downstream

By creating a new diversion point for a portion of Delta exports, this alternative allows better management of diversions, reducing fish entrainment and improving water quality. Additional water storage throughout the system further maximizes flexibility to meet a variety of water needs, providing a moderate level of benefits for water supply, water quality, and environmental needs.

Alternative 11

Through-Delta Conveyance Improvement

Overview

This alternative relocates the diversion location for Delta exports to a new screened facility on the Sacramento River and expands the flow capacity of some existing north Delta channels to improve water flow through the Delta. The alternative would reduce fish entrainment impacts, improve the quality of some export water, and improve flows in the south Delta.

improved through Delta conveyance

At present, water from the Sacramento River is diverted into the Delta through the Delta Cross Channel and Georgiana Slough, both of which are unscreened. Water moves through the Delta to the pumping plants in the south Delta. High fish mortality results from the diversion of fish from their natural migration

reduce fish mortality with new screened diversion location

routes in the Sacramento River into the central Delta, reverse flows in Delta channels which provide improper cues to migratory fish, and entrainment at the pumps.

This alternative would reduce fish mortality rates by screening the new intakes on the Sacramento River and eliminating reverse flows by improving the efficiency of flow through the Delta and increasing the permitted export pumping facility. The new intake facility with state-of-the-art fish screens would be constructed on the Sacramento River near Hood, providing a fresher source of water and keeping fish in the Sacramento River. Fish screens would also be constructed on moderate and high priority diversions in the Delta and on upstream rivers and tributaries. Improvements to Delta channels would improve the efficiency of water flow to the south Delta pumps and would reduce or eliminate reverse flows in the channels.

expand flow capacity of some existing channels

fish screens on moderate and high priority diversions

New water storage dedicated for environmental purposes will be created in the Delta. This facility would be filled when water was available. Water would be released from this facility to improve fish transport in the Delta or to flush fish away from the pumps to allow diversions to continue. Real-time monitoring would be used to avoid fish entrainment. Water for environmental purposes would be purchased from San Joaquin River users to be used for fish transport and to improve south Delta water quality. Delta and Sacramento water quality would also be improved by reduction in pollutant discharges from agricultural, municipal, industrial, and mine sources. Retirement and fallowing of agricultural land with drainage problems will increase available water supplies while reducing pollutant discharges.

100 TAF of new environmental water storage in Delta

improved water quality through pollutant source control

This alternative restores habitat in the Sacramento River downstream from Sacramento and restores channel features to improve survival of anadromous fish on the San Joaquin River. This alternative also restores aquatic and riparian habitats along Delta levees, restores shallow riverine and riparian habitat along Delta channels, and creates tidal wetlands in Suisun Bay. Delta levees will be improved to a moderate level, and will incorporate habitat restoration activities. A stable funding source for levee maintenance would be established, and an emergency levee management plan would be established and funded.

moderate levels of levee protection

1,500 to 2,500 acres of tidal wetlands in Suisun Marsh

By screening a new intake, improving flows through the Delta and using acquired and stored water, this alternative improves export and south Delta water quality, increases water supply reliability and reduces fish mortality.

improved conditions for all four objective areas

Alternative 12

Dual Conveyance

Overview

This alternative relocates a portion of South Delta diversions to a new screened facility on the Sacramento River and constructs a small, isolated transfer facility along the east side of the Delta to the south Delta pumps. This alternative would reduce fish entrainment impacts, improve the quality of some export water, and improve flows in the south Delta.

small isolated facility with increased through-Delta conveyance

At present, water from the Sacramento River is diverted into the Delta through the Delta Cross Channel and Georgiana Slough, both of which are unscreened. Water moves through the Delta to the pumping plants in the south Delta. High fish mortality results from the diversion of fish from their natural migration routes in the Sacramento River into the central Delta, reverse flows in Delta channels which provide improper cues to migratory fish, and entrainment at the pumps. This alternative will reduce fish mortality rates by screening a new intake on the Sacramento River, reducing reverse flows and reducing pumping in the south Delta.

reduce fish mortality with new screened diversion location

A new intake facility with state-of-the-art fish screens will be constructed on the Sacramento River near Hood, to provide a fresher source of water for diversions and to keep fish in the Sacramento River. A portion of this water would be transported around the Delta in a small isolated transfer facility and delivered directly to multiple Delta water users, including the export pumps. Fish screens would also be constructed on high and moderate priority diversions in the Delta and on upstream rivers and tributaries. Closure of the Delta Cross Channel would accompany operation of the new diversion; otherwise fish impacts would be greater than now.

7,000 cfs isolated conveyance facility

new screened diversions

New water storage would be created in the Delta to be dedicated for environmental purposes. This facility would be filled when water was available and real-time monitoring would be used to avoid fish entrainment. This facility would release water to improve fish transport in the Delta or to flush fish away from the pumps, allowing diversions to continue.

100,000 AF of new environmental storage in Delta

Water for environmental purposes would be purchased from San Joaquin River users to be used for fish transport and to improve south Delta water quality. Delta and Sacramento water quality would also be improved by reductions in pollutant discharges from agricultural, municipal, industrial, and mine sources. Retirement and fallowing of agricultural land with drainage problems would increase available water supplies as well as reduce pollutant discharges.

about 100,000 AF of water from San Joaquin River willing sellers

This alternative will restore habitat in the Sacramento River downstream from Sacramento and restore channel features on the San Joaquin River to improve survival of anadromous fish. This alternative would also restore a variety of aquatic and riparian habitats along Delta levees, and would restore shallow riverine and riparian habitat along Delta channels. Tidal wetlands would be created in Suisun Marsh. Delta levees would be improved to a moderate level, and habitat restoration activities would be conducted in concert with levee improvements. A stable funding source for levee maintenance would be established, and an emergency levee management plan would be established and funded.

moderate habitat restoration upstreams in the Delta and in Suisun Marsh

Through the use a new isolated transfer facility, screened intakes and reduced south Delta pumping, this alternative will improve water quality and supply reliability while reducing fish mortality. Acquired and stored water will also support these goals.

improves conditions for all four objectives

Alternative 13 East-Side Foothills Conveyance

Overview

This alternative will reduce fish entrainment in the Delta and upstream by restructuring the water distribution system. A portion of export diversions will be moved to a less environmentally sensitive location, reducing fish losses. Moderate habitat restoration will further increase fish populations.

diversions are relocated to save fish

Currently, the SWP and CVP pumps create reverse flows that move fish into the South Delta, where many of the fish are entrained. Under the ESA, limits are set on fish entrainment (take limits) to avoid jeopardizing fish populations. When these limits are approached, pumping is temporarily reduced or stopped. The constant threat of a temporary pumping reduction or shut-down makes it difficult for export water users to predict or rely on their supply. This alternative moves a portion of the SWP and CVP diversions to the Sacramento and Feather Rivers upstream of the Delta. This will reduce reverse flows and cause fewer fish to be drawn into the South Delta and entrained. Also, moderate levels of habitat restoration and fish screening will improve overall ecosystem health and further increase fish populations. Consequently, larger fish populations will make ESA take limits less of a factor in water supply operations, not only for the SWP and CVP, but for all water users in the Sacramento and San Joaquin Basins.

saving fish improves water supply reliability

new isolated conveyance facility

A portion of the SWP and CVP diversions will be relocated upstream of the Sacramento River/Feather River confluence. New diversions will be constructed on the Sacramento and Feather rivers to supply a new canal. This canal will convey water south along the east side of the Sacramento and San Joaquin valleys to the California Aqueduct in Kern County. The existing

Folsom South, Madera, Friant Kern and Cross Valley Canals may be modified to incorporate the new canal. The new canal will be connected to east side projects (e.g., Mokelumne Aqueducts) to improve water supplies, facilitate water transfers and increase instream flows in east side rivers. Water will also be delivered for groundwater recharge and banking in the San Joaquin Valley, including San Joaquin county. The new canal will operate mostly in the winter and spring to capture flood flows for banking and subsequent use. This will reduce the need to divert from the Delta during more environmentally sensitive periods. Additionally, remaining exports from the existing facilities may encounter reductions in water quality as a result of upstream diversions.

a new canal runs from the Sacramento and Feather Rivers to the California Aqueduct in Kern County

This alternative will moderately improve habitat along the Sacramento River downstream of Sacramento and will restore channel features on the San Joaquin River to improve survival of anadromous fish. Moderate habitat restoration in the Delta will include improvement of shallow riverine and riparian habitats to improve conditions for anadromous fish. Moderate levee improvements will incorporate habitat restoration. Moderate levels of shallow tidal habitat will be developed in Suisun Marsh to benefit migrating salmon and provide spawning and rearing areas for Delta Smelt.

moderate habitat restoration upstream, in the Delta, and in Suisun Marsh

With a portion of the SWP and CVP diversions relocated, inflow to the Central and South Delta will be reduced, threatening water quality in these areas and for some export users. Therefore, this alternative includes new in-Delta storage facilities, flow barriers, and a water supply purchased from willing San Joaquin River Basin water users. The in-Delta storage and water purchases will increase the flexibility of environmental releases of water, protecting water quality in the Central and South Delta while improving fish transport through the Delta. Additionally, overall water quality will be improved by pollutant source controls.

water purchases and storage to protect water quality and improve fish transport

By increasing fish population and improving aquatic habitat, ESA take limits that affect pumping operations will be less constraining, thereby improving water supply reliability and predictability. Habitat restoration simultaneously reduces system vulnerability and protects overall water quality.

Alternative 14

West-Side Sacramento Small Conveyance Facility

Overview

This alternative emphasizes a combination of habitat restoration, system reliability improvements, and actions to improve water supply. A portion of Delta export diversions will be relocated to two locations upstream of the Delta in order to reduce fish entrainment and improve export water quality. Water storage facilities will be constructed upstream of and in the Delta, increasing the capacity to capture, store, and use flows for environmental and water supply benefits.

relocate export diversions

High quality water will be diverted during flood flows from the Sacramento River at Red Bluff and from the Feather River at Thermalito Afterbay. Water from both diversions would be conveyed to a new off-stream storage facility of approximately 1.5 to 2 million acre-feet, located on the west side of the Sacramento Valley. Sacramento River water would be diverted using the pumps at the Red Bluff diversion dam and conveyed to the reservoir via the Tehama-Colusa Canal. A new conveyance facility connecting Thermalito Afterbay to the new reservoir would siphon under the Sacramento River. A transfer facility would be constructed from the new reservoir to pumps in the south Delta. Possible interties could also be created to the North Bay Aqueduct, Contra Costa Canal, the Mokelumne Aqueduct, and the South Bay Aqueduct.

2 million AF of new storage in the Sacramento Valley

Water storage will be constructed on Delta islands to better manage water transfers and capture unregulated flows. This will also minimize storage constraints on exports and allowed to be supplied to users during critical periods while avoiding adverse effects on fish. In addition, water will be purchased from San Joaquin River users to improve transport of fish through the Delta and improve south Delta water quality.

Delta storage and purchased water for the environment

This alternative combines water supply actions and environmental restoration with actions to improve levee stability and protect land uses and infrastructure in the Delta. Upstream of the Delta, habitat restoration and screening of high and moderate priority diversions will increase fish populations. In the Delta, levees will be improved to protect critical western islands and islands with important local and regional infrastructure or important habitat. Restoration of riverine and riparian habitat in combination with restoration of Suisun Bay tidal wetlands will also benefit fish populations. Water quality improvements in the Delta will be achieved through pollutant source control actions.

restore habitat, improve levees, and control pollutant sources

By providing new upstream diversion points and a transfer facility for a portion of Delta exports, this alternative supports better management of diversions, improves water quality and reduces fish mortality. Additional water storage throughout the system further maximizes flexibility to meet various water needs.

Alternative 15

Large West-Side Storage and Conveyance

Overview

This alternative emphasizes a comprehensive combination of habitat restoration, system reliability improvements, and actions to expand water supply, achieving a high level of benefits. Major diversions now impacting fisheries will be relocated and consolidated to upstream locations in existing reservoirs, eliminating entrainments and improving export water quality. Large water storage facilities will be constructed upstream of the Delta, increasing the capacity to capture, store, and efficiently use flows for environmental and water supply benefits.

High quality water will be diverted during high flows from Shasta Lake and the Feather River at Thermalito Afterbay, and conveyed to new off-stream storage facilities totaling 8 to 10 million acre-feet for "banking" on the west side of the Sacramento Valley. Operation of Shasta and Oroville reservoirs would be modified to operate in concert with the new reservoirs but would continue to meet instream flow standards. The conveyance system from the new reservoirs would cross under the Delta and terminate at the current south Delta pumps to improve water quality.

Sacramento River diversions such as Red Bluff and Glen Colusa Irrigation District would be eliminated and irrigation districts would receive stored water. Turnouts along the new conveyance system would serve west-side agriculture and groundwater conjunctive use areas. A large transfer facility would be constructed from the new reservoirs to pumps in the south-Delta, with possible additional interties to the North Bay Aqueduct, Contra Costa Canal, the Mokelumne Aqueduct, and the South Bay Aqueduct. Water will also be purchased from San Joaquin River users to improve fish transport through the Delta and improve south Delta water quality.

Environmental restoration and water supply actions in this alternative are combined with actions to improve levee stability and protect land uses and infrastructure in the Delta. Upstream of the Delta, habitat restoration and screening of moderate and high priority diversions will increase fish populations. Delta levees will be improved to protect critical western islands and islands with important local and regional infrastructure or important habitat. Restoration of riverine and riparian habitat and tidal wetlands around Suisun Bay, in combination with substantial levee improvements in the Delta, will greatly increase fish habitat and decrease system vulnerability. Water quality improvements in the Delta are achieved through pollutant source control actions and water augmentation.

*major diversions
in Sacramento
river and Delta
relocated*

*approximately 8-
10 million AF of
new upstream
storage*

*large 10,000-
15,000 cfs
isolated cross-
Delta facility
improves water
quality*

*improved
habitats on
Sacramento and
San Joaquin
Rivers*

*75-125 miles of
habitats along
levees*

By combining new diversion points for the Sacramento River and the Delta exports and removing them from estuary and river system, this alternative allows diversions to be managed to reduce entrainment and improve water quality. Additional water storage will further maximize flexibility to meet Delta needs,

while moderate levee and habitat improvements will provide environmental and system infrastructure benefits.

Alternative 16

Large East-Side Conveyance

Overview

This alternative will reduce fish entrainment in the Delta and upstream by restructuring the Delta system. Diversions will be moved to a less environmentally sensitive location, reducing fish losses. Extensive habitat restoration will further increase fish populations.

*diversions are
relocated to
protect fish*

Currently, the SWP and CVP pumps create reverse flows that move fish into the South Delta, where many of the fish are entrained. Under the ESA, limits are set on fish entrainment (take limits) to avoid jeopardizing fish populations. When these limits are approached, pumping is temporarily reduced or stopped. The constant threat of a temporary pumping reduction or shut-down makes it difficult for water users to predict or rely on their supply. This alternative moves the SWP and CVP diversions to the Sacramento River. This will reduce reverse flows and cause fewer fish to be drawn into the South Delta and killed. Also, maximum levels of habitat restoration and fish screening will improve overall ecosystem health and further increase fish populations. Consequently, larger fish populations will make ESA take limits less of a factor in water supply operations, not only for the SWP and CVP, but for all water users in the Sacramento and San Joaquin Basins.

*saving fish
improves water
supply reliability*

The SWP and CVP diversions will be relocated from the South Delta to the Sacramento River near Hood. The new diversion will be equipped with state of the art fish screens and real time monitoring to minimize entrainment of fish. A new canal, which will be isolated from the Delta, will be constructed to convey water from the new diversion to the existing Banks and Tracy Pumping Plants. The isolated facility will be sized to provide water service to users in Sacramento County, San Joaquin County and the Bay Area as well as the CVP and SWP. While the new diversion location will improve water quality for most users, certain Bay Area users may find this water quality unacceptable.

*diversions
moved to the
Sacramento
River and con-
nected to the
existing pumps
with a new canal*

This alternative will extensively restore habitat upstream of the Delta in the Sacramento and San Joaquin systems by constructing meander belts and

*maximum
habitat*

restoring channel features to improve spawning success and survival of anadromous fish. Maximum habitat restoration in the Delta will include improvement of shallow riverine and riparian habitats to improve conditions for anadromous fish. Extensive levee improvements will incorporate habitat restoration. Substantial shallow tidal habitat will be developed in Suisun Marsh to benefit migrating salmon and provide spawning and rearing areas for Delta Smelt.

*restoration
upstream, in the
Delta, and in
Suisun Marsh*

With the SWP and CVP diversions relocated, inflow to the Central and South Delta will be reduced, threatening water quality in these areas. A supplemental water supply purchased from San Joaquin River Basin water users will increase the flexibility of environmental releases of water, protecting water quality in the Central and South Delta while improving fish transport through the Delta. Additionally, overall water quality will be improved by pollutant source controls.

*extensive levee
improvement*

By improving fish habitat and increasing fish populations, ESA take limits that affect pumping operations will be less constraining, thereby improving water supply reliability and predictability. Habitat restoration simultaneously reduces system vulnerability and protects overall water quality.

*water purchases
to protect water
quality and
improve fish
transport*

Alternative 17

Delta Protection and Water Management

Overview

This alternative emphasizes management of Bay-Delta water quality by modifying releases from existing upstream reservoirs and installing barriers at Delta locations that are crucial to in-Delta water quality. Tidal gates and flow barriers will be installed in the south Delta to improve flow circulation.

*manage Bay-
Delta water
quality*

Upstream reservoir releases will be operated as needed to improve upstream anadromous fish habitat conditions (e.g. flow and temperature), transport fish through the Delta and improve water quality. Improved flow conditions in upstream and in-Delta aquatic habitat will substantially increase populations of key fish species.

*existing
reservoirs
operated to
improve flow
conditions*

This alternative includes basic actions to address habitat restoration upstream and in the Delta and improve Delta levee reliability. Approximately 100 miles of levees in the Delta will be rebuilt to improve flood protection and increase the extent of shallow water, riverine, and riparian habitats. Levee protection will focus on western Delta islands critical for water quality and other islands with both regional infrastructure facilities and valuable habitat. Tidal wetlands

*basic levels of
habitat and levee
improvement*

will be restored along Suisun Bay, and a subsidence management program will gradually reduce flooding risk on Delta islands and increase wetland habitat.

To further reduce entrainment impacts at existing diversion locations, fish screens will be installed on high priority diversions throughout the Bay-Delta system. Behavioral fish-movement barriers or functional equivalents will be evaluated for use at the head of Old River, Georgiana Slough, Threemile Slough, and on the Delta Cross Channel. Forebay operations at the export diversion facilities will be modified to reduce fish losses at the export pumps.

fish screens and barriers benefit fish

The alternative includes a modest program of demand management actions. These focus primarily on water conservation and retirement of marginally productive lands, especially those that contribute substantially to regional drainage and water quality problems. Groundwater banking, conjunctive use, and water transfers will also be used to enhance water supplies. Pollutant source controls will be implemented to reduce adverse effects of agricultural, urban, and mine drainage on water quality.

demand management and groundwater banking and conjunctive use

By modifying and improving flow conditions that control water quality upstream and in the Delta, this alternative provides benefits for all uses of Bay-Delta system resources. These actions will substantially increase habitat quality and productivity while enhancing water quality for in-Delta uses and for exports. The water quality actions will be balanced by habitat restoration and levee improvement actions.

benefits for each of four objective areas

Alternative 18 Delta Protection With Storage

Overview

This alternative emphasizes improved system reliability by upgrading levees, improving maintenance, and increasing the flow capacity of some existing north Delta channels. This will provide improved flood protection. Additional water storage is created in the Delta to provide environmental benefits and south of the Delta to improve water supply reliability.

Delta protection and new storage

This alternative improves Delta levees to a moderate level of flood protection and provides a plan and stable funding source for levee maintenance and an emergency levee response. New water storage in the Delta dedicated for environmental purposes would be filled when water was available and real-time monitoring would be used to avoid fish entrainment. Water would be released to improve fish transport in the Delta, flush fish away from the pumps to allow diversions to continue, or manage Delta salinity levels. Additional off-stream

water storage for environmental purposes

storage would be created along the west side of the San Joaquin Valley to store water diverted from the Delta during times of high water availability.

Fish screens will also be constructed on high and moderate priority diversions in the Delta and on upstream rivers and tributaries. Improvements to Delta channels would improve the efficiency of water flow to the south Delta pumps and could reduce reverse flows in Delta channels. Water for environmental purposes would be purchased from San Joaquin River users to be used for fish transport and to improve south Delta water quality. Delta and Sacramento water quality would also be improved by reductions in pollutant discharges from agricultural, municipal, industrial, and mine sources. Retirement and fallowing of agricultural land with drainage problems and reclamation and conservation programs would decrease demand for Delta water and improve water quality.

*fish screens and
water quality
protection*

Because pumping in the south Delta would continue, habitat restoration would be concentrated in other parts of the Delta. This alternative would restore habitat on the Sacramento River downstream from Sacramento and restore channel features on the San Joaquin River to improve survival of anadromous fish. This alternative also restores a variety of aquatic and riparian habitats along Delta levees, restores shallow riverine and riparian habitat along Delta channels, and creates tidal wetlands in Suisun Bay.

*Delta habitat
restoration*

By providing increased protection of Delta islands, improving flows through the Delta, and constructing new storage facilities, this alternative will improve system reliability. The use of acquired and stored water will also enhance the reliability of supplies while improving south Delta water quality and reducing fish mortality.

Alternative 19

Improve Delta Flow Through Operational Changes

Overview

This alternative focuses on increasing the availability, reliability, and quality of water supplies primarily through operational changes of the water system. Physical modifications within the Delta include habitat improvements, new water storage for environmental uses, levee and channel improvements for flood control, and flow barriers to improve water stages and flow circulation.

*operational
changes to the
system*

Operational changes in this alternative include moderate demand management actions such as water conservation and land retirement to reduce the need for Delta water, modified operations of existing reservoirs, and increased reliance

*groundwater
banking*

on groundwater banking and conjunctive use to increase water availability. Specifically, groundwater storage and conjunctive use programs in the Sacramento and San Joaquin River basins will be expanded, maximizing the ability to make operational changes in other portions of the system. High surface flows during early winter months are stored in the ground for later use during summer months or during drought periods. This allows increased flexibility in using both stored groundwater and surface water to improve the quantity and quality of water available.

A strong emphasis is placed on water pollutant source control and using operational changes to better manage the flow of pollutants to the Delta.

With water available from expanded groundwater and conjunctive use programs, the operation of existing upstream and downstream surface reservoirs, conveyances, and diversion systems can be modified for more efficient water management. Generally, releases from reservoirs could be modified to increase summer and fall flows through the Delta while addressing localized water quality problems such as south Delta salinity. The timing of Delta and export diversions would also be managed more precisely during seasonal and localized poor water quality conditions. Improving water quality and supply by focusing on operational modifications to the storage, conveyance, and diversion system will require development of real time flow monitoring and management of the system. In addition, acquisition of water from willing sellers will increase the amount available for Delta uses.

*demand
management
and water
acquisition*

This alternative provides basic levels of habitat restoration and levee improvements. Habitat restoration will take place in the river systems, Delta islands, channels, and upland areas, and Suisun Marsh. Fish screens will be installed on all high priority diversions in and upstream of the Delta. A basic level of Delta levee and channel improvement will reduce the vulnerability of system functions to catastrophic failure.

*basic level of
habitat
restoration*

By integrating operational changes related to water supply and ecosystem quality with improved flow conditions, this alternative achieves water quality benefits while providing basic improvements to Delta levees and channels.

*basic level of
levee
improvement*

Alternative 20

Improve Delta Flow Through Added Storage

Overview

This alternative emphasizes new storage and operational changes of the water system, increasing the availability, reliability, and quality of water supplies. Physical modifications within the Delta include habitat improvements, new water storage for environmental uses, levee and channel improvements for flood

control, and flow barriers to improve water stages and flow circulation.

This alternative provides additional surface storage in the Delta as well as upstream and downstream. A variety of moderate demand management actions including water conservation and land retirement reduce the need for Delta water. Expanded groundwater storage and conjunctive use programs in the Sacramento and San Joaquin River basins maximize the ability to make operational changes in other portions of the system. High surface flows during the early winter months are stored in the ground for later use during summer months or during drought periods. This allows increased flexibility in using the stored water in conjunction with stored surface water to improve the quantity and quality of water available.

*primarily new
storage and
operational
changes*

With water available from new storage and from the expanded groundwater and conjunctive use programs, the operations of existing upstream and downstream surface reservoirs, conveyances, and diversion systems can be modified for more efficient water management. Generally, releases from reservoirs could be modified to increase summer and fall flows through the Delta while addressing localized water quality problems such as south Delta salinity. The timing of Delta and export diversions would also be managed more precisely during seasonal and localized poor water quality conditions. In addition, acquisition of water from willing sellers on the San Joaquin system will increase the amount available for Delta environmental uses. Improving water quality and supply by focusing on new storage and operational modifications to the storage, conveyance, and diversion system requires development of real time flow monitoring and management of the system.

*modify existing
operations*

Habitat in the Delta and around Suisun Bay will be restored and fish screens will be installed on high and moderate priority diversions. These actions will improve fish production and survival. A moderate level of levee and channel improvement in the Delta will significantly reduce the risk of system failure.

A strong emphasis is placed on controlling water pollutant sources and using the operational changes to better manage the flow of pollutants to the Delta. These actions include implementing source control regulations for agricultural drainage and retiring lands with drainage problems. Treatment controls may include storage and treatment facilities for better management of mine drainage sources. In addition, increased flows, better management of the timing of flows, and providing barriers to better direct these flows will improve water quality.

*water quality is
prime benefit*

In summary, this alternative achieves water quality benefits by integrating actions related to water supply and ecosystem quality with those that improve flow conditions for all uses while providing a significant degree of improvement Delta levees and channels.

*benefits in four
objective areas*