CACHE SLOUGH COMPLEX

Conservation Opportunity Region Overview

Regional Setting

The Yolo Bypass/Cache Slough region (YBCS) is a key area of public focus for many short- and long-term planning processes. The 53,000-acre Cache Slough Complex (CSC) is located in the northwest corner of the Sacramento-San Joaquin River Delta in Solano and Yolo counties, at the downstream end of the YBCS, and is an integral part of the regional landscape, hydrology, and flood planning (Figure 1). It links directly to the Sacramento River via Miner and Steamboat Sloughs, while low-lying grasslands and seasonal wetland/vernal pool complexes separate it from the northeast corner of Suisun Marsh .[1]

The CSC has been identified as an area with potential for tidal restoration as a result of its connectivity with the Yolo Bypass floodplain, suitable elevations, high turbidity, high primary and secondary productivity, and use by Delta smelt (*Hypomesus transpacificus*), Chinook salmon (*Oncorhynchus tshawytscha*), and other native fishes. Both federal and state wildlife agencies consider the CSC as a prime area to advance habitat conservation to benefit endangered species in the Sacramento-San Joaquin Delta and incorporate improvements to the regional flood management system (Figures 2 & 3).

Primary land uses in the Cache Slough Complex region include agriculture, local and regional flood protection, terrestrial and aquatic wildlife habitat, and water supply for local agriculture and regional municipal and industrial needs, including the North Bay Aqueduct. Agriculture is the primary land use in the CSC region and relies on soils suitable to support a range of agricultural land uses and protection from the tides and floods from the Yolo Bypass, Sacramento River, and the local watershed. Located at the southern end of the Yolo Bypass, the CSC could be affected by actions farther up in the YBCS, especially potential modification to the flood management system and habitat restoration.

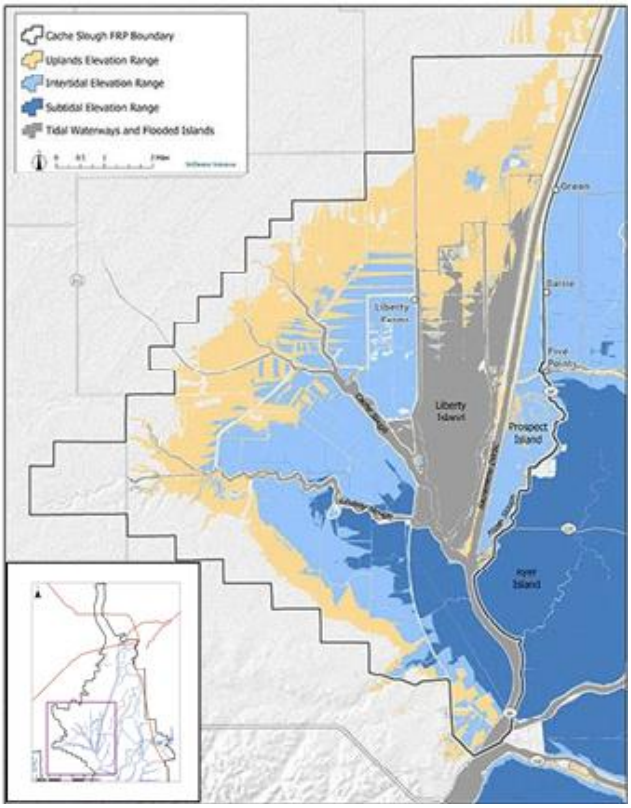

Figure 1: Map of Cache Slough Complex
Source: Department of Water Resources

Planning Context

There are a number of tidal habitat restoration projects completed or currently being implemented in the CSC through California *EcoRestore*, including: Lower Yolo, Prospect Island, and Lindsey Slough.[2] The CSC is also downstream of the larger Yolo Bypass floodplain, where efforts are under way through California *EcoRestore* to improve adult fish passage in the Yolo Bypass and increase effectiveness of floodplain rearing (17,000+ acres) for juvenile salmonids.

The California Department of Water Resources completed Volume 1 of 2 of the *Cache Slough Complex Conservation Assessment* in August 2016 in collaboration with the California Department of Fish and Wildlife.[1] As part the Fish Restoration Program (FRP), the *Cache Slough Complex Conservation Assessment* evaluates the potential for restoring the CSC and provides information on the current and historic conditions of the CSC in order to generate a regional landscape conceptual model for conservation of tidal habitats to support the recovery of Delta smelt. With this FRP focus, Volume 2, still under development, will present an overall regional restoration approach including restoration strategies, using regional conceptual models; key drivers for tidal restoration outcomes; a procedure for assessing the restoration potential of available properties; principles for approaching landscape-scale restoration; and compatibility with other regional plans.

Figure 2: Northern Liberty Island tidal wetlands
Source: Bird's Eye View

Figure 3: Liberty Island looking northwest towards Lindsey Slough. Source: Bird's Eye View

The *Cache Slough Restoration Planning* partnership (CSRPP), led by the Sacramento-San Joaquin Delta Conservancy, is currently developing a broad restoration strategy, or *Regional Conservation Strategy,* for the CSC.[3] Building on the California *EcoRestore* and FRP efforts described above, the CSRPP is developing a locally supportable vision and strategic planning approach that reduces potential conflicts between land uses (agriculture, flood protection, and conservation) and that recognizes opportunities for a landscape-level integrated

approach to conservation that includes ecosystem processes, multiple habitat types, and species. It identifies CSC areas for habitat restoration and projects going forward that would be eligible for Water Bond - Proposition 1 funding. Through engagement in a collaborative planning process between local, state, and federal agencies and interests, this regional planning effort compliments ongoing collaborative work among local, state, and federal agencies in the larger YBCS Region (please see Yolo Bypass Conservation Opportunity Region Overview); and it builds on efforts by the local partners in the Corridor Management Framework. Phase 1 of the Cache Slough Restoration Planning effort was anticipated to be completed by summer 2017. In general, restoration of the CSC will take place within the context of other ongoing conservation efforts, and will inform the Natural Resources Agency's California EcoRestore initiative.

Opportunities for Conservation

The CSC offers *notable conservation value* for species associated with tidal wetlands, seasonal wetlands (including vernal pools), and grasslands in and around the Delta.[1] This includes resident and anadromous fish native to the Delta and other native plant and animal species, such as Swainson's hawk (*Buteo swainsoni*) and giant garter snake *(Thamnophis gigas)*. The CSC has been established as the only known freshwater Delta site supporting year-round populations of endangered Delta smelt, and it provides spawning and rearing habitat for populations migrating from the estuary's low-salinity zone.[4,5] Moreover, undeveloped lowland grasslands and ranch land that spans the short distance between the CSC and Suisun Marsh to the west offer an *ecological corridor* for movement of wildlife between the two areas, benefitting native species populations and providing *sea level rise accommodation space* over the long term.[1]

The CSC fits into a "grand strategy to create an inter-connected series of habitats, mostly tidal, in this region",[6] as a result of its potential for biodiversity conservation and location at the southern end of the Yolo Bypass. This "grand strategy" has been referred to as the "North Delta Habitat Arc" and consists of a reconciled ecosystem strategy to create an arc of habitats connected by the flows of the Sacramento River.[6] The Yolo Bypass is the upstream end of the arc, which continues through the Cache-Lindsey Slough-Liberty Island region (CSC), down the Sacramento River including Twitchell and Sherman Islands, and into Suisun Marsh (see Figure 4).

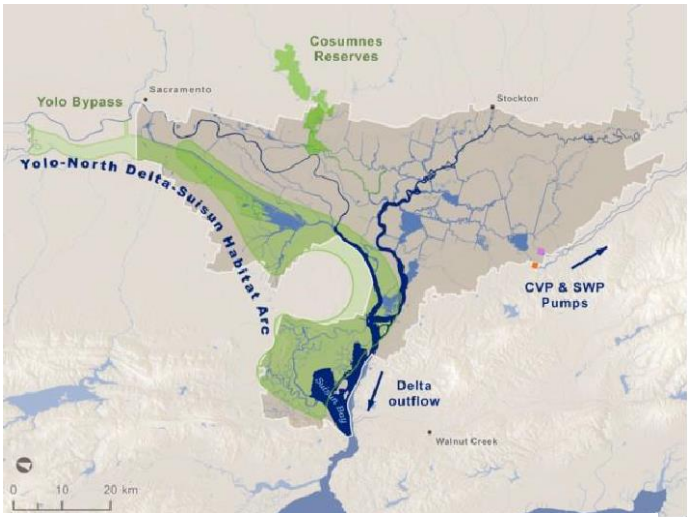

Figure 4: The Delta, showing the North Delta Habitat Arc
Source: UC Davis Center for Watershed Sciences

Throughout the CSC, land subsidence has been relatively modest, and the hydrodynamic and habitat variability in the region *support a range of native species*, aquatic and terrestrial .[1] The gradual alluvial slopes of the surrounding uplands may *accommodate sea level rise* through lateral marsh expansion .[1] Because Cache Slough still contains natural drainage patterns and is connected to the Sacramento River, the area is widely regarded as prime location for restoration projects. Examples of conservation projects include the reconnection of historic tidal sloughs to Calhoun Cut [7], the development of a tidal marsh "from scratch" as mitigation habitat, and Liberty Island Ecological Reserve.[8]

Due to its proximity to the Yolo Bypass and the distributary channels of the lower Sacramento River, the CSC also benefits from natural flood pulse flows, providing *seasonal migration, spawning, and rearing habitats for adult and juvenile native and anadromous fish*.[1] The floodplains and distributary channels are *primary sources for food web productivity* during inundation and high-flow events, bringing with them winter sediment supply from the Sacramento River watershed and winter storm flows. Liberty Island and Little Holland Tract—two very large, naturally restored islands—now support a mix of emergent tidal marsh, intertidal flats, and shallow to moderate depth subtidal aquatic habitats. These flooded islands have demonstrated the *ecological potential of tidal restoration* in the CSC. The CSC is also adjacent to a biologically unique, broad, lowland grassland/vernal pool

complex, which connects to Suisun Marsh to the west. The proximity of these biologically rich areas, with important ecotones and ecological corridors, should favor efforts to *revitalize* CSC terrestrial and aquatic wildlife populations.

Potential Solutions to Recognized Challenges

Climate Change and Adaptation Opportunities for Long-term Sustainability

The CSC region will be affected by climate change induced sea level rise within the next 30-100 years. Lands currently in the intertidal zones are projected to become subtidal.[9] Rising water levels will affect and submerge current shorelines and nearby areas (Figure 5). In low-lying areas, sea level rise will mean that current agricultural land will be lost to increased salinity levels or inundation. Further, flood dynamics will likely change over coming decades, with more frequent and extreme storm and rainfall events and associated flood pulses coming through the CSC. Scenario planning will help project likely impacts on ecosystems and species and integrate these into the long-term conservation planning picture.[10] A scenario planning approach will also integrate long-term conservation management and funding needs, and it will allow evaluation of how near-term conservation actions may evolve into the future. This will help determine how to prioritize conservation actions based on long- term effectiveness, the potential for outcomes to evolve over time, and cost-effectiveness if implemented down the road. Regular reevaluation of scenarios over time will help with examining how exactly projections play out and how management actions of conservation lands need to be adjusted over time.

Wildlife-friendly Agriculture

There is a potential for conflict between conservation projects and existing agricultural land uses and increased recreation and public access. Also, the effective managing of agricultural water intakes to minimize fish entrainment and related loss is a key issue. To address these potential challenges as conservation projects are implemented and managed over the long term, it is essential to have clear and consistent communication with all stakeholders and adherence to good neighbor practices.[11] In the YBCS, like elsewhere in the Delta, agriculture has been the main way of life, industry, and cultural linkage to the land for Delta residents for several generations. These strong cultural ties to the land also come with associated fears of livelihood loss and lifestyle change if conservation displaces agriculture. For example, the CSC is situated at the southern end of the Yolo Bypass and is protected by levees. If it were to become flooded as conservation progresses and as sea level rises, it could result in big changes to current agricultural practices, with serious impacts on the local economy. Therefore, as conservation moves forward in the CSC, local community concerns will have to be considered carefully to ensure long-term viability of the region. In general, prior Delta planning efforts have shown that early and effective inclusion of all stakeholders in the planning process is essential to the success of conservation. It is also important to include socioeconomic information into the data used to select and prioritize conservation sites. Specifically in the CSC, this includes an analysis of agriculture in the area through the California Agricultural Land Evaluation and Site Assessment Model,[12] which is currently being conducted by Solano County. It is also recognized that planning has to occur at several time steps, with a shorter and a longer term evaluation of various change scenarios.

Figure 5: Prospect Island and adjacent farmlands along Miner Slough
Source: Bird's Eye View

Integrated Flood Management

Flood protection for the agricultural operations in the region is provided by levees and the Reclamation Districts that maintain them.[1] It is possible to link long-term levee maintenance and agricultural operations with conservation outcomes. For example, maintaining hedgerows at the margins

of agricultural fields can increase the habitat value of agricultural operations, and levees could be used to provide wildlife transition habitat. These links provide opportunities for integrative and strategic conservation that connects directly with local stakeholder needs.

Low-Impact Recreation

Providing public access remains a general challenge with restoration in the Delta in order to minimize human disturbance to wildlife and other negative effects such as littering. The 2011 California State Parks Recreation Proposal for the Sacramento-San Joaquin Delta recommends exploring the recreation potential of the CSC, recognizing that there is opportunity in this area for environmental restoration coupled with outdoor recreation (wildlife observation, boating, fishing access and hunting).[13] At present, there are several recreation areas in the CSC. Many of these are private facilities set up for hunting waterfowl and other game birds; however, there are public areas such as the Miner Slough Wildlife Area and Liberty Island Ecological Reserve that also allow hunting and fishing. A list of "Potential Future State Parks in the Delta-Suisun Marsh Region," including Barker Slough as a possible location for a new state park, are included in the State Parks Recreation Proposal .[13] Habitat restoration would be integrated with recreational facilities, development (picnic sites; trails; kayak, canoe and other small paddle-craft facilities; and interpretive services). Recreation and related tourism with opportunities for fishing, camping, boating, and hiking that could be expanded and integrated with conservation efforts may provide increased economic value in the Delta. Moreover, the 2006 *Great California Delta Trail* proposal's vision is to link the San Francisco Bay trails system and planned Sacramento River trails in Yolo and Sacramento counties to current and future trails in the Delta, potentially skirting the eastern edge of the CSC.[14] Public access, recreation, education opportunities will therefore remain a priority for the region.

Entities/Partnerships Important for Implementation (Now and Ongoing)

The CSRPP is a collaborative partnership of agencies consisting of the Sacramento-San Joaquin Delta Conservancy, Solano County, Solano Resource Conservation District (RCD), Solano County Water Agency, Yolo County, Yolo County RCD, Dixon RCD, Reclamation District 2068, Department of Fish and Wildlife (CDFW), Department of Water Resources (DWR), California Natural Resources Agency - California *EcoRestore*, San Francisco Estuary Institute, and Flow West Consulting. The representatives from the RCDs, Reclamation District 2968, Solano Water Agency, and the Counties provide outreach to additional stakeholders, including Delta farmers, landowners and residents. The CSRPP should also establish ties with the Yolo Bypass working group and Yolo Bypass/Cache Slough partnership upstream to tie in with landscape-scale floodplain dynamics and conservation work under way. In the context of the "North Delta Arc" it may also be beneficial to establish or maintain ties with conservation and management efforts in the Suisun Marsh region.

Link to Delta Conservation Framework

The Delta Conservation Framework is a high level 33-year planning framework with a landscape-scale focus across the entire Delta, Suisun Marsh, and Yolo Bypass, to guide conservation efforts until 2050. Implementation of its overarching goals and strategies is recommended in the context of regionally focused, multi-stakeholder partnerships that develop *Regional Conservation Strategies* with detailed regional objectives and implementation actions**.** The CSRPP is such a regionally focused effort that develops priority projects that tie in with the Delta Conservation Framework overarching goals and strategies. The CSRPP directly addresses Delta community integration (*Goal A, Strategies A1 and A2*) through regular stakeholder involvement and inclusion of socioeconomic considerations into Delta conservation planning and implementation processes. It also aligns with a focus on developing multi-benefit conservation solutions (*Goals C-F)* through integrative data analysis and scenario planning, utilizing best available datasets to implement actions that help reestablish ecological function, assist species recovery, and integrate benefits for flood protection, wildlife-friendly farming operations, and recreation in the CSC at the local and landscape scales (with focus on both CSC, and as part of Yolo Bypass, or "North Delta Arc" dynamics). The CSRPP also presents a unique opportunity to align with Goals F and G of the Delta Conservation Framework aimed at addressing conservation-related permitting through a general regional permit and short-and long-term funding development via bond initiatives and other opportunities.

The cornerstones for successful conservation planning and implementation are: 1) establishing and maintaining trust among stakeholders, best achieved through continuous communication and evaluating goal-based progress; 2) an agreed-upon structure for roles and responsibilities to govern an implementation partnership; and

3) principles for stakeholder engagement based in inclusiveness, and open and on-going communication, and science based decision support. Since starting in late 2016, the CSRPP has developed a sound partnership approach with clear roles and responsibilities, and Phase 1 collaborative planning objectives for determining initial CSC conservation opportunity areas. This will lead to the development of a long-term *Regional Conservation Strategy* in Phase 2 of the CSRPP planning process. This process will integrate the FRP's Volume 1 of 2 of the Cache Slough Complex Conservation Assessment. Upcoming project solicitations for Proposition 1 funding by CDFW or the Delta Conservancy will draw from available information of this planning process for project situated in the CSC region.

230 # EndNotes

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