

# **“Fortified Aqueduct” proposal**

**(Straw scenario 2, with potential to develop to scenario 5)**

*Staff suggestions in italics*

*Note: The following considerations have been set aside for the purposes of moving forward with this proposal until their effects are further understood:*

- *Salinity*
- *Protection levels*
- *Assumed export quantity*

## **Land form and levees:**

\* Protect the existing island configuration and use a fortified channel for primary water conveyance along South Fork of Mokelumne and Middle River (**EC.1**).

\* Protect critical infrastructure, including the water conveyance channel, and a South Delta infrastructure corridor (including Highway 4, the Mokelumne Aqueduct, and the BNSF Railroad; **EC.2**) with seismically safe levees.

\* Reduce risk of failure of all western islands to a reasonable level. Explore use of cross-levees to achieve this risk reduction by confining inundation in the event of exterior levee failure (with caution not to endanger existing residents), and to provide flexible management opportunities in different sub-sections of islands (**EC.3**).

\* Improve other levees to future 100-year flood protection as scientific knowledge of future hydrology emerges.

\* Enhance habitat conditions along Old River and in west Delta with setback and/or vegetated levees. Explore appropriateness of setback levees on Sutter and Steamboat Sloughs (**EC.4**).

\* Explore dredging of Yolo Bypass and quarrying of Montezuma Hills as sources of fill material (delivered by slurry line) to rebuild key western Delta islands, particularly Sherman Island, to sea level over time (**EC.5**).

\* Reuse all other dredged materials beneficially (e.g. for levee construction, island fill) whenever possible.

\* Identify areas to store materials for emergency response (including temporary channel barriers) as soon as possible

\* Explore the potential for floodways and additional groundwater and surface water storage to mitigate effects of global warming, including reduced snowpack.

## **Conveyance and water quality:**

\* Partially segregate the water conveyance system and aquatic habitat by gating connections between Old and Middle Rivers (**EC.6**), and siphoning the Victoria Canal under Old River to deliver water to the Clifton Court Forebay (**EC.7**).

\* Extend Contra Costa Water District and East Contra Costa Irrigation District intakes to Middle River and move south (**EC.8**).

\* After above conveyance strategy is constructed and operating, and pending results of hydrodynamic modeling, cost-benefit analyses, and other relevant studies, explore construction of additional isolated conveyance channel **(EC.9)**.

### **Ecosystem:**

\* Restore floodplain along the main stem of the Sacramento River (upstream of city of Sacramento) for the benefit of splittail and migrating salmonids, and to increase nutrient and organic carbon flows to Delta. Improve salmon spawning gravels in upstream reaches and tributaries of Sacramento River **(EC.10)**.

\* Explore infiltration of floodwaters upstream to reduce Delta flood risk and replenish Central Valley groundwater aquifers **(EC.11)**

\* Manage Yolo Bypass for benefit of splittail and salmonids, and to increase nutrient and organic carbon flows to Delta **(EC.12)**

\* Enhance channel configuration and hydraulics of Elk Slough, Sutter Slough, and Steamboat Slough to provide alternative route for migratory fish that avoids Georgiana Slough and the Delta cross-channel **(EC.13)**

\* Improve hydraulic residence time and tidal exchange between Cache Slough and the Delta to contribute organic carbon, nutrients, phytoplankton and zooplankton to the Delta, for the benefit of Delta smelt among others. Create a hydrologic and terrestrial connection between Cache Slough and Suisun Marsh **(EC.14)**

\* Restore Mokelumne and Cosumnes River corridors **(EC.15)**

\* Increase availability of brackish and freshwater tidal habitat in Suisun Marsh, including dendritic channels with both intertidal and subtidal areas, to increase habitat diversity and quality, and availability of habitat for Delta smelt and other species. Increases in organic carbon, phytoplankton, and zooplankton production benefit numerous aquatic species in the area. Continue to maintain significant expanses of freshwater marsh in Suisun Marsh **(EC.16)**.

\* Restore seasonal floodplains on lower San Joaquin River, including flood bypass on Paradise Cut **(EC.17)**

\* Restore tidal marsh on Decker Island and Dutch Slough **(EC.18)**

\* Create setback levees at other opportune sites in west Delta and the lower Sacramento River to allow tidal marsh restoration.

\* Enhance river channel habitat along the length of Old River **(EC.19)**.

\* Explore habitat enhancement in numerous other channels, including Georgiana Slough, both forks of the Mokelumne River and East Side tributaries if dual conveyance strategy is built **(EC.20)**

\* Purchase terrestrial habitat and wetlands easements from willing landowners. Maintain working landscapes that also serve ecological and recreational enhancement goals.

\* Create new flood bypasses along lower San Joaquin River and in Stone Lakes region. Link south Delta flood bypass to tidally influenced habitat areas on Fabian Tract. Explore potential for additional flood bypass parallel to Sacramento ship channel **(EC.21)**.

\* Create floodplain habitat on McCormack Williamson Tract **(EC.22)**.

- \* Manage flood bypasses for fish migration and rearing in low flows, and for flood attenuation in high flows. Maintain hydrologic connection between bypasses / floodplains and rivers during spring flows.
- \* Explore creation of tidally influenced habitats on selected portions of Fabian Tract and Netherlands Tract **(EC.23)**.
- \* Explore controlled inundation of selected western Delta islands for operational flexibility in water management, ecosystem management and levee failure risk reduction **(EC.24)**.
- \* Explore creation of perennial, non-tidal habitats on Bouldin Island, Holland Tract and potentially elsewhere **(EC.25)**
- \* Conduct flexible experimentation and adaptive management of Delta ecosystem, especially with respect to in-channel flow and salinity, with channel gates
- \* Experiment with depths and forms of river channels to simulate natural conditions of aquatic habitat
- \* Develop a sequenced plan for dealing with invasive species and fish problems without creating undue harm to other parts of the ecosystem.
- \* *Assist in the achievement of habitat acquisition, creation, and enhancement goals of Central Valley Joint Venture for seasonal wetlands, semi-permanent wetlands, riparian forests, and waterfowl-friendly agriculture*
- \* *Assist in the acquisition of water needed for seasonal and semi-permanent wetland habitat acquisition, creation, and enhancement under the Central Valley Joint Venture plan*
- \* *Insert flow barrier on eastern edge of Clifton Court Forebay to avoid fish entrainment.*

**Land use:**

- \* Encourage integration of agriculture, wildlife-related recreation and ecological enhancement on agricultural land throughout the Delta.
- \* Provide incentives to farmers to manage land for multiple public benefits, including ecological enhancement.
- \* Create programs and research to incentivize farming that deals proactively with climate change and subsidence (e.g. carbon sequestration crops, rice, etc.).
- \* Concentrate tourism and recreation investments along Highways 160 and 12, in north Delta waterways, and in legacy towns **(EC.26)**.
- \* Permit sustainable growth to allow for socially and economically viable communities in legacy towns **(EC.27)**.
- \* Permit boating throughout Delta.
- \* Enhance fishing, hunting and birdwatching through ecosystem management changes described above.
- \* Explore recreational trail development in eastern Delta transition zone between Delta and uplands **(EC.28)**
- \* Develop conservancy and/or land trust to buy and protect agricultural and open space lands that are at risk of urban development in and around the periphery of the Delta.

**Infrastructure:**

\* Protect Highway 4, the Mokelumne Aqueduct, and the BNSF Railroad in seismically safe South Delta infrastructure corridor

\* Protect Stockton ship channel and water conveyance channel with seismically safe levees (**EC.29**)

\* Key electricity transmission lines and natural gas fields mostly protected along with western Delta islands; repair other reaches on an as-needed basis.

\*Leverage investments in new highway construction on seismically stable levees into habitat and recreation benefits associated with setback levees. Road relocations should also consider criteria for restoration and recreational opportunities.