

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.

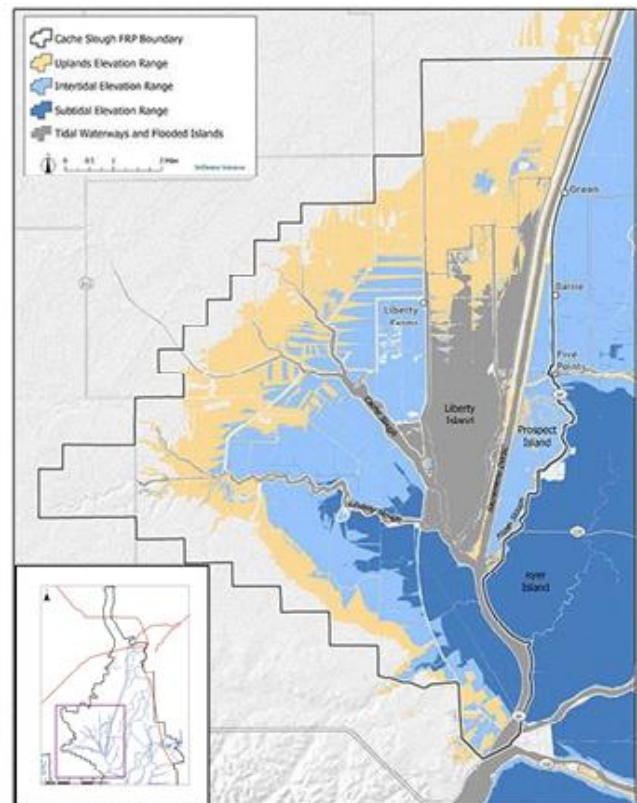


Figure 1: Map of Cache Slough Complex
Source: Department of Water Resources

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.

42 The California Department of Water
43 Resources completed Volume 1 of 2
44 of the *Cache Slough Complex*
45 *Conservation Assessment* in August
46 2016 in collaboration with the
47 California Department of Fish and
48 Wildlife.¹ As part the Fish Restoration
49 Program (FRP), the *Cache Slough*
50 *Complex Conservation Assessment*
51 evaluates the potential for restoring
52 the CSC and provides information on
53 the current and historic conditions of
54 the CSC in order to generate a
55 regional landscape conceptual model
56 for conservation of tidal habitats to
57 support the recovery of Delta smelt.
58 With this FRP focus, Volume 2, still
59 under development, will present
60 an overall regional restoration

61 approach including restoration strategies, using regional conceptual models; key drivers for tidal restoration
62 outcomes; a procedure for assessing the restoration potential of available properties; principles for approaching
63 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

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

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

78

79 Opportunities for Conservation

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

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

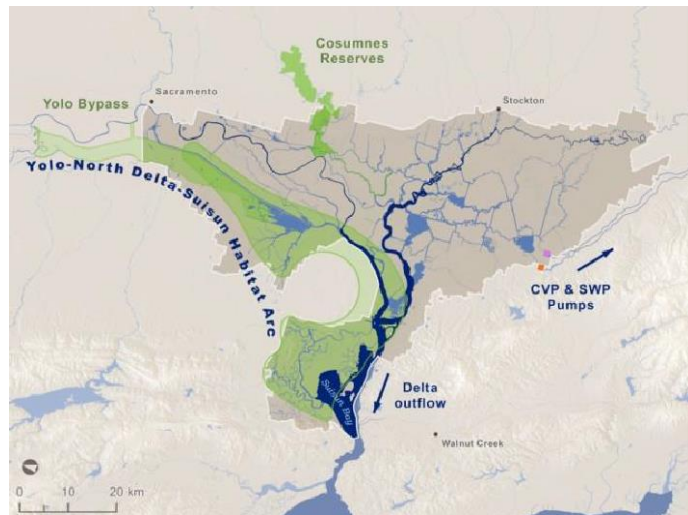


Figure 4: The Delta, showing the North Delta Habitat Arc
Source: UC Davis Center for Watershed Sciences

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

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

120 complex, which connects to Suisun Marsh to the west. The proximity of these biologically rich areas, with
121 important ecotones and ecological corridors, should favor efforts to *revitalize* CSC terrestrial and aquatic wildlife
122 populations.
123

124 Potential Solutions to Recognized Challenges

125 *Climate Change and Adaptation Opportunities for Long-term Sustainability*

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

138 *Wildlife-friendly Agriculture*

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

162 *Integrated Flood Management*

163 Flood protection for the agricultural
164 operations in the region is provided by
165 levees and the Reclamation Districts
166 that maintain them.¹ It is possible to
167 link long-term levee maintenance and
168 agricultural operations with
169 conservation outcomes. For example,
170 maintaining hedgerows at the margins



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

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

174 Low-Impact Recreation

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

191 **Entities/Partnerships Important for Implementation (Now and Ongoing)**

192 The CSRPP is a collaborative partnership of agencies consisting of the Sacramento-San Joaquin Delta Conservancy,
193 Solano County, Solano Resource Conservation District (RCD), Solano County Water Agency, Yolo County, Yolo
194 County RCD, Dixon RCD, Reclamation District 2068, Department of Fish and Wildlife (CDFW), Department of Water
195 Resources (DWR), California Natural Resources Agency - California *EcoRestore*, San Francisco Estuary Institute, and
196 Flow West Consulting. The representatives from the RCDs, Reclamation District 2968, Solano Water Agency, and
197 the Counties provide outreach to additional stakeholders, including Delta farmers, landowners and residents. The
198 CSRPP should also establish ties with the Yolo Bypass working group and Yolo Bypass/Cache Slough partnership
199 upstream to tie in with landscape-scale floodplain dynamics and conservation work under way. In the context of
200 the “North Delta Arc” it may also be beneficial to establish or maintain ties with conservation and management
201 efforts in the Suisun Marsh region.
202

203 **Link to Delta Conservation Framework**

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

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

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

- ¹ DWR and CDFW (2016). Fish Restoration Program - Cache Slough Complex conservation assessment- Volume 1: Characterization report. California Department of Water Resources, Division of Environmental Services (DWR), West Sacramento, CA, and California Department of Fish and Wildlife (CDFW), Sacramento, CA, with assistance from Stillwater Sciences, Davis, CA. Contract No 4200009291. Available: http://www.water.ca.gov/environmentalservices/docs/frpa/CSCCA_Vol1_Final_August2016_Web.pdf. Accessed: September 8, 2017
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- ⁸ Delta Conservancy (2015). Restoration projects in the Delta and Suisun Marsh. The Sacramento-San Joaquin Delta Conservancy, West Sacramento, CA. Available: <http://deltaconservancy.ca.gov/restoration-projects-delta-and-suisun-marsh/>. Accessed: September 25, 2017.
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- ¹¹ DWR (2017). DWR Agricultural Lands Stewardship Workgroup - potential strategies - Strategy A4.1. California Department of Water Resources, Agricultural Lands Stewardship Workgroup (DWR), Sacramento, CA. Available: <https://agriculturalallandstewardship.water.ca.gov/web/guest/strategy-a4.1>. Accessed: January 27, 2017.
- ¹² Department of Conservation (2016). Land Evaluation & Site Assessment Model (LESA). Department of Conservation, Sacramento, CA. Available: http://www.conservation.ca.gov/dlrp/Pages/gh_les_a.aspx. Accessed: September 25, 2017.
- ¹³ California State Parks (2011). Recreation proposal for the Sacramento-San Joaquin Delta and Suisun Marsh. California State Parks, Planning Division, Sacramento, CA.
- ¹⁴ Delta Protection Commission (2017). The Great California Delta Trail. Delta Protection Commission, West Sacramento, CA. Available: http://delta.ca.gov/recreation/delta_trail/. Accessed: September 25, 2017.