

SECTION IV

**Delta Conservation
Based on Science**



Illustration: Alison Lozano

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KEY TERMS

- **ADAPTIVE MANAGEMENT** - involves a series of cyclical steps that include: defining the problem; establishing measurable goals and objectives; modeling linkages between objectives and proposed actions; selecting actions and related performance measures; designing and implementing actions and developing an associated monitoring plan; analyzing, synthesizing, and evaluating new data; disseminating learned information; and adapting practices to incorporate what was learned.²¹ Adaptive Management is not to be confused with managing adaptively. Both have value – yet they are very different concepts. Managing adaptively, or adjusting management actions to fit circumstances, often based on experience, is common practice.²¹
- **CLIMATE CHANGE** - Any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from natural factors, including changes in the sun's intensity or changes in the Earth's orbit around the sun; natural processes within the climate system (such as changes in ocean circulation); or human activities that change the composition of the atmosphere (for example, through release of carbon) and land surfaces (for example, deforestation or urbanization).
- **X2** - The point identified by the distance from the Golden Gate Bridge where salinity at the bottom of the water column is about two parts per thousand. Keeping X2 within a range of positions around Suisun Marsh (by managing fresh water outflows as needed) is considered supportive of the health of the estuarine food web. X2 serves as a metric for both the extent of native fish habitat in the low salinity zone in the San Francisco Estuary and the salinity standard in the state's water quality control plan.
- **EXTREME EVENTS** - One of the most visible consequences of climate change is an increase in the intensity and frequency of extreme weather events. Weather and climate extremes include hurricanes, tornadoes, heavy downpours, heat waves, and droughts that affect all sectors of the economy and the environment, impacting people where they live and work.
- **NOVEL ECOSYSTEMS** - A novel ecosystem can be identified by its origins rooted in human agency, the ecological thresholds it has crossed, a significantly altered species composition, and a capacity to sustain itself. In 2013 Hobbs and co-authors defined a novel ecosystem as “a system of abiotic, biotic, and social components (and their interactions) that, by virtue of human influence, differ from those that prevailed historically, having a tendency to self-organize and manifest novel qualities without intensive human management.”
- **SEA LEVEL RISE** - An increase of the global volume of water in the oceans, resulting in receding shorelines and increased flooding. Sea level rise is often discussed in the context of climate change (such as thermal expansion of ocean waters and the melting of glaciers and ice sheets).
- **RESILIENCE** – Resilience is a means by which ecosystems, habitats, and species are likely to successfully adapt and thrive over time. The concept of resilience in conservation focuses on creating systems that are robust enough to persist and adapt over the long term, in order to manage ecosystems for an uncertain future. Resilience can also refer to non-ecological systems, such as agriculture.
- **RECONCILIATION ECOLOGY** - Reconciliation ecology seeks to improve conditions for native species while recognizing that most ecosystems have been altered irrevocably by human use and will continue to be used to support human goals. Improving ecosystem conditions for native species must therefore happen in a context of continuing use of land and water by humans and continuing physical and biological change.²⁸

Footnotes: The Delta Conservation Framework footnote and endnote references can all be found in Appendix 1 online by section.

Introduction

Throughout the Delta, a multitude of stressors impair ecosystem processes and discourage the persistence of native species.^{1,2,3,4,5,6,7} Ecosystems are most resilient and functional when they are interconnected at various scales.^{8,9} To achieve lasting resilience, it is important to understand how ecological processes function across time and space within a mosaic of wildlife-friendly land management approaches and agriculture in the Delta.^{10,11} In addition, sustaining functional ecosystems, native species, agriculture and other human land uses will become much more difficult with the projected increase in environmental extremes over the coming decades.^{7,12,14} It may become necessary to shift the focus from managing “native” or “natural” systems to managing for “reconciled” or “novel” ecosystems.^{13,14} (See also Key Terms p.108.)

Understanding such complexities, and the reverberating impacts on the use of the Delta by both people and native species, requires collaborative multi-interest science, long-term monitoring, and adaptive management based on this research and monitoring. Without science-based conservation practices that support rapid responses to crises and provide long-lasting solutions, Delta conservation may not be successful in the long term.^{15,16,17}

This section offers an overview of science capacity in the Delta, including current and upcoming scientific research and progress made toward comprehensive adaptive management programs. (The relationships among some of these programs, however, is still in the process of being clarified.) Several such programs are addressing the needs of upcoming conservation and mitigation actions under California EcoRestore,¹⁸ state and federal water project operations, and California WaterFix,^{19,20,21} as well as those of restoration programs outside these mandates.

The *Delta Conservation Framework* supports these and other efforts to tailor Delta science to current conditions and future challenges. The Framework, in its push for science-based restoration on a landscape scale, recognizes the value and intent of the Delta’s existing collaborative science and management programs. In following up on Framework goals and strategies, regional partnerships should tap this strong existing capacity to monitor progress and manage conservation outcomes.

One Delta - One Science

The most comprehensive recent effort to organize the Delta’s diverse regional science and monitoring programs, and to increase transparency, integration, and collaboration, is the *Delta Science Plan*.²⁰ The *Delta Science Plan* sets the vision for “One Delta, One Science,” a collaborative and open science community that contributes to a shared body of scientific knowledge to inform future water and environmental decisions.

The Delta Stewardship Council’s Delta Science Program has coordinated a set of collaborative documents that make up a Delta Science Strategy^{20,21} aimed at achieving the vision of One Delta, One Science:

- The Plan offers a cooperative science-oriented approach that extends across multiple agency and program authorities.
- The Strategy prioritizes and aligns near-term science actions to inform management actions and achieve the objectives of the *Delta Science Plan*.
- The State of Bay-Delta Science reports synthesize scientific knowledge about the Delta, including progress made on key research questions and remaining knowledge gaps.



Fish and food web sampling under the Interagency Ecological Program. Photo: IEP

Connecting Agency-Driven Science to Future Science

One Delta One Science is a broadly focused, program in a constellation of Bay-Delta science and monitoring endeavors. The region has a 60+-year history of data collection for management purposes, and one of its longest running programs is the Interagency Ecological Program (IEP). IEP was established in the 1970s to “provide and integrate relevant and timely ecological information for use in the management of the Bay-Delta ecosystem and the waters that flow through it.” The IEP currently conducts research, monitoring, and synthesis to address high-priority management and policy needs in order to fulfill responsibilities established under various water rights decisions, the state and federal Endangered Species Acts, and the Clean Water Act. The mission directives are carried out by multi-disciplinary teams composed of agency, academic, nongovernmental organizations, and consultants.^{21,22}

Multi-Layered Science, Monitoring, and Adaptive Management

Increasingly, Delta science is undertaken in teams combining agency or policy driven science with socio-economic or ecosystem-based science. These teams are supported by regional or area wide monitoring programs and linked to adaptive management programs. In addition to those mentioned above, some of these active teams are involved in the Collaborative Science and Adaptive Management Program, the Fish Restoration Program Monitoring Team, and the Delta Regional Monitoring Program. Other significant scientific contributions to conservation and land management in the Delta include cross-cutting projects such as the Delta Region Area-wide Aquatic Weed Project (see Section III), the Tidal Wetland Monitoring Framework for the Upper San Francisco Estuary²³ and various research programs conducted by the San Francisco Estuary Institute and the UC Davis Center for Watershed Sciences. The Public Policy Institute of California, meanwhile, helps communicate science to decision-makers to inform public policy.

Science Enterprise

Collectively, all the science programs and activities in the Delta region that inform and serve managers and stakeholders in decision-making are referred to as the “Science Enterprise.”¹⁹ Collectively, the Science Enterprise was a joint Delta Stewardship Council-US Geological Survey effort that recognized a need for additional levels of collaboration and integration, particularly in the context of conservation planning, implementation, and adaptive management. Those initiatives or plans spearheading increasing cross-cutting science coordination include the Science Action Agenda and its development process, the Delta Independent Science Board, IEP’s science agenda process, and the *Delta Plan* Interagency Implementation Committee’s Delta Agency Science Workgroup.

“Big changes are always impractical for those deeply embedded in existing practices that are failing us.”

RICHARD NORGAARD, UC BERKELEY
DELTA INDEPENDENT SCIENCE BOARD

A Framework for Conservation Science

Available ecological and socioeconomic studies in the Delta should inform conservation-related decision-making. The *Delta Conservation Framework* encourages priority setting throughout the Delta Science Enterprise to support long term monitoring and adaptive management and acquire the data needed to evaluate the effectiveness of conservation-related actions over time. Using this information to improve on ineffective management actions will help keep costs down and avoid unnecessary impacts.

Strategic science and action priorities will also help elicit competitive and informed grant solicitations, agency budget change proposals, coordinated multi-agency efforts, updates to individual science programs within federal and state governments, and integration with outside science. Having a common direction and a strong science-based infrastructure for conservation, management, and policy decisions will be especially useful in light of upcoming challenges related to climate change, and public support for action on that front.

More details about these science programs are presented in the following pages under Goal E, Strategies 1 and 2, and in the Guide to Related Plans and Programs on pp. 128-132.

Framework in Depth: Goal E

Assessing Conservation Progress and Informing Effective Management

Decisions about individual conservation project design and long-term management should be based on the best-available science and a commitment to long-term monitoring and evaluation.

This *Delta Conservation Framework* goal supports the strong existing science capacity available in the Delta to inform decisions. Goal E also supports multi-agency, cross-cutting, coordinated science priorities to inform conservation and restoration planning, among other science, monitoring, and adaptive management strategies and objectives.

A USGS monitoring station in Suisun Marsh, one of 35 in a network spread throughout the Delta monitoring hydrodynamics, salinity, chlorophyll (base of the food web for fish), and other biogeochemical variables. These stations report remotely, offering gigabytes of real time information on Delta conditions to help optimize management for ecosystem health and beneficial uses of the state's waters.
Photo: Amber Manfree





GOAL E

Evaluate conservation progress and address climate change stressors and other drivers of change by implementing the science strategies and priorities of the Delta Science Program and Interagency Ecological Program, the adaptive management program for Biological Opinions related to state and federal water project operations, and adaptive management recommendations emerging from interagency integration teams.

STRATEGY E1

Implement and increase communication of established priority research, science, and monitoring actions and needs.

- Reference the Delta Science Strategy and Science Action Agenda.
- Consider the Interagency Ecological Program Science Agenda.
- Consult the *Delta Smelt Resiliency Strategy* and the *Sacramento Valley Salmon Resiliency Strategy*.
- Utilize the Tidal Wetland Monitoring Framework.

STRATEGY E2

Assess conservation progress, as well as the status and trends for species and habitats of interest, using existing Delta adaptive management approaches and programs.

- Consider the guidance in the Adaptive Management Program for the California Water Fix and Current Biological Opinions on the Coordinated Operations of the Central Valley and State Water Projects.
- Support the Collaborative Science and Adaptive Management Program.
- Support the Delta Stewardship Council's Interagency Adaptive Management Integration Team.

STRATEGY E3

Evaluate best practices to maintain and increase ecosystem and species resiliency to projected climate change.

- Develop and recommend best practices to enhance the resilience of Delta ecosystems and species to climate change effects such as sea level rise, salinity intrusion, precipitation and temperature changes (in air and water), and extreme weather events.
- Include climate change in regional conservation partnership planning processes.

FRAMEWORK IN DEPTH: GOAL E - CONTINUED

Priority Science Actions

Strategy E1 under Goal E supports implementation of priority science actions identified by the 2017-2021 Science Action Agenda, the Interagency Ecological Program, the salmon and Delta smelt resiliency strategies, and related socioeconomic research.^{19,21,24,25,26,27} In response to declining native species populations and reduced ecosystem health, efforts are accelerating to restore ecological processes and recover ecosystem functions in the Delta.^{25,26} Advanced scientific methods and tools such as computer models are needed to plan and implement projects in an integrated, consistent, and systematic way and to improve implementation of adaptive management over the long term.^{28,29,30,31,34,35,36,37} Efforts to set meaningful, collaborative priorities should be supported and strengthened.

As mentioned earlier in this section, one important reference for the *Delta Conservation Framework* in terms of identifying Delta science action priorities that support Framework conservation and restoration goals is the 2017-2021 Science Action Agenda (SAA).¹⁹ The Agenda, a collaborative document coordinated by the Delta Science Program, "identifies science actions that fall between the mission statements and priorities of a single group, program, or agency but are otherwise recognized as cross-agency and multi-group priorities, as feasible to implement and perform, and as opportunities to promote collaborative efforts. In this

way, the SAA fills gaps and serves as the glue for synergistic and multi-benefit science to support important management needs."¹⁹

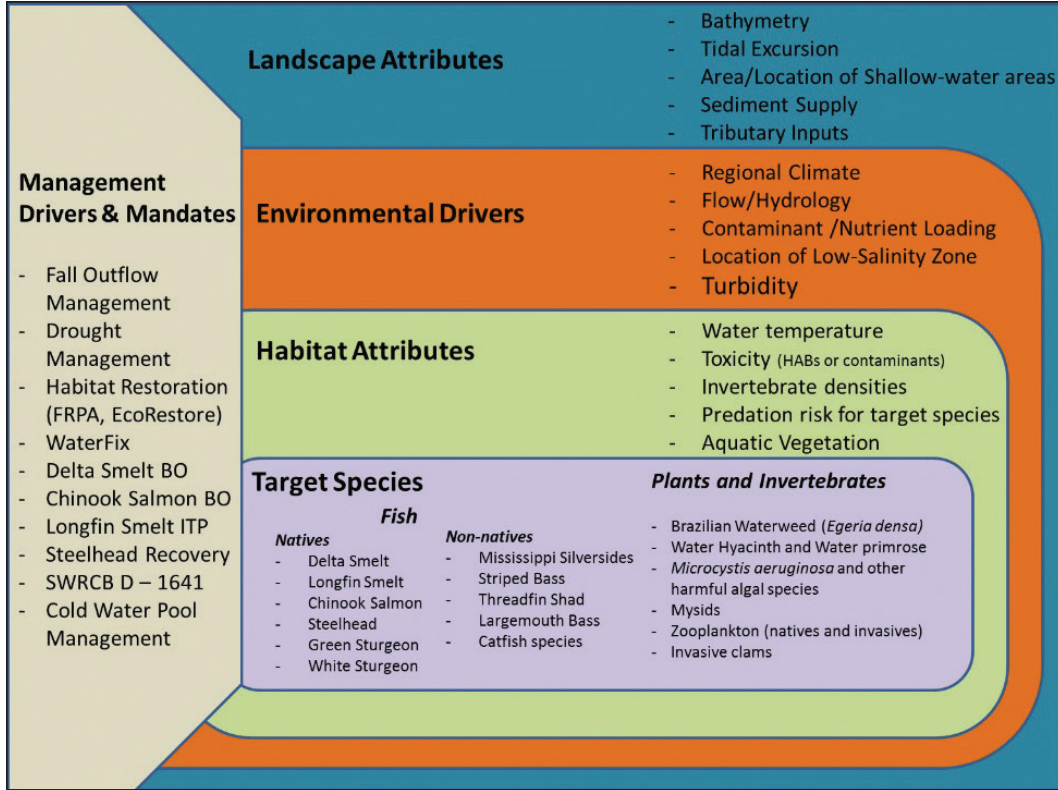
The *Delta Conservation Framework* references the SAA because it is founded on the latest Bay-Delta science and earlier efforts to identify high impact priorities. It also expands upon the critical activities of existing collaborative efforts, including IEP and the Delta Regional Monitoring Program (Delta RMP). It further advances the vision of One Delta, One Science and the broad Delta Science Enterprise.

Of particular relevance to the *Delta Conservation Framework* is the priority placed on understanding the human dimension of conservation²⁷ in the SAA, as well as the management needs outlined in the SAA addressing landscape-scale practices to evaluate the functionality of restored areas, conduct effective planning, and assess potential cumulative effects. SAA priority science actions focused on these management needs include: 1) developing methods for evaluating long-term benefits of habitat restoration based on current understanding of how species use restored areas and how use changes over time as habitats evolve (such as outlined in the Tidal Wetland Monitoring Framework;²³ and 2) estimating and assessing the system-wide effects of location and sequence of tidal marsh habitat restoration projects in areas that are impacted by sea level rise and climate change.

*San Joaquin
Restoration
Program
biologist holds
first fall run
Chinook salmon
reintroduced to
the river.*



FRAMEWORK IN DEPTH: GOAL E - CONTINUED



IEP Science Strategy conceptual model.

A second important resource for the *Delta Conservation Framework* and regional conservation partnerships is the Interagency Ecological Program Science Strategy.²¹ This agenda guides IEP agencies as they select studies for the IEP Work Plan and employ strategies to achieve the goals of the 2014 Strategic Plan.²⁴ Other planning efforts, including the Delta Science Program’s SAA, are taken into consideration in the setting of the IEP’s science agenda, and vice versa. By institutionalizing a science agenda, the IEP serves evolving priority management needs, policy needs, and diverse perspectives.³² The IEP Science Agenda uses a conceptual model (see above) and emphasizes five areas of near-term science: effects of climate change and extreme events; the ecological contribution of restored areas; the impacts of non-native species; food webs; and the restoration of native species and communities. For each of these topic areas, the Science Agenda lays out the current knowledge base and lists priority science questions to inform management of needs for monitoring, focused studies, data synthesis, and coordination. The *Delta Conservation Framework* supports this kind of strategic approach to key science questions in the San Francisco Estuary.

Another important strategic science initiative that can inform decision-making by regional conservation partnerships and the *Delta Conservation Framework* is the Collaborative

Science and Adaptive Management Program (CSAMP).³³ The CSAMP is coordinating a research program to investigate to what extent increased Delta outflow can positively affect environmental drivers and habitat attributes important to Delta smelt resiliency.²⁶ The CSAMP will determine appropriate research methods for evaluating management actions in the *Delta Smelt Resiliency Strategy* (details in Section III, p. 88) individually and synergistically, and will also oversee implementation and synthesis of results to inform subsequent management actions. In addition, those entities implementing the *Sacramento Valley Salmon Resiliency Strategy* will consult with CSAMP regarding designs for research, monitoring, and evaluation to assess action performance, review of proposed research or monitoring, and progress reporting.²⁵ These collaborative efforts can help inform regional conservation strategies and actions targeting endangered fish.

The Delta Ecosystem Integrated Modeling Steering Committee is another collaborative science and management effort, supported by the Delta Stewardship Council. This effort aims to integrate Delta ecosystem modeling, model users, and decision makers, and to build capacity by sharing data sets and equations that are required for integrated modeling. The committee effort seeks to demonstrate the value of integrated models for management decisions by creating and

documenting transparent, repeatable processes for addressing complex Delta issues.

In addition to these collaborative science and management efforts, tools for integrated computer modeling are also important resources for planning within the *Delta Conservation Framework*. Well-established modeling tools commonly used to analyze Delta hydrodynamics, water quality and ecological conditions include CalSim 2 and DSM2.^{30,34} Additionally, the State Department of Water Resources' Fish Restoration Program has initiated and begun developing another modeling effort that can help regional conservation managers ensure consistency with other restoration goals. With the help of this effort, the Department can work collaboratively with other tidal restoration practitioners to better understand how collective restoration efforts are impacting salinity and the tidal prism on a system-wide scale (see Quick Links p. 132).

Longfin smelt in lab.
Photo: DWR



Good science and strong models benefit from consistent data from monitoring programs, another important component of *Delta Conservation Framework* efforts to support successful outcomes with data-based results. One cornerstone new monitoring program is the Tidal Wetlands Monitoring Framework (TWMF) for the Upper San Francisco Estuary.²³ This monitoring framework will develop scientifically sound, project-specific plans to monitor the effectiveness of tidal wetland restoration in providing benefits to at-risk Delta fish species. TWMF will serve as a model for preparing similar frameworks for the assessment of other conservation actions in the Delta. It includes recommendations for data management, analysis, quality assurance, and reporting protocols for compliance with various regulations and policies. Regional conservation partnerships can learn from the protocols and the results of the TWMF.

Finally, to achieve the multi-benefit — float all boats — approach embraced by the *Delta Conservation Framework*, all this

biological and physical science research must also be integrated with social science evaluations of how human uses of Delta landscapes directly influence conservation opportunities.²⁷ The *Delta Conservation Framework* supports strong consideration of the needs and opinions of landowners and the public, both of which are essential to long lasting conservation success. When designing and adaptively planning for future Delta landscapes, regional conservation partnerships should consider specifics on local cultures, local economies, and human interactions with restored landscapes revealed by socio-economic research. This should help ensure that conservation projects fit within a broader cultural context that supports the “Delta as an evolving place”, as outlined in the Delta Reform Act (CA Water Code §85054).

Many of the Delta's science programs also highlight the importance of considering the human impacts of natural resource management decisions and the big picture effects of changing land use in the Delta when planning for conservation. In order to integrate these factors into conservation planning and decision-making, a variety of tools and processes are available.^{33,34,35,38,39,40}

See Guide to Related Plans and Programs pp.128-132 for more detail on initiatives described above.

A generalized water resources modeling system for evaluating operational alternatives of large, complex river basins, CalSim 2 is used by California's state and federal water projects to simulate operations. DSM2, a second modeling package, is used by water managers, engineers, and scientists for analysis of complex hydrodynamic, water quality, and ecological conditions in riverine and estuarine systems.^{30,34}

FRAMEWORK IN DEPTH: GOAL E - CONTINUED

Conservation Status and Progress

Strategy E2 under Goal E suggests using adaptive management, including coordinated area wide monitoring programs, as an integrated part of conservation management. Adaptive management involves a series of cyclical steps that include: defining the problem; establishing measurable goals and objectives; modeling linkages between objectives and proposed actions; selecting actions and related performance measures; designing and implementing actions and developing an associated monitoring plan; analyzing, synthesizing, and evaluating new data; disseminating learned information; and adapting practices to incorporate what was learned.¹⁶

Adaptive management allows land, water and wildlife managers to proactively look ahead to potential sources of uncertainty such as drought, deluge, earthquakes, invasive species, or restoration timelines and budgets, and to use accumulated knowledge in a structured approach to management and decision-making. For Delta conservation partnerships to evaluate progress on conservation projects or programs, they must be able to determine baseline ecosystem conditions, quantify the efficacy of conservation actions, and assess progress towards landscape-scale goals and objectives.

As a science-based, flexible approach to resource management decision-making, adaptive management programs offer the opportunity to make and implement decisions while simultaneously conducting research to reduce the ecological uncertainty

of a decision's outcome.^{35,36,37} This approach also facilitates resource management that is transparent, collaborative, and responsive to changes in scientific understanding. Multi-stakeholder collaboration, decision-support, scenario-evaluation tools, and conceptual and simulation models, are available to help plan and implement this assessment process (see Section V1).

This strategy of the *Delta Conservation Framework* recognizes the need for landscape scale adaptive management of conservation projects and programs, and the current programs underway to support it. In the Delta three prominent adaptive management programs are already in place to plan, assess, and evaluate the progress of conservation in meeting initial goals and objectives.

1. **The Collaborative Science and Adaptive Management Program³³** (CSAMP) for the Delta was established in 2013 to inform sound decision-making regarding the implementation and revision of the current US Fish and Wildlife (USFWS) and National Marine Fisheries Service (NMFS) Biological Opinions on the operations of the State Water Project (SWP) and Central Valley Project (CVP). A management team (CAMT) under the CSAMP is designed to answer a set of prioritized scientific questions, and identify new initiatives based on the results of these studies.
2. **The Adaptive Management Program for the California WaterFix and Current Biological Opinions on the Coordinated Operations of the Central Valley and State Water Projects³⁵** (the AMP) was established by DWR, CDFW, the NMFS,



UC Davis and USGS collaborate on sampling for the Complete Marsh Project in the Rush Ranch National Estuarine Research Reserve in Suisun Marsh. Photo: Amber Manfree

A blue-green algae bloom producing cyanobacteria that killed fish in this reservoir. Photo: CDFW



USFWS, and the Bureau of Reclamation (a.k.a five agencies) in 2017. Collectively, the intention is for the five agencies commit to ongoing adaptive management in implementing the current BiOps, as well as future operations under California WaterFix.⁴⁸ The aim is to decrease uncertainty and improve the performance of CVP and SWP water operations in protecting listed species and maintaining water supply reliability.

3. **The Delta Stewardship Council Inter-agency Adaptive Management Integration Team**³⁷ (DSC-IAMIT) formed in 2016 to address the gaps and inefficiencies associated with having multiple, distinct adaptive management programs. The DSC-IAMIT is currently focused on providing technical and scientific recommendations on how adaptive management of restoration projects in the Delta and Suisun Marsh can be developed and implemented.³⁹

The *Delta Conservation Framework* recommends that the goals and objectives of conservation planning efforts, and program or project budgets, be woven into a strong adaptive management approach as appropriate, given the high level of uncertainty of desired outcomes in the Delta. Adaptive management actions must inform the planning and implementation of regional conservation strategies, or similar bottom-up collaborative partnership approaches. In addition, regional conservation partnerships should use adaptive management to test best management practices for projects designed to benefit Delta ecosystems and for

multi-benefit projects linked to Delta agriculture and communities.

Conducting adaptive management across larger landscapes or to address multi-interest mandates will always be challenging. The Review of Research on the Sacramento-San Joaquin Delta as an Evolving Place by the Delta Independent Science Board⁴⁰ and the Delta Science Program SAA suggests that more research and interdisciplinary science is needed to inform decisions on when, where, and how adaptive management can be integrated into larger planning, design, and management frameworks.

Nutrients are one current challenge for Delta adaptive management programs. Nutrients are increasingly affecting water quality in the San Francisco Estuary and its watershed due to changing environmental conditions (turbidity, runoff, water temperature, etc.). Since 2015, the Central Valley Regional Water Quality Control Board and a stakeholder advisory group have worked on a collaborative nutrient research plan and management strategy. Concerns include cyanobacteria blooms, invasive aquatic macrophytes, nutrient forms and ratios, numeric modeling, and drinking water.

For more information on the programs mentioned under this strategy see Guide to Related Plans and Programs, p. 128-132.

FRAMEWORK IN DEPTH: GOAL E - CONTINUED

Climate Change Effects

Strategy E3 under Goal E emphasizes developing resources and recommending best practices for increasing wildlife and ecosystem resiliency to climate change. Climate change is already affecting California ecosystems, biodiversity, and agricultural land throughout the state.^{41,42,43,44,45,46,47,48,49,50}

Case studies have shown that climate change has increased temperatures, altered hydrology, changed precipitation levels, increased drought-induced water stress and adverse effects on wildlife habitats, and impacted agricultural production in the Delta and Central Valley watersheds.

The *Delta Conservation Framework* recommends that more resources and best practices be developed to address projected climate change effects and maintain or increase the resiliency of ecosystems, wildlife, and conservation projects.

Climate change impacts will continue to increase over time in coastal and estuarine systems, including the Delta.^{49,50,51,52,53} During the next century, California winters will likely become wetter and warmer, with more extreme weather events earlier or later in the season, reduced snow packs in the Sierra Nevada, earlier snowmelt, more precipitation falling as winter rain than snow, and increases in run-off quantity and velocity during storm events.^{49,53,54}

Accordingly, summers will be longer, hotter, and drier. This will likely result in warmer summer water temperatures, changes in water quality, and increases in water demand by people and wildlife.^{55,56,57,58,59} The Delta region is expected to experience more intense winter flooding and storm events, causing greater erosion of riparian areas and increased sedimentation in wetlands.⁴⁹ In the summer there will be increased likelihood of saltwater intrusion farther upstream in the Delta, disrupting ecosystem processes, food webs, agriculture, and local water supplies.^{45,49}

Globally, sea level is projected to increase between 0.22-1.5 meters (0.72-5 feet) in the 21st century, or even to as high as three meters (10 feet).^{41,49} Sea level rise (SLR) combined with more extreme storm events and tidal action will put additional pressures on Delta levees.⁵⁰ Assuming a 1.5-meter SLR by 2050 under a scenario in which there are no significant global efforts to limit or reduce emissions (RCP 8.5)⁵⁰ it is anticipated that the acreage of flood prone land (during a 100-year flood event) in Solano County will increase from 15,241 to 69,877 acres.⁴⁹ In Contra Costa County, flood-prone land is expected to increase from 847 to 8,607 acres.⁴⁹ In Sacramento County it is expected to increase from 171.4 to 411 acres.⁴⁹ An additional more extreme climate scenario (H++) that incorporates the likelihood of extreme SLR of up to 10 feet in San Francisco by 2100 (see Figure 4.1), should be consid-

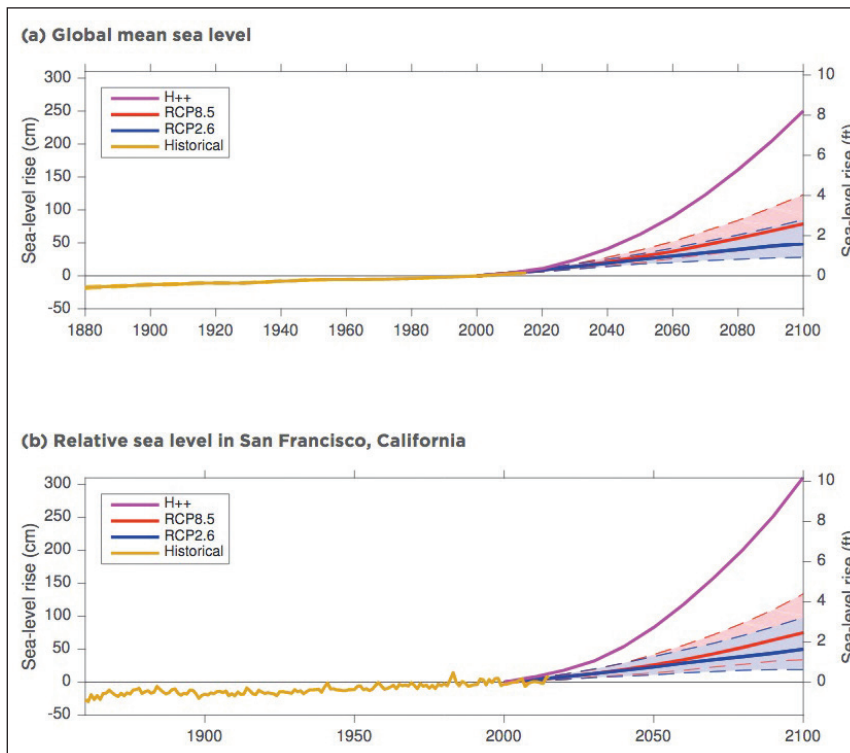


Figure 4.1
Comparison of the projections of (a) Global mean sea level, and (b) Relative sea level in San Francisco, CA. Source: Griggs et al 2017.⁵⁰ A “Representative Concentration Pathway” (RCP) represents a greenhouse gas (GHG) concentration trajectory, adopted by the Intergovernmental Panel on Climate Change (IPCC).⁴¹ The IPCC recognizes four RCPs, or projected scenarios, for climate change. They are: RCP 2.6 (global annual GHG emissions peak between 2010 and 2020 then decline); RCP 4.5 (emissions peak around 2040 then decline); RCP 6 (emissions peak around 2080 then decline); and RCP 8.5 (emissions continue to rise throughout the 21st Century). RCP 8.5 is the scenario with the highest amount of human-generated emissions.

ered alongside the probability distributions for other scenarios (RCPs 2.6, 4.5, and 8.5).⁴⁹ At this point, however, it is scientifically premature to estimate the probability that the more extreme scenario will come to pass and, if so, when the world will move onto that trajectory.⁴⁹

Looking ahead, the *Delta Conservation Framework* recognizes that climate change impacts must be given immediate and sustained consideration if the region is to adapt without serious hardship or ecological losses. Regional conservation partnerships and resource managers need to develop actions that integrate Delta climate change adaptation into ongoing Delta conservation management practices. Creating more redundancy, interconnectivity, diversity, and complexity of landscape features and land

stewardship will help increase resiliency and sustain wildlife and ecosystems.⁶⁰ Conservation managers must also consider how the ongoing need to maintain water supply reliability for human use, and impending climate change impacts, will continue to put pressure on Delta ecosystems, levee systems, and agricultural operations. Over the long term, the *Delta Conservation Framework* supports regionally integrated management of water, energy, food, and related ecosystem processes to better adapt to global climate change at the regional scale.

The Framework also recommends that regional conservation partnerships including climate change in project planning examine a range of scenarios and tradeoffs. Scenario evaluation is essential for long term, science-based decisionmaking.

Anticipated Climate Change Effects on Delta Ecosystems^{46,498,49,50,51,52,53,54,55,56,57,58,59,60}

Distribution of Delta Ecosystems: The location, extent, and composition of Delta ecosystems currently at or below sea level will change as a result of increased sea level, saltwater intrusion, and shifts in the tidal hydrologic system. Tidal wetland ecosystems will become more deeply inundated, unless they can accumulate additional layers of sediment or organic matter and “migrate” upslope. Wetlands protected by levees will be submerged if levees are overtopped, unless strategies are implemented to raise the elevations. Salt marsh and freshwater marsh are among the natural communities most exposed and vulnerable to climate change. The Delta also supports species that have been identified as climate vulnerable such as salt marsh harvest mouse and Delta smelt. Fluctuations in the size of wildlife populations will occur at different rates, because individual species will respond differently to changes in ecosystems. While some species will adapt in place, others will move to more suitable areas or become locally extinct.

Flood risk: Rising sea levels, increased tidal range and winter river flows, and more intense winter storms will significantly increase the hydraulic pressure on levees in areas where current farming practices continue and subsidence increases over time. If key levees collapse during a storm or seismic event, it could lead to catastrophic seawater intrusions and flooding throughout the Delta. Portions of the Suisun Marsh are particularly vulnerable to these anticipated stressors and tidal marsh drowning.

Water quality: Changes in the timing and volume of freshwater inflows and the projected increase in sea level make it possible the Delta will experience higher salinities, requiring increased intervention to maintain water quality standards. Additionally saline water will continue to seep into subsided areas. Stream temperatures throughout the region could also increase with climate change as ambient

air temperatures rise and inflow changes. For example, projections for estuarine inflows are expected to be 20 percent higher on average October through February, and 20 percent lower March through September.

Average temperature and precipitation: The Delta region is expected to experience increases in average ambient air temperatures. January average temperatures are expected to increase by 4.5–4.9°F by 2070; average July temperatures are projected to increase by 6.6–6.9°F by 2070. Annual mean precipitation is expected to increase in Solano County (from 19.4 to 25.4 inches), Contra Costa County (from 18.4 to 23.1 inches), Yolo County (from 19.4 to 25.1 inches), Sacramento County (from 18.4 to 22.2 inches), and San Joaquin County (from 13.8 to 16.8 inches) by 2100 (RCP 8.5 emission scenario). Upland areas of the Delta, including portions of Contra Costa, San Joaquin, and Sacramento counties, are also projected to experience increased risk of wildfire.

Ecosystem services: The phenology of animal migration, flowering, and insect emergence is expected to shift in response to increased temperatures. Shifts in phenology that cause plants and pollinators to be out of sync, could disrupt pollination timing and associated natural and agricultural plant production. The structure and function of transition zones and upland ecosystems are also likely to be disrupted by shifts in temperature and precipitation, and increased frequency of extreme weather events. Resulting droughts and extreme storms will directly affect water availability and quality, and increase flood risk for Californians in the Delta and associated watersheds.

California's Fourth Climate Change Assessment: 2018⁶⁰

Since California's last state-led climate change assessment in 2012, the Golden State has experienced a litany of natural disasters. This includes four years of severe drought from 2012 to 2016, an almost non-existent Sierra Nevada snowpack in 2014–2015 costing \$2.1 billion in economic losses, widespread Bay Area flooding from winter 2017 storms, and extremely large and damaging wildfires climaxing with the 2018 Camp Fire that destroyed Paradise. California's most recent climate assessment, predicts the state can expect even more in the future.

The results are alarming for our state's future: an estimated four to five feet of sea level rise and loss of one to two-thirds of Southern California beaches by 2100, a 50 percent increase in wildfires over 25,000 acres, stronger and longer heat waves, and infrastructure like airports, wastewater treatment plants, rail and roadways increasingly likely to suffer flooding.

California's latest assessment dives into climate consequences on a regional level. Academics representing nine California regions spearheaded research and summarized the best available science on the variable heat, rain, flooding and extreme event consequences for their areas.

The following is some information largely excerpted from the assessment's regional sections on the Sacramento Valley and the San Joaquin Valley, which encompass the Delta.

Sacramento Valley:

- In terms of agriculture, climate change will bring about longer growing seasons; insufficient cold for some tree crops; low elevation flooding; changes in productivity of current crop varieties; and conversion of agricultural land to other land uses.
- In terms of floods, climate change will bring about more extreme floods; greater floodplain vulnerability; pressure to expand flood bypasses, levees, and flood storage in reservoirs; and higher Delta water levels.
- In terms of water supply, the region will experience more extreme droughts; pressure to reduce water supply storage due to larger floods; and possibly greater water demands from higher crop and landscape water use. In the Delta, saltwater will intrude into areas from which water is pumped for agricultural and municipal uses.
- In the Delta, higher sea levels, levee subsidence, and greater floods will threaten levees. By 2050–2080, some Delta levees may no longer meet federal standards.
- In terms of the ecosystem, climate change will produce higher temperatures that threaten native species, make reservoirs less effective for sustaining salmon populations, and increase Delta water levels.

Some of the more promising ways to reduce climate change risks to the Delta region related to conservation and agriculture include: climate-smart buildings and more accessible “cooling centers” for heat waves; strategic forest thinning, controlled burning, and fire reduction practices; enhanced emergency preparedness with a focus on disadvantaged communities; increased land use planning to prepare for extreme floods and drought, including innovations to levees, bypasses, and reservoir capacity; increased water availability and attention to integrated water supply management within the entire watershed; improved management for climate-adaptive native species and assisted migration to protect ecosystem services, including outdoor recreation; and incorporation of climate risks into regional plans for energy, water, transportation, land use and conservation.

San Joaquin Valley:

In the San Joaquin Valley, the problems and solutions related to climate change challenges are similar but different. In general however, the agricultural sector may see shifts in cropping patterns and repurposing of fallowed lands. Regulatory and physical constraints on water supply for agriculture, and environmental factors such as warmer temperatures and more variable precipitation, new pests, and reduced chill hours will, affect agricultural decision-making and implementation. Managing sustainable agro-ecosystems in the San Joaquin Valley will require a systems approach that accounts for resource linkages to other economic sectors, such as water for cities and the environment.

Ecosystems in the San Joaquin Valley are highly vulnerable to climate change given existing stressors and the lack of organization of landscape-scale science, funding, and mitigation of adverse impacts within the region. This is particularly the case during prolonged droughts when scarce water supply disproportionately impacts ecosystems. Building resilience in ecosystems through active management, developing physical and biological connectivity, and restoring key biophysical processes will greatly improve ecosystem response to acute extreme climate events and chronic anthropogenic stressors.

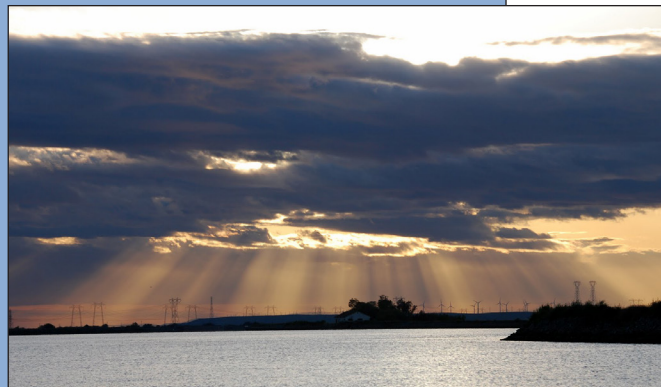


Photo: Carson Jeffres



CONSERVATION OPPORTUNITY REGION

Balancing Conservation and Development in the West Delta

Dutch Slough. Photo: Christina Sloop

Like many areas of the Delta, prime farmland and wildlife habitats are threatened by urban development in the West Delta. All along the Contra Costa County shore open spaces and habitats are feeling the squeeze – landward from populations seeking more affordable homes and lives in the ever more expensive Bay Area, and seaward from rising sea and salinity levels pushing in from the upper estuary. Add noxious invasive species and impacts from agricultural operations and the West Delta region faces many conservation challenges.

Current West Delta conservation efforts reflect *Delta Conservation Framework* goals for forward-thinking regional partnerships and strategies. The Framework also highlights the West Delta as a “conservation opportunity region” where a critical mass of natural landscapes, public lands, potential conservation opportunities, conservation-minded people, and existing partnerships occur in one place. The Framework seeks to support such regions and partnerships in strategic conservation planning. Together these regions will one day add up to a healthier Delta – both for people and wildlife.

CONSERVATION OPPORTUNITY REGION - CONTINUED

Regional Setting

The West Delta conservation opportunity region is located in northeastern Contra Costa County. The area roughly extends along Highway 4 between Bay Point and Discovery Bay, and reaches north to Bethel Island. While much of the area adjacent to the highway is developed, the more eastern and northern portions of the West Delta are mainly a rural mosaic of farms, ranches, and open space. Public lands include the Antioch Dunes National Wildlife Refuge and Big Break Regional Shoreline. These lands offer recreational and educational opportunities to the public, and provide wildlife habitat. The adjacent Dow Chemical plant manages the 472-acre Dow Wetlands Preserve of tidal marshes and beaver ponds. Other public lands in the region include potential regional park sites (identified in the *East Bay Regional Park District Master Plan*), Jersey Island (owned by the Iron Horse Sanitary District) and creek and riparian habitats (owned by the Contra Costa County Flood Control and Water Conservation District). Due in part to its proximity to the San Francisco Bay Area, the population in the area is growing. Forecasts predict a population increase of 127,000 people in Contra Costa County between 2007 and 2025, with a significant portion of this urban growth occurring in the West Delta. The West Delta is also home to over 150 rare species, however (see At a Glance sidebar). The potential loss of habitat for these species could create conflicts between conservation and economic development.

Planning Context

Conservation planning in the West Delta region is currently most strongly guided by the *East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan* (ECCC HCP/NCCP).¹ These plans provide a framework for comprehensive species, wetlands, and ecosystem conservation

that contributes to the recovery of threatened and endangered species while clearing regulatory obstacles to continued economic development. They help to avoid costly and time-consuming project-by-project permitting and uncoordinated, biologically ineffective mitigation. The HCP/NCCP enables multiple stakeholders — including Contra Costa County, the Contra Costa County Flood Control and Water Conservation District (Flood and Water District), the East Bay Regional Park District, and the Cities of Brentwood, Clayton, Oakley, and Pittsburg — to coordinate endangered species permitting for activities and projects in their respective management areas. The City of Antioch, on the western edge of the West Delta, originally elected not to participate in the ECCC HCP/NCCP; however, as of 2017, they began developing their own HCP/NCCP, modeled after the ECCC HCP/NCCP.

At the state level, the California EcoRestore initiative, a comprehensive suite of habitat restoration actions to support the long-term

West Delta At A Glance

Size: 100,000-110,000 acres

Location: Northeastern Contra Costa County

Elevation Range: 91 feet below sea level to 436 above sea level

Zoning: 30-35 percent agricultural; 20-25 percent public or conservation lands

Other Primary Land Uses: urban, flood management

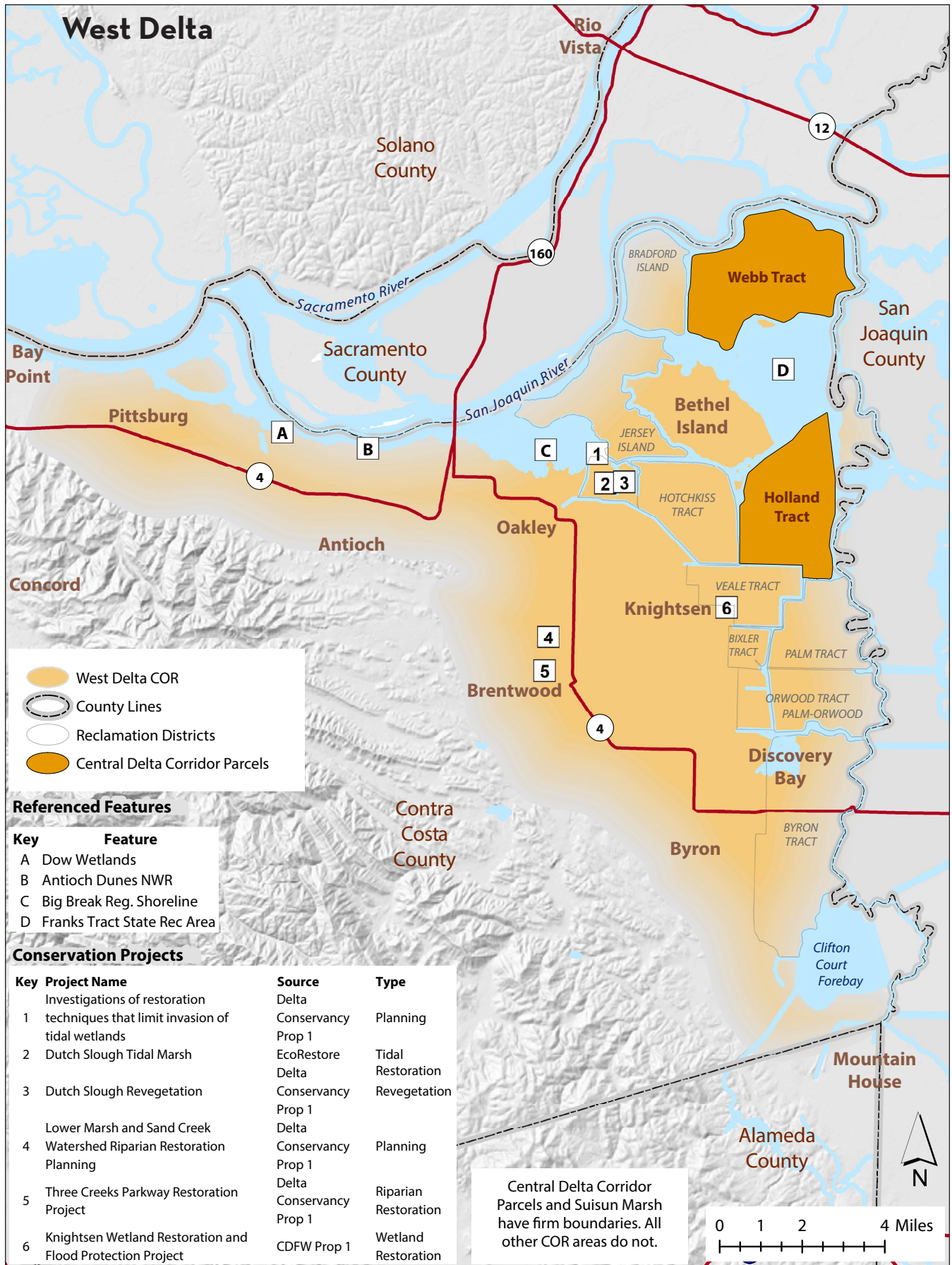
Urban Population: 243,000-283,000

Rural Population: 9,000-20,000

Recreational Opportunities: Trails, wildlife observation, boating, picnicking, nature study

Sampling of Listed Species: Delta smelt, longfin smelt, Chinook salmon, Central Valley steelhead, giant garter snake, Swainson's hawk, salt-marsh harvest mouse, San Joaquin kit fox, California black rail, California tiger salamander, California red-legged frog, vernal pool fairy shrimp, soft bird's beak, Antioch Dunes evening primrose, Contra Costa wallflower.

CONSERVATION OPPORTUNITY REGION



Map: CDFW, 2018

CONSERVATION OPPORTUNITY REGION - CONTINUED

health of the Delta and its native fish and wildlife species, supports a number of projects situated in the West Delta including the Dutch Slough and Winter Island Tidal Marsh Restoration projects.

At the county level, voters approved an Urban Limit Line (ULL) for Contra Costa County in 1990, which was extended in 2006. The limit line restricts urban development to no more than 35 percent of the County, requiring in turn that at least 65 percent of the County be preserved for agriculture, open space, wetlands, parks, and other non-urban uses. The ULL helps to prevent urban sprawl, provide more infill housing development near transit and existing urban infrastructure, and ensure that schools, fire, and police services are not overburdened.

Opportunities for Conservation

Several major conservation opportunities for the West Delta region were identified in the ECCC HCP/NCCP. These include the Three Creeks Parkway Restoration Project, the Dutch Slough Tidal Marsh restoration project, and enhanced habitats and connections along the Contra Costa shoreline containing Antioch Dunes National Wildlife Refuge, Dow Wetlands Preserve, and Big Break Regional Shoreline. Other conservation opportunities in the region include the restoration of part of Franks Tract to tidal marsh (also a feature in the Central Delta Habitat Corridor of public lands, see p. 63).

Planned or existing conservation projects include the following:

DUTCH SLOUGH TIDAL MARSH RESTORATION

This critical, large-scale habitat restoration project broke ground in 2018 two decades after it was first conceived. The site, located in Oakley on land formerly slated for urban development, offers suitable soil types and elevations for the creation of 1,187 acres of tidal marsh and complex intertidal channels favored by native Delta species. The site encompasses three leveed parcels to be restored to a mosaic of tidal marsh, riparian woodland, open water, and managed marsh (see Figure 5.1, p. 139).² Native grasslands and riparian forests will also be restored in the upland portions of the site. The Dutch Slough project is adjacent to Big Break Regional Shoreline and Marsh Creek and consequently provides landscape-scale connectivity benefits for the Delta ecosystem.

WINTER ISLAND TIDAL HABITAT RESTORATION

This 589-acre project will restore tidal action to the interior of Winter Island. The island, once farmed by handful of socialist utopians in the 1890s, is located just north of Pittsburg. The current goal is to breach the perimeter levee to create both aquatic habitat at intertidal and shallow subtidal elevations, as well as associated high marsh and riparian habitats, to benefit native fish species.



Dutch Slough. Photo: Christina Sloop

KNIGHTSEN WETLAND RESTORATION AND FLOOD PROTECTION

This project will restore a mosaic of habitats on a 645-acre property near Knightsen, and provide flood protection for the community. The project will convert agricultural and fallow fields to habitat for special status species (including giant garter snake, western burrowing owl, among others). This multi-benefit project also improves Delta water quality and provides new recreational opportunities. The project is a partnership with the ECCC Habitat Conservancy, EBRPD, and the Knightsen Community Services District.



Burrowing owls.
Photo: Rick Lewis

Potential Solutions to Recognized Challenges

The primary conservation challenges in the West Delta relate to habitat loss due to housing development, impacts from agricultural operations and noxious invasive species, and projected flooding of shoreline ecosystems and infrastructure due to climate change.

WILDLIFE-FRIENDLY AGRICULTURE

Agriculture has been the main way of life, industry, and cultural linkage to the land in the West Delta for several generations. According to the 2015 *Economic Contributions of Contra Costa County Agriculture Report*,² agriculture in the county provides 2,277 jobs and contributes approximately \$225 million to the local econo-

my. With such strong cultural ties to the land, local landowners are concerned about livelihoods and lifestyles being displaced by restoration and habitat protection activities. Wildlife-friendly farming can provide a welcome link between these two beneficial uses of Delta landscapes, however. Wildlife-friendly agricultural practices include farming crops that also benefit wildlife — for example rice or irrigated pasture — and providing drainage ditches, hedgerows, and trees for habitat value.³ The Central Valley Farmland Trust (CVFLT), formerly Brentwood Agricultural Land Trust, is a land trust that works with West Delta farmers and the agricultural community to protect fertile orchards and farms permanently. By partnering with local agencies, and using agricultural easements, CVFLT has helped to secure properties such as the 520-acre Cecchini property near Discovery Bay. Such projects have helped preserve farmland at risk of development⁴ and provide habitat for the Swainson's hawk, burrowing owl, and the Western long-eared bat.

RECREATIONAL OPPORTUNITIES

Recent acquisitions by the East Bay Regional Parks District (EBRPD) in the West Delta conservation opportunity region include future potential parklands. On several of these properties, the intent is to provide multiple benefits including restored habitat for special status species and new trail links and recreational opportunities. Such efforts are also creating new collaborations. The EBRPD is collaborating with the Ironhouse Sanitary District, for example, to evaluate sites on Jersey Island for not only recreation and education opportunities, but also opportunities to use reclaimed water for farming and restoration. The District's 3,520-acre property on Jersey Island uses recycled water to irrigate fields of hay.

INTEGRATED FLOOD MANAGEMENT

In the West Delta, reclamation districts maintain the levees that provide flood protection for agricultural operations. The

CONSERVATION OPPORTUNITY REGION - CONTINUED

Contra Costa County Flood Control and Water Conservation District (the District) serves all of the West Delta conservation opportunity region. The District owns property throughout the County for the purpose of constructing and maintaining regional flood control basins, channels, and creeks. Since 1951 when it was formed (funded primarily through property taxes and developer fees), the District has worked to protect local communities from flooding. Today, the District offers regional flood protection and environmental resources stewardship in District-owned creeks. Within the West Delta conservation opportunity region, the District is actively seeking opportunities to have their facilities function as a combination of flood control and habitat, including along Marsh Creek, Walnut Creek, Pinole Creek, and other areas.

The District's \$10 million Upper Sand Creek Basin flood protection and habitat restoration project in Antioch offers an example. The project will expand the basin to store eight times more storm water than before and build an 1800-foot-long dam, ranging in height from one to 40-feet. The project will also restore 3,500 linear feet of Sand Creek. The expansion will include planting over 2,500 willow trees, creating 10 acres of wetlands inside the basin, and installing an innovative trash capture device to help clean up the creek. This integrated habitat and flood management

project is an important part of the District's Marsh Creek regional flood protection master plan, which significantly reduces the flood risk for Antioch, Brentwood, and Oakley residents living downstream along Sand Creek and Marsh Creek.

The District is also working with partners on the Three Creeks Parkway, a multi-benefit flood control, creek restoration, and public access project. The project will improve approximately 4,000 linear feet of Marsh Creek¹ in Brentwood by widening the channel with a floodplain bench and planting with native vegetation. Begun in 2015, this multi-agency public-private partnership project will transform some of the Marsh Creek flood control channel into high quality salmon and riparian habitat. Such efforts within existing infrastructure projects offer opportunities to enhance and connect surrounding conservation projects.

CLIMATE CHANGE AND ADAPTATION OPPORTUNITIES FOR LONG-TERM SUSTAINABILITY

In general, the Delta region is expected to experience more intense winter flooding and storm effects due to climate change, causing greater erosion of riparian areas and increased sedimentation in wetlands.^{5,6,7} In the West Delta, as in other Delta regions, more intense winter storms with increased winter river flows will likely significantly increase the hydraulic pressure on levees which could lead to catastrophic flooding. In the summer, lower river



Three Creeks Parkway Project at the confluence of Sand and Marsh Creeks. Photo courtesy Contra Costa County Flood Control and Water Conservation District

flows could increase the possibility of saltwater intrusion farther upstream in the Delta, disrupting ecosystem processes, food webs, agriculture, and local water supplies along the Contra Costa shoreline. Annual mean temperatures and precipitation are expected to increase in the West Delta by 2100.⁸

Climate change is also expected to affect the range and habitat needs of special status species. The *Delta Conservation Framework* notes that the West Delta conservation opportunity region is located in an important transition zone between the Delta, the San Joaquin Valley, and the Mount Diablo ecosystems. The area supports the northern and westernmost extent of some species. As summers become dryer, conservation partnerships should work to create and restore habitats and protect movement corridors for species migrating to cooler, wetter areas. For example, as reduced rainfall leaves vernal pools in the area dry, species may need alternative seasonal wetlands and pools during the hydro-period of their life cycle. Species will also need safe movement corridors to new ranges.

Looking Ahead

The *Delta Conservation Framework* supports current and planned conservation efforts and partnerships in the West Delta, and suggests that more may need to be done to increase transition zones for wildlife as the climate changes and to link current habitat planning and preservation to the future. A regional partnership could develop a regional conservation strategy that considers all conservation opportunities in the West Delta region, including flood management and wildlife-friendly agricultural efforts that link the ECCC HCP/NCCP preserve area to surroundings.

The partnership base and vision for the West Delta region is already strong. Signatories to the Implementing Agreement of the ECCC HCP/NCCP include ECCC Habitat



Swainson's hawk. Photo: Rick Lewis

Conservancy, County of Contra Costa, City of Brentwood, City of Clayton, City of Oakley, the Flood and Water District, EBRPD, USFWS, and CDFW. For Dutch Slough and Winter Island, the state's DWR and CDFW are already strong partners in tidal marsh restoration efforts. For the Three Creeks Parkway Restoration Project, partners include American Rivers, the Contra Costa County Flood Control and Water Conservation District, Friends of Marsh Creek Watershed, and City of Brentwood. The *Delta Conservation Framework* supports the expansion of these early partnerships to better integrate conservation, flood management, and sustainability planning in the West Delta.

QUICK LINKS

Dutch Slough Tidal Restoration Project

<https://water.ca.gov/Programs/Integrated-Regional-Water-Management/Delta-Ecosystem-Enhancement-Program/Dutch-Slough-Tidal-Restoration-Project>

East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan (ECCCCHC 2006).

www.co.contra-costa.ca.us/depart/cd/water/HCP/documents.html

For more detailed descriptions of these conservation opportunity regions, see Appendix 2.

Guide to Related Plans and Programs

Adaptive Management Program for the California WaterFix and Current Biological Opinions on the Coordinated Operations of the Central Valley and State Water Projects (the AMP)

STRATEGY E2

The Delta Reform Act of 2009 identified adaptive management as the desired approach to reduce ecological uncertainty related to the management of the Sacramento-San Joaquin Delta ecosystems. The federal and state water operations agencies (Reclamation and DWR) and the state and federal fisheries agencies (USFWS, NMFS, and CDFW) (collectively, the Five Agencies) agree that adaptive management is the tactic best suited to advance the management of the Delta and its resources. However, there were differences among agencies regarding the definition of adaptive management and how and when to implement it. Under the AMP, the intention is for the five agencies to commit to ongoing adaptive management in implementing the current biological opinions, as well for future operations under California WaterFix. The aim is to decrease uncertainty and improve the performance of the Central Valley Project and State Water Project in protecting listed species and maintaining water supply

reliability. To do this, significant new investments in related research, monitoring, and modeling are needed, with the understanding that all efforts (existing and new) will build on each other. The AMP relies on Collaborative Sciences Workgroups to develop priority science needs to support decision making. A new Interagency Implementation and Coordination Group (IICG) is to be formed to coordinate science and management recommendations coming out of the workgroups, and to support implementation of those recommendations. The IICG will make its recommendations to the Five Agencies for a decision by the agency or agencies with final decision-making authority. The AMP will also integrate with existing adaptive management plans or programs that are more focused on specific conservation goals or regions within the Delta.

Collaborative Science and Adaptive Management Program/ Collaborative Adaptive Management Team

STRATEGY E2

The CSAMP and CAMT were formed as part of a federal and state proposal to modify the court-ordered remand schedule for the salmon and Delta smelt biological opinions for the water export facilities. CSAMP is comprised of state and federal resource agencies, other public water agencies, and nongovernmental organizations. It was established in 2013 to promote the collaborative development of scientific information to inform sound decision-making regarding the implementation and revision of the current USFWS and NMFS biological opinions on the operations of the State Water Project and the Central Valley Project. Although CSAMP originated during litigation related to the biological opinions, the legal requirement for the program ended in 2015.

In addition to its focus on the initial scientific investigations, the program has served as a forum for discussion and consideration of emerging topics such as the effects of proposed drought operations, the efficacy of proposed seasonal Delta outflow augmentations, and implementation of the *Delta Smelt Resiliency Strategy*.

The CAMT's mission is to complete studies designed to answer a set of prioritized scientific questions, and identify new initiatives based on the results of these studies. CAMT has two scoping teams, one focused on Delta smelt (DSST), and the other focused on juvenile salmon (SST). Products currently being developed by the scoping teams and principal investigators include analysis and synthesis tools and reports concerning Delta smelt entrainment, potential biases in fish survey data, fall Delta smelt habitat effects, and juvenile salmonid survival.



Photo: Amber Manfree

Delta Independent Science Board

ONE DELTA, ONE SCIENCE, STRATEGY E1

The Delta Independent Science Board (Delta ISB) provides independent oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Delta through periodic program reviews. The Delta ISB is composed of nationally or internationally prominent scientists with expertise to evaluate the broad range of scientific programs that support adaptive management of the Delta.



Zooplankton sampling in the Delta. Photo: CDFW

Delta Nutrient Research Plan

STRATEGY E2

This plan (the DNRP) is currently being developed by the Central Valley Regional Water Quality Control Board. A Stakeholder and Technical Advisory Group (STAG) was formed in 2015 to develop the DNRP as part of a Delta Nutrient Management Strategy, representing interests including water supply, drinking water, waterways, irrigated agriculture, environmental justice, wastewater, storm water, and resource management. To inform the DNRP, the STAG provides research recommendations that fill knowledge gaps in understanding the potential effects of nutrients in the Delta. A set of white papers now reflects information gathered through discussions among scientific working groups, and from a public workshop (CA EPA 2017). These white papers (available online) represent five topic areas: cyanobacteria blooms, invasive aquatic macrophytes, nutrient forms and ratios, numeric modeling, and drinking water. The STAG developed initial prioritization criteria and overall ranking of research for each topic area. Regional Water Board staff are now in the process of writing the *Nutrient Research Plan*, based on findings from the white papers, documents from scientific working groups, the public workshop, and the initial prioritization and overall ranking developed by the STAG.

Delta Regional Monitoring Program Science Enterprise

STRATEGY E1

This program monitors pesticides and toxicity, nutrients (nitrogen and phosphorous), mercury in fish, water, sediment, and pathogens. The mission of the Delta RMP is to produce objective and cost-effective scientific information critical to understanding regional water quality conditions and trends in the Delta. Results inform decisions on how to protect, and where necessary, restore beneficial uses of water in the Delta. The Central Valley Regional Water Quality Control Board, the San Francisco Estuary Institute-Aquatic Science Center, and other scientists and interested parties collaborate to conduct the Delta RMP. Representatives of publicly owned treatment works, municipal stormwater programs, irrigated agriculture, water suppliers, and state and federal agencies are participants in the program. Since state and federal laws require dischargers to monitor waters downstream of their discharge, coordinated regional monitoring allows them to pool their funds, as well as to share expertise to provide data for improved water quality management and informed policy decisions facing the Delta.

Guide to Related Plans and Programs - continued

Delta Science Program

ONE DELTA, ONE SCIENCE, STRATEGY E1

The Delta Science Program works to achieve the One Delta, One Science mission by funding research to fill critical gaps, conducting and facilitating science synthesis and independent peer review, coordinating agencies, and interpreting and communicating scientific information to decision-makers, stakeholders, scientists, and the public. Information gathered and evaluated by the program must be unbiased, independently peer-reviewed, relevant, authoritative, integrated across state and federal agencies, and communicated to Bay-Delta decision-makers such as agency managers, stakeholders, the scientific community, and the public. In 2018 the Delta Science Program coordinated the development of the *Delta Science Plan*,³² which is a framework for conducting science that organizes and integrates Delta science activities and builds an open collaborative science community known as One Delta, One Science. Established by the Delta Reform Act of 2009, the Delta Science Program is the replacement for and successor to the CALFED Science Program.

Delta Science Action Agenda 2017-2021

ONE DELTA, ONE SCIENCE, STRATEGY E1

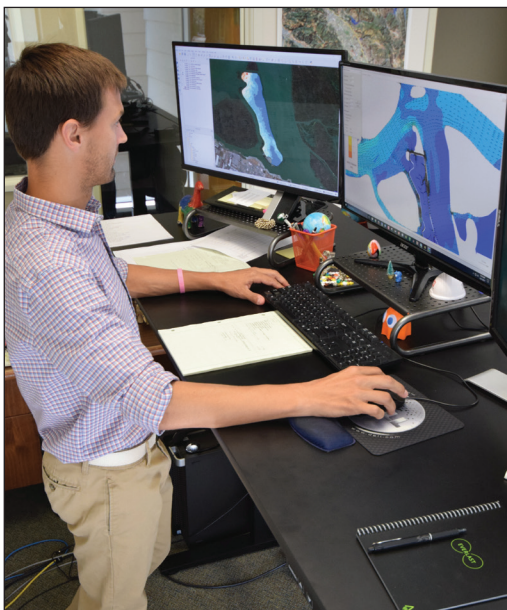
The Delta SAA prioritizes and aligns near-term science actions to inform management needs and achieve the objectives of the *Delta Science Plan*. The State of Bay Delta Science's (SBDS) past (2008 and 2016) and future publications synthesize the current scientific knowledge in the Delta, including science topics of high management concern in the Bay-Delta system. The knowledge gaps identified in the SBDS are used to guide updates to the SAA, and integrate science actions across multiple agencies and their science programs. The 2017-2021 Science Action Agenda identifies 13 science actions organized under five priority action areas that address knowledge gaps and build scientific infrastructure and capacity on a four-year implementation cycle:

1. Invest in assessing the human dimensions of natural resource management decisions.
2. Capitalize on existing data through increasing science synthesis.
3. Develop tools and methods to support and evaluate habitat restoration.
4. Improve understanding of interactions between stressors and managed species and their communities.
5. Modernize monitoring, data management, and modeling.

Delta Stewardship Council Interagency Adaptive Management Integration Team (DSC-IAMIT)

STRATEGY E2

The Interagency Adaptive Management Integration Team (IAMIT) aims to help achieve habitat restoration goals and increase restoration success for the benefit of the long-term health of the Sacramento-San Joaquin Delta and Suisun Marsh's native fish and wildlife species. The California Natural Resources Agency asked the Delta Science Program to convene an interagency technical team to develop recommendations to support adaptive management for the EcoRestore initiative. The focus was broadened in 2018 to support existing habitat restoration efforts besides EcoRestore, such as the Proposition 1 and 68 restoration grants programs. The goal is to create a strong foundation for habitat restoration adaptive management in the Delta, Yolo Bypass, and Suisun Marsh. The IAMIT supports both system-wide adaptive management and individual habitat restoration projects by identifying gaps, improving coordination, and providing technical assistance.



Data driven information sharing and scenario modeling helps inform collaborative adaptive management of a complex system with multiple interacting variables derived from both human actions and natural processes. Photo: Amber Manfree

Fish Restoration Program

SCIENCE ENTERPRISE, STRATEGY E2

A collaborative effort between California Departments of Fish and Wildlife and Water Resources, the Fish Restoration Program (FRP) aims to restore 8,000 acres of tidal wetlands in the Delta and Suisun Marsh required by the 2008 USFWS Biological Opinion on the long-term operations of the state and federal water projects. The collaboration was established via the FRP Agreement in 2010. CDFW provides assistance to DWR in planning and implementing restoration and in monitoring the biological effectiveness of restoration. The program's monitoring team (the FRPMT) is responsible for assessing the biological effectiveness of the restoration project. The team coordinates the IEP's Tidal Wetland Monitoring Project Work Team that developed and recently published online the Tidal Wetland Monitoring Framework for the Upper San Francisco Estuary, Standard Operating Procedures for recommended sampling methods, and the Effects of Tidal Wetland Restoration on Fish (an IEP technical report). The Fish Restoration Program's pilot monitoring studies are currently included in the IEP work plan. The FRPMT writes project-specific adaptive management and monitoring plans, conducts on-the-ground work to inform the work group products, and actually does the monitoring for FRP projects.

Water supply and gentrification in the Delta continue to be major public policy issues for the region, and are often seen as at odds with conservation initiatives. Photo: Amber Manfree

Interagency Ecological Program

STRATEGY E1

This program promotes collaborative and scientifically sound monitoring, research, modeling, and information synthesis for the Bay-Delta ecosystem. The IEP mission addresses high-priority management and policy needs in order to fulfill responsibilities established under various water rights decisions, the State and Federal Endangered Species Acts, and the Clean Water Act. The mission directives are carried out by multidisciplinary teams composed of agency, academic, nongovernmental organizations, and private scientists. The IEP consists of nine member agencies, including the Department of Water Resources, the Department of Fish and Wildlife, the State Water Resources Control Board, U. S. Fish and Wildlife Service, Bureau of Reclamation, U.S. Geological Survey, U. S. Army Corps of Engineers, National Marine Fisheries Service, and the Environmental Protection Agency. The IEP also partners with the San Francisco Estuary Institute and Aquatic Science Center, the Delta Science Program, and the Central Valley Regional Water Quality Control Board.⁶⁷

Public Policy Institute of California

SCIENCE ENTERPRISE, STRATEGY E2

As a nonprofit, nonpartisan think tank, the Public Policy Institute of California (PPIC) is dedicated to informing and improving public policy in California through independent, objective, and nonpartisan research. PPIC includes three policy centers that integrate science information at the policy level to inform decision makers. Most relevant to the Delta is the PPIC Water Policy Center, which recommends water management solutions that support a healthy economy, environment, and society. Other PPIC capacities include the PPIC Higher Education Center, advancing practical solutions that enhance educational opportunities for all of California's students. Topics that may be relevant to the Delta include Climate Change/Energy, Economy, and Political Landscape. PPIC multidisciplinary research staff include experts in economics, demography, political science, sociology, and environmental resources. PPIC was established in 1994 to conduct research without partisan or ideological biases, encourage productive dialogue, and inspire the search for sustainable solutions in Sacramento and across the state.



Guide to Related Plans and Programs - continued

San Francisco Estuary Institute

DELTA LANDSCAPES PROJECT
SCIENCE ENTERPRISE, STRATEGY E1

SFEI is an aquatic and ecosystem science institute that aims to “provide independent scientific support and tools for decision-making and communication through collaborative efforts”. SFEI’s Resilient Landscapes Program focuses on assessing and improving the health of the waters, wetlands, wildlife, and landscapes of the San Francisco Bay Area and the Delta, which included the completion of the Delta Landscapes Project in 2016. Rather than attempting to recreate the Delta of the past, given the nature and scale of documented changes, the project instead highlights the services that altered Delta ecosystems currently provide and could provide in the future. Recommendations are based on extensive research that analyzes how the Sacramento-San Joaquin Delta used to function, how it has changed, and how it could evolve given implementation of a suite of conservation and management actions that focus on providing enhanced ecological function of Delta ecosystems into the future. Its recommended approaches to reestablishing or mimicking certain natural processes aim to establish an appropriate functional configuration of habitat types at the landscape scale, and they aim to use multi-benefit management strategies to create a more viable Delta ecosystem that can adapt and continue to provide valued functions as the climate and land uses change. The recommended approaches are also designed to integrate with the human landscape to provide ecosystem improvements that also benefit the agricultural economy, water infrastructure (and diversions), and urbanized areas in the Delta. The recommendations provided in *A Delta Renewed* directly inform a number of *Delta Conservation Framework* overarching goals, strategies, and objectives (see Section III).

State of Bay-Delta Science

ONE DELTA, ONE SCIENCE, STRATEGY E1

The State of Bay Delta Science is a regularly updated collection of synthesis reports on scientific topics that emphasize progress made on management-relevant science topic areas during the past decade, and identify remaining knowledge gaps. The 2016 SBDS report includes insights from recent scientific research regarding multiple stressors that impact the continuing existence and resilience of native species. These stressors include: habitat loss, increased frequency of extreme weather conditions linked to climate change, sea level rise, anthropogenic changes in flow regimes, potential for heightened importance of nutrients in Delta waterways (related to the spread of floating aquatic invasive plants, and influence the growth of phytoplankton at the base of the food web); and an ever-changing mixture of contaminants derived from agricultural, urban, and industrial discharges.^{3,71} The reports cover the status and population dynamics of endangered and threatened fish species; the Delta as a changing landscape; food web dynamics, climate change impacts, agricultural and urban water supply reliability; dynamics of water contaminants and their transportation; multi-dimensional models on distribution and movement of fish and food organisms; levee system vulnerability; nutrient dynamics, and contaminant effects in the Delta.

UC Davis Center for Watershed Sciences

SCIENCE ENTERPRISE, STRATEGY E2

Dedicated to the interdisciplinary study of critical watershed challenges, the UC Davis Center for Watershed Sciences (Center) was founded in 1998 by geologist Jeffrey Mount and fish biologist Peter Moyle. The original focus was to develop more integrated and imaginative approaches to water science and policy; over time, the Center grew in size and disciplinary breadth to stay ahead of potential water crises associated with climate change and increased water demands. It is now one of California’s leading water management academic institutes. Today, the Center utilizes expertise from physical, biological, social, and engineering sciences to conduct quantitative analyses of ecological, economic, and social aspects of water management systems and to evaluate critical uncertainties in watershed, riverine, riparian, floodplain, and tidal marsh restoration efforts. Center scientists partner with agencies and conservation groups to conduct problem-solving research and data syntheses on topics such as restoration and water resource management. The Center also conducts non-partisan research supported primarily by foundations, public agencies, and conservation groups.

QUICK LINKS

Delta Nutrient Research Plan Stakeholder and Technical Advisory Group

www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/delta_nutrient_research_plan/index.html

Fish Restoration Program

www.wildlife.ca.gov/Conservation/Watersheds/FRPA

Interagency Ecological Program

www.water.ca.gov/Programs/Environmental-Services/Interagency-Ecological-Program

Public Policy Information Center

Water Policy Center: www.ppic.org/water
Delta-relevant publications:
www.ppic.org/publications/#t1

San Francisco Estuary Institute

www.sfei.org/projects/delta-landscapes-project

Science Action Agenda

<http://scienceactionagenda.deltacouncil.ca.gov>

State of Bay-Delta Science

<http://stateofbaydeltascience.deltacouncil.ca.gov>

SECTION V

Facilitating Permitting and Funding for Delta Conservation



Illustration: Alison Rezac

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| Goal F: Improve agency and regulatory capacity for permitting Delta conservation projects..... | 136 |
| Goal G: Secure long term funding for Delta conservation | 144 |
| Suisun Marsh Conservation Opportunity Region..... | 149 |
| Guide to Related Tools, Permits, Requirements and Programs | 157 |

KEY TERMS

COMMON PERMITS, AGREEMENTS, AND DISCLOSURES REQUIRED FOR CONSERVATION PROJECTS

- **CALIFORNIA DEPARTMENT OF FISH & WILDLIFE LAKE AND STREAMBED ALTERATION AGREEMENTS (CDFW-LSA):** A project proponent is required to notify CDFW before starting any project that may divert or obstruct the natural flow of any river, stream, or lake; change or use any material from the bed, channel, or bank of any river, stream, or lake; or deposit debris, waste, or other materials that could pass into any river, stream, or lake under Fish and Game Code sections 1600-1603.
 - **CALIFORNIA ENDANGERED SPECIES ACT AUTHORIZATION FOR INCIDENTAL TAKE:** Take of a threatened, endangered, or candidate species (listed species) is defined as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” in Fish and Game Code Section 86. Take is generally prohibited without a permit under section 2081 of the Fish and Game Code.
 - **CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMITS:** The Board requires an encroachment permit for any project that is within an area for which there is an Adopted Plan of Flood Control.
 - **CLEAN WATER ACT SECTION 402 CONSTRUCTION GENERAL PERMIT:** Required for all construction sites greater than one acre, which discharge wastewater or stormwater from a point source into a surface water of the U.S.
 - **CLEAN WATER ACT SECTION 404 PERMIT:** Regulates the discharge of dredge or fill material into waters of the U.S., including wetlands.
 - **DELTA PLAN CONSISTENCY:** If a project determines that it meets the conditions outlined in Water Code section 85057.5 as a Covered Action under the Delta Reform Act, it must submit a certification for consistency with the *Delta Plan* to the Delta Stewardship Council.
 - **EIS/EIR UNDER CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) AND NATIONAL ENVIRONMENTAL POLICY ACT (NEPA):** Each require a lead agency and a process to evaluate impacts of a project on environmental resources, including air quality, water quality, and biological, archeological, cultural, and other resources.
 - **NATIONAL HISTORIC PRESERVATION ACT SECTION 106 LETTER OF CONCURRENCE:** Project proponents must consider potential effects of a project on historic properties before acquiring a permit under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.
 - **MCATEER-PETRIS AND MARSH DEVELOPMENT PERMITS:** Projects within the Primary or Secondary Management Areas in Suisun Marsh should work with the San Francisco Bay Conservation and Development Commission to secure permits needed for compliance with the Suisun Marsh Preservation Act and the McAteer Petris Act.
 - **PORTER-COLOGNE ACT SECTION 401 WATER QUALITY CERTIFICATION AND WETLANDS PROGRAM:** Regulates discharge of fill and dredged material into state waters under the Clean Water Act Section 401 and waste discharge under California’s Porter-Cologne Water Quality Control Act.
 - **RIVER AND HARBORS ACT SECTION 10 PERMIT:** This requires authorization of the U.S. Army Corps of Engineers (USACE) to construct any structure in or over a navigable water of the United States or alter the course, condition, location or capacity of a navigable water of the U.S.
 - **RIVERS AND HARBORS APPROPRIATION ACT SECTION 408 PERMIT:** USACE issues permits to projects that alter civil works projects such as levees or other flood control infrastructure.
 - **US ENDANGERED SPECIES ACT (ESA) AUTHORIZATIONS:** U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) share responsibilities of administering the ESA. The ESA directs all Federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the ESA. Section 7 of the ESA is the mechanism by which Federal agencies insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat. The term “take” means to harass, harm, pursue, hunt, shoot, would, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Section 9 of the ESA prohibits activities affecting plants and animals designated as endangered or threatened, and the habitats in which they depend, unless authorized by a permit from the USFWS and NMFS or exempted through section 7. The basic permit types are section 10(a)(1)(A), which include Recovery Permits and Interstate Commerce permits, and section 10(a)(1)(B) Incidental Take Permits and Enhancement of Survival Permits (including Safe Harbor Agreements and Candidate Conservation Agreements with Assurances).”
- See also Guide to Related Tools, Permits, Requirements and Programs p. 157-164, as well as Ideas for Tackling Two Common Permitting Challenges, Table 5.1, pp. 104-105.
- Footnotes: The Delta Conservation Framework footnote and endnote references can all be found in Appendix 1 online by section.*

Introduction

Whether it's restoring a few acres of wetland or planting riparian vegetation on levees or removing invasive weeds, most conservation projects on Delta landscapes require permissions and permits from government regulators. Myriad regulations reflect federal, state, regional and local goals for environmental quality, wildlife protection, public safety, land use, and other areas of public interest and common good. Faced with the many layers of regulatory oversight governing Delta projects – not to mention sometimes conflicting definitions and directives – any first time project manager undertaking a Delta conservation project might feel overwhelmed. Indeed even the most seasoned engineers, resource managers, biologists, and advocates for conservation projects complain of the complexity and cost of moving projects through planning, permitting, compliance, and construction. By the time projects are approved and shovel-ready, the dollars and equipment required to do the job may have already evaporated.

During the 2016 stakeholder workshops held as part of the development of this *Delta Conservation Framework*, participants repeatedly voiced frustration about the number and complexity of permits required for a single restoration project. Many stakeholders commented on the challenges of working with such a variety of agencies, each with different authorities, and on the

length of time and amount of documentation required to apply for, and obtain permits for, each component of a conservation project. According to stakeholders, it can take years, even decades, before permits are granted and conservation projects are authorized for implementation. This has inherent drawbacks, especially when degraded environmental conditions are left to linger until conservation actions move forward. Delays can also increase the costs of conservation, and undermine timelines for mitigation or compliance.

Another major challenge for conservation success is the lack of long-term funding for maintenance, monitoring, and adaptive management of projects after construction. Planning and implementing conservation projects is most often based on short-term government or donor funding cycles that grant funds over the course of three- or five-year contracts. Longer term funding can be harder to come by, and neighbors and communities in the Delta remain concerned about adequate ongoing stewardship of public lands and conservation initiatives.

The *Delta Conservation Framework*, as an overarching framework for coordinating large scale conservation, recognizes that these are major challenges to the timely and cost-effective implementation of conservation projects in the Delta, and offers strategies and solutions for how to facilitate permitting and funding for conservation.

One recurring comment voiced in the stakeholder workshops held to develop the Delta Conservation Framework in 2016 was the extraordinary complexity of the permitting process for conservation projects. Schedules and budgets are often stretched by efforts to meet the array of regulatory requirements in the Delta. Photo: Christina Sloop



Framework in Depth: Goal F

Improve Agency Capacity for Permitting Conservation Projects

Infrastructure, habitats, waterways, communities, and agriculture all occur side-by-side in the Delta landscape, and each can be undermined by neighboring activities, construction, or factors ranging from weeds and floods to disturbance and disaster. To guard against negative impacts, agencies across all levels of government—federal, state, regional, and local—have regulatory responsibilities concerning the review of potential impacts of new projects on the infrastructure and environment in the Delta, the Yolo Bypass, and Suisun Marsh.

Potential project impacts to infrastructure (including roads, bridges, flood protection structures, transmission lines, and natural gas lines) must be reviewed to

minimize negative effects on public facilities and services, and to preserve public safety. Potential project impacts on sensitive species, water quality, and the environment must also be reviewed and mitigated as necessary, even if there are projected long-term project benefits to wildlife or ecological health.

Despite the best intentions of each agency, the process of complying with regulatory requirements and implementing conservation projects in the Delta can be daunting. Goal F of the *Delta Conservation Framework* identifies some opportunities and strategies for improving the permitting process.



In the Delta, where rivers connected to 40 percent of the state flow through myriad channels and sloughs, impacts on sensitive native species migrating through, such as Chinook salmon, add to the permitting complexity of conservation projects.

Photo: CDFW



Illustration: Afsoun Radzvi

GOAL F
Improve resource agency and regulatory capacity for permitting Delta conservation projects.

| STRATEGY F1 | STRATEGY F2 | STRATEGY F3 |
|--|---|---|
| <p>Find ways to improve the permitting process through direct engagement with regulatory agencies and existing venues aimed at greater efficiencies.</p> <ul style="list-style-type: none"> • Build on the efforts of the Collaborative Science and Adaptive Management Program and the Delta Plan Interagency Implementation Committee. • Make the most of regional partnerships and relationships to increase collaboration and efficiency. • Dedicate staff in permitting agencies to liaison with conservation partnerships and managers • Use planning tools to help project proponents better understand permitting processes. | <p>Support the development of planning tools for permitting, in coordination with regulatory agencies, to provide high-level guidance for project proponents and agency staff issuing permits for individual projects in the Delta.</p> | <p>Support the development of regional programmatic permits for conservation projects in the Delta.</p> |



Innovative and rapid permitting of multi-benefit flood protection habitats and blue infrastructure - such as the Yolo Bypass — will be increasing important in protecting cities like Sacramento, and their agricultural surroundings, from increased flooding due to climate change.

*Photo:
Carson Jeffres*

Coordination Among Regulators and Project Proponents

Strategy F1 under Goal F highlights the need to improve the efficiency of permitting for conservation projects in a way that meets the regulatory requirements of federal, state, regional, and local permitting agencies. The complexities of permitting conservation projects can discourage proponents of high-value projects. In addition, the steep costs associated with protracted permitting processes can drain the already limited funds available for conservation projects.

Under this strategy, the *Delta Conservation Framework* provides three recommendations. These recommendations are based on proven solutions that have improved coordination and expanded resources in support of efficient permitting and implementation of Delta conservation efforts.

The *Delta Conservation Framework's* first recommendation under this strategy is to continue to support the existing executive-level coordination position established by the California Natural Resources Agency in 2015. This position was created to coordinate and facilitate landscape-level and project-specific Delta habitat restoration actions that further multiple state objectives, including but not limited to regulatory obligations and voluntary restoration goals, consistent with the California Water Action

Plan and California EcoRestore. The person in this position represents California's Secretary of Natural Resources and Governor in matters concerning the restoration of ecosystems within the Delta and associated regions in order to accelerate and maximize the ecological impact and scope of state restoration efforts. If institutional challenges for permitting conservation projects are identified through normal regulatory review and permitting processes, the person in this position is a resource for facilitating high-level collaboration and overcoming roadblocks along the way.

The *Delta Conservation Framework's* second recommendation under this strategy is to support the funding of new staff positions at regulatory agencies that are dedicated to permitting conservation projects located within the Delta. Dedicated staff will improve permitting efficiency by creating one consistent point of contact at each regulatory agency to communicate with project proponents and participate in regular coordination meetings. Over the long term, dedicated staff will also have the opportunity to develop expertise in a specific area, making them more efficient at permit review and processing. A current example of the effectiveness of this approach are staff at the California Department of Fish and Wildlife dedicated to permitting Delta restoration and levee projects under the state's Fish



Dutch Slough restoration site in early 2018, two decades of negotiation, planning, design, and permitting after first being identified as a likely, higher elevation, freshwater marsh restoration site.

Photo: Christina Sloop

Restoration Program Agreement. These dedicated positions have successfully facilitated project compliance with state environmental laws and regulations.

The Delta Conservation Framework's third recommendation under this strategy is to support the development of planning tools to help project proponents better incorporate permitting processes into their plans. As a general practice, incorporating permitting and compliance monitoring into project timelines, implementation plans, and overall budgets allows more accurate planning and more complete funding over the life cycle of each project. Alternatively, to improve cost-effectiveness, long-term projects implemented or managed over decades could take a phased approach to planning, permitting, and implementation with separate budgets and timelines for each phase.

Conservation practitioners also need easily accessible online resources to explain permitting requirements and guidelines clearly. Specific Delta-wide, general resources could include:

1. A permitting guide book and training workshops that summarize steps to take and lessons learned from past projects;

2. A decision tree and table that show all the permits required for conservation projects and their associated timelines;
3. A regularly updated list of points of contact within each regulatory agency to assist project proponents during the process of applying for required permits.

Combined, these resources should help practitioners better incorporate permitting processes in project planning and foster interagency coordination ahead of, and during, planning and construction.

The Guide to Related Tools, Permits, Requirements and Programs at the end of this section, starting on p.157, contains examples of commonly required permits, disclosures, or notifications, among other resources for navigating the complexities of Delta conservation work. Further examples are provided under Key Terms, "Common Permits" on p.134. In addition, the CDFW Habitat Conservation Planning Branch website explains the state permitting options available.⁹

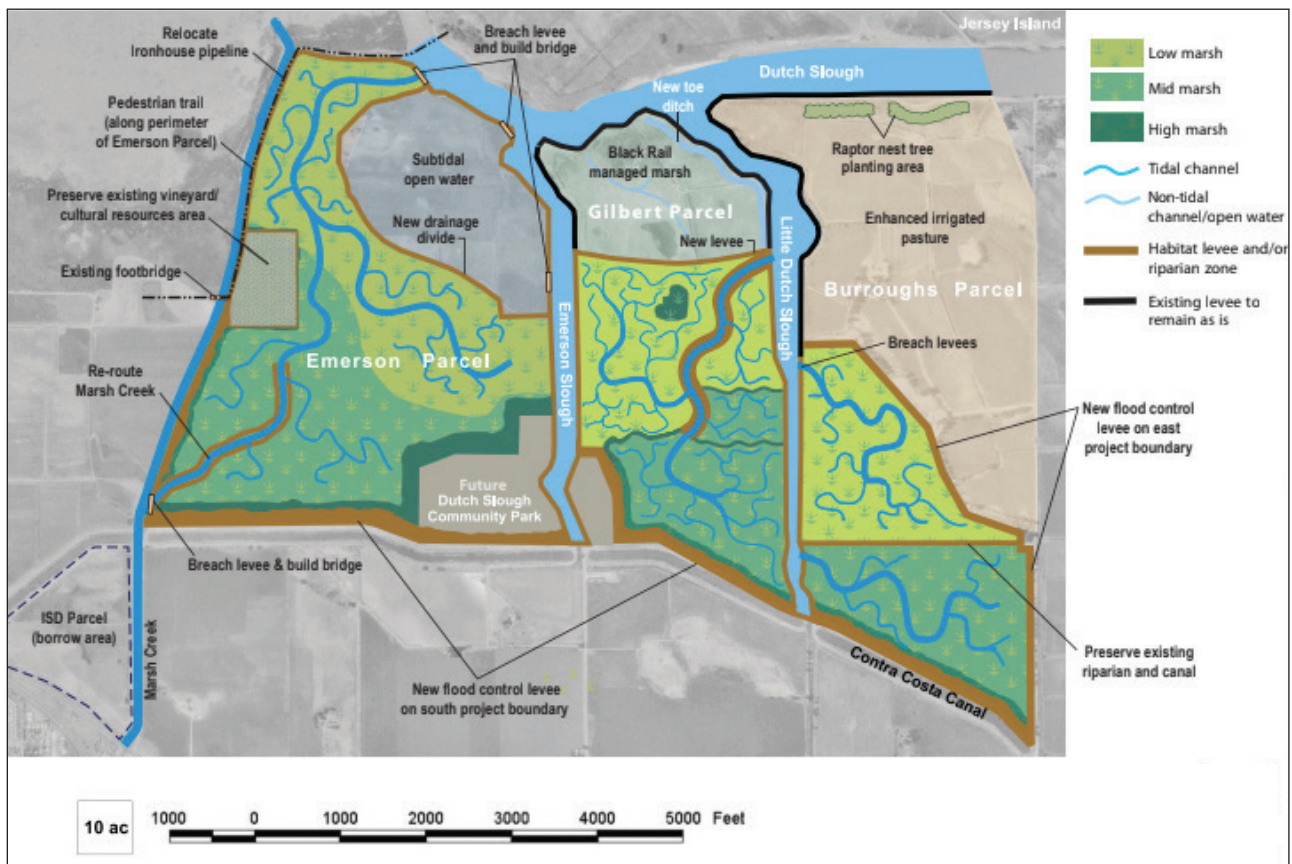


Figure 5.1: The Dutch Slough restoration plan includes several experiments to test conservation outcomes. Rendering: ESA Assoc.

Table 5.1: Ideas for Tackling Two Common Permitting Challenges**Incidental Take & Long Term Funding for Mitigation Sites**

The following section highlights six options for tackling two common permitting challenges: the incidental take of listed species, and the requirement that long term funding and monitoring be available for mitigation sites. Options identified include: 1) pursuing permits exempt from mitigation requirements; 2) planning for advanced mitigation; 3) negotiating consistency among state and federal requirements; 4) mitigating through on-site restoration; 5) expanding the state's advance mitigation sites and banks; and 6) requesting take authorization for management purposes. The *Delta Conservation Framework* offers this short-list of options as a first step to implementing Goal F, and as an introductory guide to navigating the regulatory environment for Delta conservation.

As project proponents may be well aware, construction of restoration projects designed to benefit a species listed as endangered or threatened under the California Endangered Species Act (CESA) or US ESA (listed species) may result in incidental take of that species. In some cases, restoration targeted to benefit one listed species can result in take of other listed species. Take may trigger the need to work with California Department of Fish and Wildlife (CDFW) and federal agencies or only one regulatory agency. In either case, incidental take of listed species triggers regulatory requirements for projects, potentially including requirements to mitigate for impacts off-site and guarantee long-term funding to support the mitigation site. Although the decision to seek take authorization for state-listed species through an incidental take permit with the CDFW is at the discretion of the project proponent, take authorization under CESA is generally requested if even the potential for take is low. Even in instances when a project provides on-site mitigation for impacts to listed species, the area set aside for mitigation is required under CESA to have long-term funding and monitoring in place. It can be challenging for projects initiated with short-term funding to demonstrate financial assurances over the long term. Options 1-5 below suggest ways to approach incidental take challenges, while options 6-7 tackle long term funding and monitoring challenges for mitigation sites.

Option 1: Pursue permits that are exempt from mitigation requirements.**Incidental take of listed species under**

CESA: Within CESA, Fish and Game Code Section 2081(a) allows CDFW to authorize public agencies to take listed species for management purposes through a Memorandum of Understanding (MOU). Projects that qualify for an MOU under Section 2081(a) would be exempt from mitigation requirements because the benefit of the management action offsets the take of individuals.



Safe Harbor Agreements: A federal Safe Harbor Agreement (SHA) is a voluntary agreement between cooperating non-federal property owners and the US Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration (NOAA), that authorize take resulting from ordinary activities when actions of the landowner contribute to the recovery of the species listed as threatened or endangered under ESA.¹ For example, see p. 143 for a description of the Lower Mokelumne River Programmatic Safe Harbor Agreement.²

The California Safe Harbor Agreement Program Act was introduced to Fish and Game Code in 2009 to encourage landowners to voluntarily manage their lands to benefit listed species.³ Through state SHAs, CDFW may authorize incidental take of a listed species if implementation of the agreement is reasonably expected to provide a net conservation benefit to the species, among other provisions (Fish and Game Code, §2089.6). California SHAs are analogous to the federal safe harbor agreement program. CDFW has the authority to issue a consistency determination (CD) based on a federal safe harbor agreement for species that are listed under both ESA and CESA (Fish and Game Code, §2089.22). A CD is issued when the federal authorization is consistent with the requirements of CESA (Fish and Game Code §208.1, §2081). California SHAs do not require mitigation; although, there must be sufficient funding to determine baseline conditions on the property and to carry out the management action and monitoring for

the duration of the agreement (Fish and Game Code, §2089.6 (g)). However, SHAs cannot be entered into with state or federal entities (Fish and Game Code, §2089.4(d)).

Completed California Safe Harbor Agreements include:

- Rock Creek, Shasta County, Shasta crayfish (2016)
- Rock Creek Upper Pool, Shasta County, SHA CD, Shasta crayfish (2015)
- Carrington Coast Ranch, Sonoma County, Townsend's big-eared bat (2014)
- Fireworks America, San Joaquin County, large-flowered fiddleneck (2014)
- Morrison Ranch, Alameda County, large-flowered fiddleneck (2014)
- Kerns Pond, Shasta County, SHA CD, Shasta crayfish (2012)
- Agriculture and Land Based Training Association, Monterey County, California tiger salamander (2012)

Habitat Restoration and Enhancement

Act (Act): Assembly Bill 2193 established a permitting process for landowners, state and local government agencies, and conservation organizations to implement small-scale voluntary habitat restoration projects in California.⁴ Habitat restoration projects, as defined by the Act, are projects that have a primary purpose of improving fish and wildlife habitat, meet the eligibility requirements of Clean Water Act Section 401, avoid and minimize incidental impacts, and result in measurable ecosystem benefits. Projects approved by CDFW, pursuant to the Act, will not require additional permits from CDFW, such as LSA Agreements or Incidental Take Permits.

Habitat Conservation Plans (HCP) and Natural Community Conservation Plans

(NCCP): If a project is located within the boundaries of an existing or developing HCP and/or NCCP planning area, take of listed species could be covered by the conservation plan if it is considered a covered activity and may not result in additional mitigation requirements. Siting the project within an approved and operating conservation plan may require strategically planning the restoration project far in advance of its initiation, but would streamline regulatory requirements. Projects may also be eligible to participate in an existing, approved conservation plan under provisions for special entities (see p. 33 for Delta related HCPs/NCCPs).

Environmental impacts analyzed under CEQA/NEPA: Mitigation for project impacts under CEQA can be avoided by designing conservation projects to meet certain categorical exemptions. For example:

- Small restoration projects (less than five acres) can be sited so that there are no significant impacts on listed species or their habitats (Cal. Code Regs., tit. 14, §15333).
- Projects that are designed to not result in a serious or major disturbance to an environmental resource, and that are designed for the purpose of collecting information before construction or during adaptive management, may be exempt under Class 6 (Cal. Code Regs., tit. 14, §15306).
- Conservation actions other than construction may be taken by regulatory agencies so that they protect natural resources (exemption Class 7) and protect the environment (exemption Class 8) (Cal. Code Regs., tit. 14, §15307-§15308).

If a conservation project does not meet categorical exemptions under CEQA, a Negative Declaration can be prepared if an initial study is conducted and clearly shows no substantial evidence that the project may have a significant effect on the environment (No Effect Determination).⁵ If the initial study shows potential for significant environmental impacts, revising the project proposal and design to avoid or mitigate those impacts could enable the lead agency to issue a Mitigated Negative Declaration and avoid preparing an Environmental Impact Report. NEPA also has categorical exclusions that can be met through careful project planning. In general, designing projects that avoid or have negligible impacts on wildlife or their habitats simplifies the process of developing a CEQA/NEPA document and decreases or eliminates the associated mitigation requirements.

Option 2: Explore advance mitigation.

Advance mitigation⁶ could enable conservation project proponents to purchase credits from mitigation banks⁷ to meet regulatory requirements prior to project implementation, after potential impacts have been identified and proponents have received the respective permit or agreement. This approach avoids temporary loss of habitat that can result in higher mitigation ratios, because the mitigation is purchased and habitat is restored and protected before the immediate need occurs. If designed and

placed on a landscape scale that considers the needs of multiple target species (including daily and seasonal migratory movement distances), mitigation banks could potentially improve ecosystem function more effectively than small, scattered mitigation projects. In many instances, mitigation credits are available for purchase through the services of firms that broker project credits with mitigation banks approved by regulatory agencies. For example, the Burke Ranch Conservation Bank, just west of the Cache Slough Complex, provides mitigation banking for California tiger salamander, Swainson's hawk, and vernal pool species. Mitigation credits with CDFW could also be developed through the Regional Conservation Investment Strategies Program (see p.157).



Option 3: Negotiate consistency among state and federal requirements.

Conservation projects may address potentially conflicting permit requirements for species listed under both ESA and CESA, present at a given project site, through negotiated consistency. For example, CDFW could issue a consistency determination on a federal ESA authorization, if CESA mitigation requirements are fully met by the ESA authorization. Otherwise, mitigation requirements can be negotiated and agreed upon ahead of time. These requirements can be included in the project description and conditions of the federal authorization to meet the CESA requirements and ensure that incidental take and impacts of the taking are minimized and fully mitigated. The more consistent the authorizations are, the faster they can be processed.

Option 4: Mitigation through on-site restoration.

Occasionally, the needs of listed species conflict, and restoration targeted to benefit one species can result in take of another listed species. For example, habitat restoration activities to benefit Delta smelt at Dutch Slough will likely result in take of Swainson's hawk when restoration of tidal marsh habitat removes known nest trees and associated foraging habitat. In this specific case, the project proponent met with CDFW to develop a project design that benefits and fully mitigates impacts to both species through

on-site restoration, habitat enhancement, and long-term conservation. This meets the CESA requirement because the incidental take of Swainson's hawk can be fully mitigated within the project area.

Option 5: Expand the state's advance mitigation sites, banks, and credits.

Expand the number or size of advance mitigation sites established by state agencies and make them more affordable as a way to establish "credits" before a given project is launched. Existing mitigation banks are managed and monitored by third parties over the long term, which relinquishes project proponents from the requirement to secure and document their own long-term funding source.

Option 6: Request take authorization for management purposes.

Under Fish and Game Code, §2081, subdivision (a), there is the option for CDFW to authorize public agencies to take listed species for management purposes. Projects that qualify for a SHA or a Memorandum of Understanding (MOU) under Fish and Game Code, §2081 (a), would be exempt from the requirement to establish a long-term funding source because take of individuals is offset by the benefit of the management action to the listed species. For example, a 2081(a) MOU⁸ was issued to the Los Molinos Water Company in 2015 for the rescue and relocation of Chinook salmon and increasing instream habitat to benefit salmon. This MOU was established to provide a framework for cooperative activities and monitoring in Mill Creek, eastern Tehama County, that includes or addresses issues of importance to Central Valley spring-run Chinook salmon, listed as threatened under CESA. The MOU provides authorization for take associated with actions by either party to rescue and relocate the salmon, or assist with increasing flows in the creek to benefit salmon, as management activities under authority of California Fish and Game Code section 2081(a). General MOU elements include fish rescue efforts, designated fish passage flows, changes in the timing of diversions to provide improved instream flow and water temperature conditions that would minimize the need to rescue fish, and the monitoring and evaluation of management actions. Further specific items of the program, tailored by stream, as well as the effective time of the agreement, are also outlined in the MOU.

FRAMEWORK IN DEPTH: GOAL F CONTINUED



CDFW crews dipnet at Jepson Prairie Preserve to monitor health of California tiger salamanders. Photo: Mandy Culpepper.

Common Guidelines

Strategy F2 under Goal F recommends that individual regulatory agencies establish common planning tools for evaluating and permitting conservation projects in the Delta. In addition to the general, delta-wide planning tools and checklists identified in Strategy F1, the efficiency of permitting (for both project proponents and agency staff) could be improved by developing permit planning toolkits within each agency tailored to conservation projects in the Delta, Suisun Marsh, and the Yolo Bypass. These specific toolkits could be developed by individual agencies, based on their expertise with their specific regulatory responsibilities, vetted internally, and used to help agency staff efficiently review and make decisions about permits for individual projects. For example, guidelines could include consistent definitions of key terms such as temporary impact, permanent impact, and listed species habitat characteristics, as well as suggested procedures for project evaluation, consultation, and mitigation (if relevant) in the Delta, Suisun Marsh, and the Yolo Bypass. These Delta-focused guidance documents should be designed to facilitate internal communication within regulatory agencies and helpful, time-saving, informed discussions between project proponents and agency staff. In the end, this would likely require less time and fewer staff resources than developing a formal programmatic or regional permit. Regardless, any work completed could also provide a useful foundation for developing any eventual, more formal, regional or programmatic permit as suggested below.

Strategy F3 under Goal F supports the development of regional and programmatic permitting frameworks for the Delta. In general, these kinds of authorizations provide a pre-approved region-specific (Delta) or problem-specific (pollution or habitat loss or levee maintenance, for example) umbrella of priorities and parameters under which individual projects can gain approval.

While regulations and permitting requirements applicable to conservation projects are likely to vary based on site-specific conditions in the Delta, Yolo Bypass, and Suisun Marsh, the result can be burdensome. Except in areas where HCPs and NCCPs have been developed (see Section 1 Guide, pp. 31-37), permits are currently issued on a project-by-project basis by a variety of federal, state, regional, and local agencies. This individual project approach requires new analyses of impacts and associated mitigation for each project by each regulatory agency — a very complex, costly, and lengthy process for all involved, as described above.

Based on stakeholder suggestions during the 2016 workshops, the *Delta Conservation Framework* supports the development of regional regulatory frameworks, or “programmatic permits,” to 1) provide clear guidance to project proponents regarding characterization of impacts and associated mitigation requirements (if any), 2) allow for better integration of individual projects into a regional planning vision. Agencies can process permit applications more quickly for projects that apply through a regional permit (generally Clean Water Act related) or under a programmatic authorization (generally ESA-related).

Programmatic permits, or regional regulatory authorizations, could improve the efficiency of conservation project implementation in the Delta by clearly defining eligible project types and associated mitigation upfront. This information can help project proponents better plan project budgets and timelines, and help agency staff process permits.

Programmatic permits or regional regulatory authorizations are nothing new. There are many California examples of programmatic biological opinions that authorize incidental take of species listed under the federal Endangered Species Act (ESA) for multiple similar projects within the same region. Their purpose is to expedite consultation under ESA Section 7 for proposed projects that have limited impacts on the listed species.¹⁰

“Regional” permits are more often water related. In one example, the San Francisco Bay Regional Water Quality Control Board issued a regional municipal permit for stormwater discharge (under the Clean Water Act) under which 76 cities and counties throughout the Bay Area are collectively reducing impacts on Bay water quality.

Conservation actions that may be suitable for programmatic or regional permitting and compliance with state and federal regulations include: planting native vegetation, restoring historic features (such as channel alignment), controlling invasive species, managing watersheds to control runoff, removing barriers to fish passage and unnatural hard points within and along channels, and undertaking minor vegetation or tree removal, among others.¹¹

The Guide on p. 157 offers examples of state and federal programmatic or regional permits in the Delta, including the new CDFW Regional Conservation Investment Strategy Program that enables agencies in a region to conduct conservation projects that could serve as mitigation for other projects within the same region.

Safe Harbor Agreement for the Lower Mokelumne

Efforts to protect the valley elderberry longhorn beetle without imposing burden on neighbors and farmers along the Mokelumne River offer one well-known example of the benefits of programmatic permits. The 2006 Lower Mokelumne River Programmatic Safe Harbor Agreement (SHA) between the California Association of Resource Conservation Districts and the US Fish and Wildlife Service promotes ecosystem restoration and conservation of the federally-listed valley elderberry longhorn beetle. The agreement is accomplished through the voluntary restoration, enhancement, and management of native riparian habitat in the lower Mokelumne watershed under ESA Section 10(a)(1)(A) (Policy 64 FR 32717 and regulation 64 FR 32706). The SHA provides certain regulatory assurances to landowners participating in conservation activities by authorizing take of valley elderberry longhorn beetle that occurs during the course of normal farming operations. The SHA details specific “enrolled properties” in the watershed the agreement pertains to, and lists the baseline determination, responsibilities, and management activities for each participating property. The SHA is based on a collective conservation benefit derived from all enrolled properties and parties. The SHA also outlines how adjacent landowners may secure incidental take authorization through a Neighboring Landowner Agreement if they maintain current farming practices.



Valley longhorn elderberry beetle. Photo courtesy Jon Katz and Joe Silveira, USFW

Framework in Depth: Goal G

Securing Lasting Conservation Funding

It is not feasible to protect, enhance, restore, and manage Delta ecosystems for the benefit of people and wildlife without committed, long-term financial support. Strategies to provide long-term funding for conservation planning, implementation, research, and adaptive management of conservation lands are vital to realizing the goals of the *Delta Conservation Framework*, as well as other Delta conservation initiatives.

In general, there are four existing sources for funding conservation.¹²

- **Government Funding** – including federal, state, and local government programs.
- **Donor-based Funding** – including nongovernment organizations, private foundations, and individuals.

- **Payments for Ecosystem Services** – including greenhouse gas reduction, outcome-based bonds (green bonds or Environmental Impact Bonds), water rights, tourism fees, and habitat exchanges.
- **Mitigation Funding** – including endowments through Business Biodiversity Offset Programs^{13,14} or other mechanisms to create and manage protected areas as mitigation for impacts to environmental resources.

In addition to these existing funding sources new voter-approved fees, taxes, fines, or dedicated bonds could provide funding for conservation projects. A centralized source of information about available funding streams and mechanisms is needed to align conservation practitioners with available funding methods, solicitations, and programs.



GOAL G

Optimize use of existing short-term funding and support current and new mechanisms to secure long-term funding for continued conservation implementation and management.

STRATEGY G1

Optimize use of existing short-term state funding for conservation by updating grant solicitation language to improve project consistency with existing regional plans and Delta Conservation Framework goals.

STRATEGY G2

Support the development of long-term funding for Delta conservation, monitoring, and adaptive management of conservation lands.

STRATEGY G3

Support the development of online resources to publicize available funding for planning and implementing conservation in the Delta

This retrofitted offloader helped save money, meet “least cost” permit requirements, and move a lot of mud to increase elevations at the Cullinan Ranch wetland restoration site in the San Francisco Estuary. Finding the right equipment for the job, and in this case aided by engineering innovations undertaken by the operator Curtin Maritime to become more competitive in the construction bidding process, can facilitate conservation.

Photo: Curtin Maritime



Short Term Funding

Strategy G1 under Goal G seeks to optimize use of short term funding opportunities for conservation. The *Delta Conservation Framework* supports direct referencing of Framework goals in current and future state grant solicitation language. Current short-term funds via government and donor grants are a first step to achieve long-term goals for the *Delta Conservation Framework*. Short-term funding is ideally suited for some projects, such as fee-title acquisitions of conservation lands, tree-planting programs, research, or targeted short-term agricultural assistance to promote wildlife-friendly practices. However, this approach is not sufficient to support functional ecosystem outcomes that may take decades to unfold. In cases where longer-term programmatic funding is needed after short-term funding is used to initiate a project, usually for operations and management of passively restoring lands, reliable financing is hard to come by.

Implementing the larger scale, ecosystem process-based, and multi-benefit goals of the *Delta Conservation Framework* will require a shift away from the project-by-project and parcel-by-parcel thinking that pervades short term funding models. This shift — and how to make it work — is something the Delta needs to start developing and testing now within agencies, NGOs, and public-private partnerships. Experimenting now with ways to make short term funding more flexible and amenable to innovation will be critical as Delta managers and conservation proponents move from crisis management of droughts, floods, and species declines to long-term, community-based stewardship of the Delta.

Long Term Funding

Strategy G2 under Goal G focuses on developing and advocating for more long term funding opportunities for Delta conservation. Unfortunately, conservation projects often fail to reach their objectives when they are implemented without long-term financial support for operations, management, and evaluation.¹⁶ Such failures can even jeopardize the projects' initial—often substantial—conservation investments. The *Delta Conservation Framework* supports the development of more long term funding commitments for conservation. Long-term support would provide for more effective land management, for the evaluation of progress and resulting adaptive management, for focused scientific research to ensure past, present, and future Delta conservation projects succeed, and for local community integration into project planning and long term stewardship.

The constraints that often come with accepting funding from government bonds, or other time-limited sources and grant programs with a specific shelf life (typically 10 years), create a fundamental limitation on project implementation and long-term success. In many cases, once short-term funding is gone, work on the project ends or the project languishes—either during the planning stage or after initial project implementation—until a new source of funding can be secured. Just as often, emerging conservation projects fail to gain traction with stakeholders and reach the planning stage because of the lack of sustained funding for project planning, permitting, implementation, and management. Many valuable initiatives—such as sustained management of ecosystems in the

FRAMEWORK IN DEPTH: GOAL G CONTINUED

face of climate change — fail or aren't fully realized over the long term because support for long term monitoring and adaptive management isn't available. Such follow up activities are not only critical to conservation success, but also save money and make future conservation activities more effective — just like any business practice that plans ahead, prepares for change, and corrects actions based on outcomes so as not to lose initial investments.

Participants in the 2016 workshops held to develop the *Delta Conservation Framework* encouraged agencies to do more to explore innovative funding opportunities to ensure long-term success of habitat projects,

including tapping the emerging carbon market and environmental trust funds supported by enduring endowments, as well as developing new bond measures and securing allocations from the state's general fund for long term, Delta-specific conservation. All of these may be needed to implement regional conservation strategies supported by the Framework.

“State and federal funding remains insufficient to address land subsidence that threatens the California water system, and carbon market revenues could help fill the funding gap. The new American Carbon Registry methodology provides an incentive to landowners in the Sacramento-San Joaquin Delta, Suisun Marsh and other historically natural wetland areas in California to convert their most subsided and marginal agricultural lands to wetlands, or to produce wetlands crops such as rice, which will stop land subsidence and reverse it over time.”

CAMPBELL INGRAM,
DELTA CONSERVANCY

Short-Term Delta Conservation Funding Sources

Short-term public funding to support Delta conservation is available from government grant programs administered by the California Department of Fish and Wildlife (CDFW), the Wildlife Conservation Board, the Delta Conservancy, the Coastal Conservancy (Suisun Marsh), the Delta Science Program, the California Department of Conservation, and California Department of Water Resources. For example, of the 30,000 acres of conservation included in the California EcoRestore initiative, 5,000 acres of habitat enhancement and restoration projects will be implemented through public funding from Proposition 1, the Wetlands Restoration for Greenhouse Gas Reduction Grant Program, and grants to local governments, nonprofit organizations, and other entities. The CDFW Proposition 1 funding also supports scientific research in the Delta. Funding may also be obtained for agricultural easements under the California Farmland Conservancy grant program.¹⁵ A few examples of current grant programs follow (see Guide p. # for more detail).

California Department of Fish and Wildlife

- Proposition 1 - Delta Water Quality and Ecosystem Restoration Grant Program
- Wetland Restoration for Greenhouse Gas Reduction Grant Program (California Climate Investments – AB 32 Greenhouse Gas Reduction Fund)
- Fisheries Restoration Grant Program
- Environmental Enhancement Fund (near waters of the state)

Wildlife Conservation Board

- Proposition 1 – Stream Flow Enhancement Program

Sacramento – San Joaquin Delta Conservancy

- Proposition 1 - Ecosystem Restoration and Water Quality Grant Program
- Other state or regional grants may be available through the Interagency Ecological Program and the Delta Stewardship Council, and from other state agencies. Federal programs are also an important source of conservation funding but remain outside state control.

A direct state budget allocation could be used to support implementation of adaptive management at the project-scale, or to contribute to larger, landscape-scale “programmatic” adaptive management monitoring that informs the evaluation of progress across the entire Delta, such as the Tidal Wetland Monitoring Framework.¹⁶ Direct budget allocations could also provide funding to support multi-benefit projects that promote agricultural practices and optimize ecosystem services, for example wildlife-friendly farming, as highlighted in Section II.

Workshop participants also called for a focused and consistent messaging campaign to the California legislature from state and local agencies, stakeholders, and NGOs, to highlight the need for additional long-term funding for the implementation and ongoing management of conservation lands (a campaign that should be coordinated with other outreach efforts described in Section II, Goal B). They suggested that a portion of California's general funds should be dedicated to Delta conservation efforts, with the premise that Delta ecosystem conservation is a public benefit that provides essential ecosystem services to Californians.

In terms of the *Delta Conservation Framework*, the goal of this new campaign would be to maximize the effectiveness of limited government conservation funds by simultaneously considering the larger planning context of Delta conservation and the Delta as Place, contemplating restoration of ecosystem function on a landscape scale, and recognizing the value of implementing projects in phases driven by available funding and ongoing insights from adaptive management. Without public support, and transparent reporting to the public on the results of these conservation investments, little progress can be made.

While long term public funding is a necessary goal, it may be difficult to obtain. In the meantime, donor-based funding, market-based opportunities involving private-public partnerships, pay-for-ecosystem services or performance contracting, environmental impact or “green” bonds, mitigation credit agreements, and additional mechanisms for leveraging new funding sources all offer other pathways to progress.

Funding Information Exchange

Strategy G3 under Goal G aims to create a conservation funding information exchange. To attract the best possible conservation projects for implementation as part of regional conservation strategies, or as individual projects that address *Delta Conservation Framework* goals, it is essential to advertise available Delta conservation funds effectively. Strategy G3 calls for a lead organization and tools to publicize available funding opportunities relevant to the Delta in one place. Information about funding opportunities could be advertised on an independent website or organization webpage, where funding entities broadcast current and upcoming solicitations. The San Francisco Bay Joint Venture’s Funding Opportunities webpage¹⁸ provides an example for this type of funding clearinghouse. Any such clearinghouse for the Delta might include tools for portraying the landscape-scale picture of currently funded projects, and links to funded project reports. This could help applicants understand how their projects might “fit” into the wider landscape of Delta conservation. Information could also be organized to reflect and inform the Delta stakeholder community about the status of ongoing conservation efforts.

In the future, to keep communities and habitats safe from flooding, the Delta will need a combination of bigger, better maintained, rock-lined levees and multi-benefit landscapes capable of absorbing overbanking. All of these steps will require assurances of long term funding to protect restoration and conservation investments, and to adapt to changes in the climate. Photo: TNC



Sustaining Carbon Farming on Sherman Island

Recent efforts to restore wetlands on Sherman Island offer a model of how new climate change mitigation funds can support Delta conservation in the long term. The state's Greenhouse Gas Reduction Fund supported the Sherman Island project, which aims to restore approximately 1,700 acres of permanent wetlands on the island. The project is a collaboration of the University of California, Berkeley, the Department of Water Resources' (DWR) Division of Flood Management, DWR's Delta Ecosystem Enhancement section, and Reclamation District 341. The project encompasses two DWR-RD341 project sites on Sherman Island.

Once the wetlands are mature, they are projected to sequester approximately 11.5 metric tons carbon dioxide-equivalent per acre per year, or nearly 20,000 metric tons carbon dioxide-equivalent per year for the entire project. The project includes critical monitoring components that will help assess future success in meeting goals. For example, the island is included in a Delta wide monitoring program for carbon dioxide, methane, and nitrous oxide, which builds upon data collected already. These data sets will support the further development and calibration of models allowing greenhouse gas (GHG) predictions of both baseline and treatment results from wetland restoration Delta-wide. The project is also closely coordinated with other Delta efforts to develop a GHG protocol for both the voluntary and regulatory cap-and-trade markets. Additionally, DWR biologists monitor and assess native plant species annually within the restoration areas, conduct biannual bird surveys, and compare observations to pre-project conditions. DWR engineers are also monitoring subsidence reversal rates.

This multi-objective project isn't just trying to reduce greenhouse gases and earn credits for it. Additional objectives include restoring connectivity among west Delta habitats, enhancing nesting and foraging habitats for native wildlife, improving flood protection, protecting climate refugia, and minimizing establishment of non-native species, among others.

Project proponents are recommending a Regional General Permit for rejuvenation maintenance of carbon farming wetlands every 5-10 years. Maintenance under this proposed permit would involve turning over and thinning out dense patches of tules that become less productive over time. Although the permitting of the original project is straightforward and takes advantage of uplift in wetland habitat types, this type of maintenance may require work within high value wetlands and a temporary loss of wetland values, resulting in a greater mitigation burden. State and federal Safe Harbor Agreements may also be feasible here.¹⁷

Increasing the quality and quantity of key wetlands in California will provide measurable carbon sequestration benefits consistent with the most recent climate change adaptation and mitigation strategies, and wildlife and fisheries management and recovery plans. Delta wetland conservation, in particular connected to subsidence reversal as an additional benefit, closely aligns with implementation of *Delta Conservation Framework* overarching goals and strategies (Goals D-E).



Sherman Island. Photo: Christina Sloop



CONSERVATION OPPORTUNITY REGION

Optimizing Stewardship and Management of Suisun Marsh for Greater Delta Conservation Goals

Photo: Carson Jeffres

Suisun Marsh encompasses more than 100,000 acres of open space and rural lands, about half of which is fresh and brackish water wetlands long managed to attract ducks and support waterfowl hunting. In addition to its established value to duck hunters, such a large swath of high-functioning wetlands between the metropolitan regions of Sacramento and the San Francisco Bay Area is very unusual and increasingly valuable for nature-based recreation, native species habitat, and future adaptation to rising sea levels. Both federal and state wildlife agencies consider Suisun Marsh a prime area to advance habitat conservation in the Delta and San Francisco Estuary. Likewise, leading conservationists and biologists increasingly see a connected North Delta habitat “arc” – ranging from Cache Slough in the north to Suisun Marsh in south – as a singular opportunity to carve out one place

in the Delta for native species that is big enough, and at the right elevations in relation to sea level, to substantially contribute to ecosystem health.

The objectives of the existing 2013 *Suisun Marsh Habitat Management, Protection and Preservation Plan* embody many other important Delta planning and habitat goals and collaborative public-private partnerships around conservation. The *Delta Conservation Framework* supports such forward-thinking regional plans. The Framework also highlights Suisun Marsh as one of seven “conservation opportunity regions” where a critical mass of public lands, potential conservation opportunities, and conservation-minded people and existing partnerships occur in one place. Together these regions will one day add up to a healthier Delta – both for people and wildlife.

CONSERVATION OPPORTUNITY REGION - CONTINUED

Regional Setting

Suisun Marsh is located in Solano County between the Carquinez Strait and the Delta, and adjacent to Suisun Bay, an important mixing zone for the fresh and salt waters of the San Francisco Estuary. The “Marsh” encompasses 116,000-acres of brackish and managed wetlands long recognized as a region of special conservation opportunities with a sustained history of wetland protection, conservation, and stewardship of natural resources. In 1974, legislators passed the Suisun Marsh Preservation Act directing the San Francisco Bay Conservation and Development Commission and the Department of Fish and Game to prepare a Suisun Marsh Protection Plan to “preserve the integrity and assure continued wildlife use” of the Marsh, as well as to maintain habitat for waterfowl. Suisun Marsh now comprises about 12 percent of California’s wetland habitat, and is the largest contiguous brackish marsh remaining on the Pacific Coast of the United States.

Land use in Suisun Marsh is primarily focused on conservation of 52,000 acres of waterfowl management areas and duck clubs. These managed marshes are a mosaic of public and privately owned lands. The largest public landowner is the California Department of

Fish and Wildlife, which oversees 15,000 acres wildlife management areas and refuges on the Grizzly Island complex.

Suisun Marsh is separated from full tidal action by exterior levees. These levees not only prevent salinity intrusion into parts of the Delta water supply but also protect the ecological and aesthetic values of the Marsh, as well as extensive private and public infrastructure. Significant examples of infrastructure in the Marsh include Solano County roads, Southern Pacific rail lines, Amtrak Capitol Corridor rail lines, and various petroleum product pipelines, natural gas production wells and transmission pipelines, and electrical transmission lines. The levees also protect water conveyance facilities managed by the Department of Water Resources, the U.S. Department of the Interior, and the U.S. Bureau of Reclamation.

Suisun Marsh At A Glance

- **Size:** 100,000 – 110,000 acres
- **Location:** West of the legal Delta between the confluence of the Sacramento and San Joaquin Rivers and the Carquinez Strait (and near the cities of Fairfield, Cordelia and Benicia)
- **Elevation range:** Up to five feet below sea level
- **Zoning:** 4–6 percent agriculture; 15- 20 percent public lands
- **Other Primary Land Uses:** Flood protection, wildlife habitat, recreation, duck clubs
- **Natural Communities:** Managed wetlands, tidal wetlands, vernal pools, mudflat, tidal perennial aquatic (tidal bays and sloughs), grassland, riparian
- **Rural Population:** 300 – 350
- **Recreational Opportunities:** Wildlife observation, boating and water excursions, fishing, hunting, hiking, interpretive services



Photo: Carson Jeffres

Planning History

In 1974 the California Legislature passed the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act, with the support of Suisun Marsh landowners. This Act placed various restrictions on development within the Marsh, and required preparation of a *Suisun Marsh Protection Plan* (SMPP) by the San Francisco Bay Conservation and Development Commission and the state Department of Fish and Wildlife. When complete, the SMPP components were formally adopted as part of the enactment of the 1977 Suisun Marsh Preservation Act. The 1977 Act provided a mechanism to preserve and enhance the wildlife habitat of the Marsh, and assured retention of upland areas adjacent to the Marsh for uses compatible with its protection. The Suisun Marsh Preservation Act names the Bay Commission as the state regulatory agency responsible for overseeing permitting and development in the marsh.

To meet the legislative requirements of the 1977 Act and the state's 1978 Suisun Marsh salinity standards (under water rights decision 1485), the US Bureau of Reclamation prepared the 1981 Suisun Marsh Management Plan and the Department of Water Resources prepared the 1984 Plan of Protection for the Suisun Marsh, including an EIR. The plans shared four key elements: 1) Delta outflow, 2) physical facilities, 3) monitoring program, and 4) the

employment of efficient management, operation, and maintenance activities of public and private managed wetlands in Suisun Marsh.

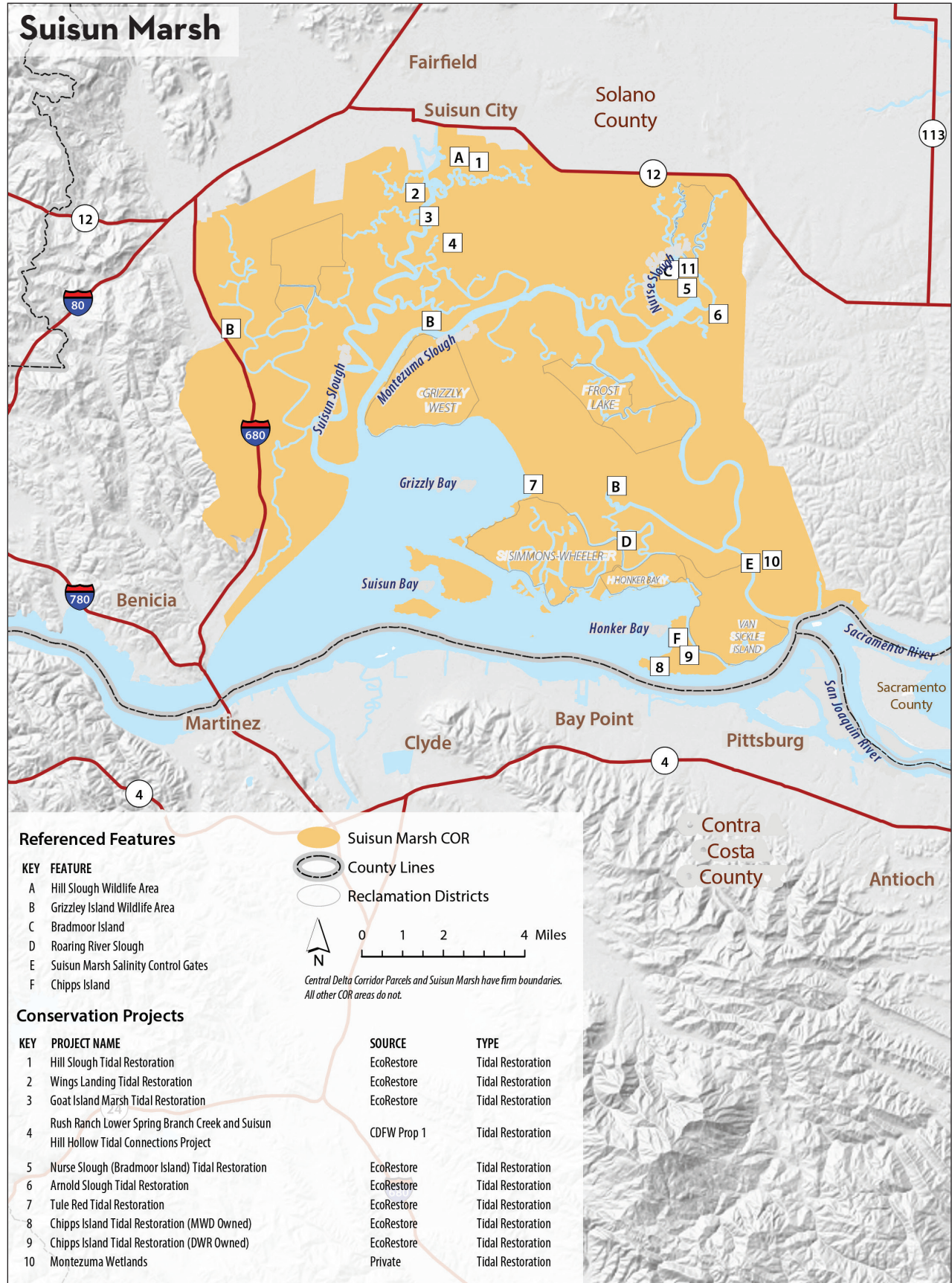
Over the next twenty years, various activities were undertaken to preserve, protect and enhance the quality and diversity of Suisun Marsh habitats, and to maintain the waterfowl carrying capacity of the managed wetlands. This included efforts by the resource agencies, the Suisun Resource Conservation District, and private landowners to implement provisions of the various preservation acts and protection plans.

In 2001, the principal agencies involved with Suisun Marsh management were directed to develop another plan for Suisun Marsh, this time to balance various values and uses of this special region. Under this directive, the agencies produced the 2013 *Suisun Marsh Habitat Management, Preservation, and Restoration Plan* (Suisun Marsh Plan) and companion EIR/EIS. The Suisun Marsh Plan is a 30-year comprehensive regional implementation plan addressing various conflicting uses of Suisun Marsh resources and aimed at achieving a multi-stakeholder approach to the restoration of tidal wetlands and the maintenance of managed wetlands. The Plan provides a vision for managing habitats and ecological processes, public and private land use, levee system integrity, and water quality. As such, the Plan is

Biologists attach radio tracking device to mallard duck to monitor habitat usage. Photo: Cliff Feldheim



CONSERVATION OPPORTUNITY REGION



Source: CDFW, 2018

the most current, most science-based management plan for Suisun Marsh to date. The Plan is designed to be consistent with the revised Suisun Marsh Preservation Agreement, the CALFED Bay-Delta Program, and the Delta Stewardship Council *Delta Plan*. The Plan also provides a strong foundation for any further conservation actions in Suisun Marsh related to *Delta Conservation Framework* goals and objectives.

Opportunities for Conservation

Suisun Marsh is well-suited to tidal habitat restoration because of its elevations, location in the San Francisco Estuary, abundance of undeveloped existing managed wetland habitats, high turbidity, productivity within the aquatic food web (primary and secondary), and use by Delta smelt, Chinook salmon, and other native fishes. Throughout Suisun Marsh, land subsidence has been relatively modest due to a history of wetland conservation and limited agricultural practices, increasing the prospects for further tidal habitat restoration. The hydrodynamic, habitat, and salinity variability in the region supports a range of aquatic and terrestrial native species.

Coot, shoveler and teal. Photo: Cliff Feldheim



Mariposa lily, Jepson Prairie. Photo: Amber Manfree



In addition, the gradual alluvial slopes of the surrounding uplands may accommodate sea level rise through lateral marsh expansion. The undeveloped grasslands of Jepson Prairie also span the short distance between Suisun Marsh and the Cache Slough complex, creating a wildlife corridor between the two areas.

Current & Planned Tidal Habitat Conservation Projects

- **Hill Slough** (750 acres tidal restoration)
- **Tule Red** (610 acres tidal restoration)
- **Bradmoor Island** (382 acres tidal restoration)
- **Meins Landing**
- **Goat Island Marsh** (80 acres tidal restoration)
- **Rush Ranch Lower Spring Branch Creek and Suisun Hill Hollow** (67 acres tidal connections)
- **Wings Landing** (approximately 270 acres of tidal and subtidal marsh restoration)
- **Arnold Slough**

In addition, Suisun Marsh's proximity to Cache Slough, Lindsey Slough and Liberty Island, as well as to the lower Sacramento River and the western Delta, allows the Marsh to benefit from natural flood pulse flows. These flows provide seasonal migration, spawning, and rearing habitats for adult and juvenile native and anadromous fish. In addition, the seasonal flooding of managed wetlands produces food for fish during the winter and spring. The degree of ecological benefits from flows and flooding in this region could, however, be affected by actions further upstream, especially any modifications resulting from state and federal water conveyance operations, local water district use, the location of X2 where salt and freshwater meet (see p. 108), salt water intrusion, and restoration projects elsewhere in the Delta.

There are a number of tidal habitat restoration projects currently being planned in Suisun Marsh through California Ecorestore and the Department of Water Resources' Fish Restoration Program Agreement (see sidebar). In the meantime, the proximity of Suisun Marsh's biologically rich areas to important ecotones and ecological corridors should favor

CONSERVATION OPPORTUNITY REGION - CONTINUED

these and other efforts to boost terrestrial and aquatic wildlife. Indeed, conservation biologists have included Suisun Marsh in a grand strategy to create an interconnected series of habitats for native species, mostly tidal and managed wetlands, referred to as the North Delta Habitat Arc (see map p. 72).

Potential Solutions to Recognized Challenges

The *Delta Conservation Framework* recognizes the value of historical planning and preservation efforts in Suisun Marsh, and the value of the current Suisun Marsh Plan in addressing ongoing challenges related to proposed changes to the Marsh and future conservation goals.

Detailed information on how the Suisun Marsh Plan addresses future challenges, and how it meshes with various existing plans and agreements, can be found in the Plan itself. In brief, and in general, the Suisun Marsh Plan has the following objectives:

- Restore 5,000 to 7,000 acres of tidal marsh, and protect and enhance of 40,000 to 50,000 acres of managed wetlands in Suisun Marsh (implementing targets established in the CALFED Ecosystem Restoration Program Plan)
- Maintain the heritage of waterfowl hunting and other recreational opportunities and increase awareness of the ecological values of Suisun Marsh in surrounding communities.
- Maintain and improve the integrity of the Suisun Marsh levee system to protect

property, infrastructure, and wildlife habitats from catastrophic flooding.

- Protect, and where possible improve, water quality for beneficial uses in Suisun Marsh, including estuarine, spawning, and migrating habitat uses for fish species as well as recreational uses and associated wildlife habitat.

The Suisun Marsh Plan requires that these interrelated and interdependent objectives be implemented concurrently and in parallel over the 30-year planning period. As such, both restoration and managed wetland activities could proceed simultaneously. One aim is to provide adequate restoration to both mitigate impacts related to managed wetland activities and to contribute to recovery of listed species. A few more specific challenges and potential solutions related to Suisun Marsh planning in the future include climate change, land use conflicts, invasive species, and the need for long term funding for adaptive management and monitoring of restoration success.

CLIMATE CHANGE AND ADAPTATION OPPORTUNITIES

The Suisun Marsh region will be affected by climate change induced sea level rise within the next 30-100 years. The region's diked managed wetlands are protected by nearly 200 miles of exterior levees and are currently in intertidal zone. The increased pressure of rising water levels and flooding will threaten levee system integrity and the long-term viability of managed wetlands. In some areas, current managed

Windmills in Montezuma Hills, uplands near Suisun Marsh, generate clean energy. Photo: Carson Jeffres



Heritage hunting program at Grizzly Slough, Suisun Marsh. Photo: Robinson Kuntz



wetlands will be lost and shorelines or tidal wetland habitats submerged. In others, levee widening, reinforcement, and maintenance may affect duck club operations and hunting activities and encroach on restoration sites.

In terms of hydrodynamics, sea level rise will also increase salt-water intrusion into Suisun Marsh. Coupled with prolonged droughts and changes in the timing of fresh water inflows from the Central Valley, climate change could significantly increase salinity levels in the Marsh. In addition, Suisun Marsh will be exposed to more frequent, more extreme storm and rainfall events and associated flood events from surrounding watersheds. All these changes will affect wetland diversity, species composition, and existing habitat functions and values in Suisun Marsh.

Today's exterior levees are maintained primarily by private landowner assessments, local Reclamation Districts, and public agencies such as California Department of Fish and Wildlife. Currently there is little state or federal funding for maintenance. A long term levee maintenance program and fund (similar to the Delta Levee Subvention Program or Delta Investment Strategy) is necessary to sustain marsh values and protect Delta water quality.

Suisun Marsh could benefit from a scenario planning effort to help project likely climate change impacts on ecosystems and species (see Guide p.185). This type of planning could also

evaluate salinity changes resulting from restoration, over the near and long-term, and allow for adaptive management, adjustments, and short and long term cost evaluation.

LAND USE CHANGES

Of the 100,000 acres of Suisun Marsh, the Suisun Marsh Plan has set goals of restoring 5-7,000 acres (5-7 percent) to tidal marsh within the next 30 years. In the process, conflicts will no doubt arise between existing managed wetland/waterfowl hunting club land uses (the legacy way of life for the region) and future habitat restoration goals. Restoration projects could displace existing land uses and decrease the number of wintering waterfowl in Suisun Marsh. Conversion could also potentially increase mercury contamination, require additional mosquito control measures, create conflicts due to expanded public access, and impact salt marsh harvest mouse populations. The net effect of restoration projects on overall salinity levels and the future of the Marsh remains unclear. Potential solutions detailed in the Suisun Marsh Plan include requirements for: regional distribution of tidal habitat restoration projects; detailed environmental commitments; avoidance and minimization measures; and salinity modeling to ensure that local and regional conditions are protected as part of restoration design and project development, including post-construction verification. Additionally, the Plan requires that all land acquisitions for tidal restoration must be from willing sellers.

CONSERVATION OPPORTUNITY REGION - CONTINUED

INVASIVE SPECIES CONTROL

Non-native invasive species have colonized most of the wetland and upland habitats of the Suisun Marsh. Control of invasive species is very labor intensive, costly, and requires diligence over the long-term. Complete eradication is unlikely, but ignoring existing conditions will ensure continued degradation of current habitat and likely failed restoration of targeted habitats. Limited resources exist for invasive plant species management once a site has been breached. As a solution, restoration projects should incorporate control mechanisms (such as the ability to dry out a site, or ongoing weed management programs) into adaptive management plans.

Looking Ahead

The *Delta Conservation Framework* views the Suisun Marsh Plan as the foundational existing regional conservation strategy for the Suisun Marsh conservation opportunity region. The Plan is also consistent with the CALFED Ecosystem Restoration Program Implementation Strategy, the 2013 *USFWS Recovery Plan for Tidal Marsh Ecosystems of the Northern and Central California*, and a number of other relevant plans and programs. The Suisun Marsh Plan was developed by the agencies with primary responsibility for Suisun Marsh management, and is intended to balance the benefits of tidal wetland restoration with other habitat uses in the Marsh by evaluating alternatives that provide a politically acceptable change in marsh-wide land uses.

The *Delta Conservation Framework* supports the efforts of the principal agencies involved in the development and implementation of the Suisun Marsh Plan. The principal agencies are: the US Fish and Wildlife Service, the US Bureau of Reclamation, the California Department of Fish and Wildlife, the Department of Water Resources, the National Marine

Fisheries Service, the Suisun Resource Conservation District, and the Delta Stewardship Council. Though the principals also consulted with numerous regulatory agencies in developing the Plan, implementation of individual projects would still require permits and approvals from the San Francisco Bay Conservation and Development Commission.

The *Delta Conservation Framework* also supports the development of a Suisun Marsh Plan adaptive management plan, as it provides a mechanism to collect and use information to optimize restoration activity benefits. To this end, a multi-agency Adaptive Management Advisory Team has been formed to review proposed projects and ongoing progress of restoration.

So much work has already gone into planning and organizing a restored and sustainable future for Suisun Marsh. What the *Delta Conservation Framework* hopes to add is a context for how current marsh plans fit into the larger, landscape scale picture of conservation throughout the Delta, in which large habitat patches and migratory corridors are all connected. Suisun Marsh, as the southwesternmost patch in this constellation, will play an important role in the Delta's future ecological riches and prosperity.

QUICK LINKS**Suisun Marsh Habitat Management, Preservation and Restoration**

CDFW: www.wildlife.ca.gov/Regions/3/Suisun-Marsh
 Bureau of Reclamation: www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=781

For more detailed descriptions of these conservation opportunity regions, see Appendix 2.

Guide to Related Tools, Permits, Requirements and Programs

PERMITTING

California Department of Fish & Wildlife Regional Conservation Investment Strategies Program

STRATEGY F3, REGIONAL PERMITTING TOOL

In 2016, Assembly Bill (AB) 2087 was signed into law, enabling CDFW to initiate a new pilot Regional Conservation Investment Strategy (RCIS) Program.⁹ This new program encourages a voluntary, non-regulatory, and non-binding regional planning process intended to result in high quality, regional-scale conservation outcomes throughout California. Yolo County was identified as one of four pilot Regional Conservation Investment Strategies in California. The RCIS Program consists of three components:¹⁵

1. Regional Conservation

Assessments – An RCA is an assessment that provides information and analyses that document the ecosystems, ecosystem functions, species, habitat, protected and conserved areas, and habitat linkages within an ecoregion to provide the appropriate context for nonbinding, voluntary conservation strategies and actions. These assessments include information for the identification of areas with the greatest probability for long-term ecosystem conservation success incorporating co-benefits of ecosystem services, such as carbon cycling, water quality, and agricultural benefits. An RCA may be used to provide context at an ecoregional or sub-ecoregional scale to assist with the development of an RCIS. RCAs are intended to provide scientific information for the consideration of public agencies and their preparation is voluntary. RCAs are optional and not required to prepare an RCIS or MCA.

2. Regional Conservation

Investment Strategies – An RCIS provides information and analyses that inform conservation and habitat enhancement actions. An RCIS offers non-binding, voluntary guidance for the identification of conservation priorities, investments in ecological resource conservation, or identification of priority locations for compensatory mitigation for impacts on focal species, habitats, and natural resources. An RCIS is intended to provide scientific information for the consideration of public agencies, to establish biological goals and objectives at the species level, and to describe conservation actions and habitat enhancement actions that, if implemented, will contribute to achievement of those goals and objectives. They may be used as a basis to provide advance mitigation opportunities through the development of credits (see 3 below) or to inform other conservation investments. Any public agency may develop an RCIS. RCISs are required if MCAs are to be developed.

3. Mitigation Credit Agreements

(MCA) – RCISs and MCAs do not provide take authorization for individual projects. Rather, MCAs create credits that may be used as compensatory mitigation for impacts under CEQA, CESA, and the LSA Program. Any person or entity may enter into an MCA with CDFW to create credits, even if the person or entity was not involved in the development of the RCIS. People or entities may create and use, sell, or otherwise transfer mitigation credits upon CDFW's finding that credits have been created in accordance with the RCIS Program requirements.

The development of an RCA or RCIS does not create, modify, or impose regulatory requirements or standards, regulate land use, establish land use designations, or affect the land use authority of a public agency. An RCIS can be used, however, to streamline mitigation requirements through the development of credits through an MCA. If approved by CDFW, a RCIS may be valid up to 10 years. CDFW may extend the duration of an approved or amended RCIS for an additional 10 years, provided the RCIS is updated to include new scientific information and the RCIS continues to meet the program's requirements outlined in Fish and Game Code section 1850, et seq.



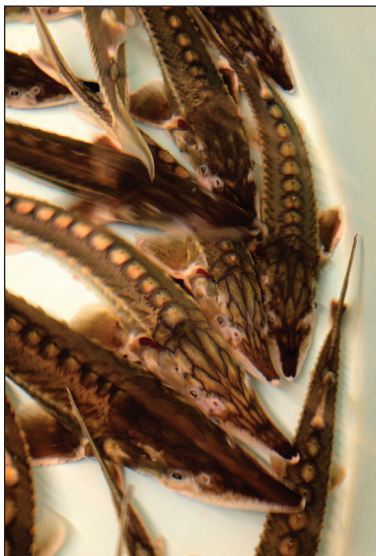
Photo: Amber Manfree

Guide to Related Tools, Permits, Requirements and Programs - continued

US Fish and Wildlife Service Guidance on Streamlining ESA Consultations for Restoration and Recovery Projects

STRATEGY F3, REGIONAL PERMITTING TOOLS

In 2016, the USFWS developed guidance for streamlining ESA Section 7 consultations for certain restoration and recovery projects (RRPs), with the primary purpose of facilitating and incentivizing projects that further habitat conservation and recovery of listed species.²² To increase efficiency in permitting these projects, the USFWS developed template Biological Assessments and Biological Opinions for expediting the permitting process for RRP that meet the standards outlined in the guidance. Criteria for RRP inclusion include projects or programs that have the primary purpose of conserving listed species in a manner that is consistent with the recovery needs of the species and that have a high level of certainty of producing a beneficial impact to the species. For example, restoration or conservation projects with small levels of adverse impacts, incidental take, and permanent loss of species' habitats may be eligible for the program.



Green sturgeon, a listed species.
Photo: UC Davis

U.S. Army Corps of Engineers Nationwide Permit 27

STRATEGY F3, REGIONAL PERMITTING TOOL

In 2017, the U.S. Army Corps of Engineers issued Nationwide Permit 27 (NWP 27) to authorize aquatic habitat restoration, enhancement, and establishment activities in waters of the U.S., under Section 404 of the Clean Water Act (33 CFR Part 330).²⁰

Specifically, activities eligible for authorization by USACE under NWP 27 include:

“Activities in waters of the United States associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas, the restoration and enhancement of non-tidal streams and other non-tidal open waters, and the rehabilitation or enhancement of tidal streams, tidal wetlands, and tidal open waters, provided those activities result in net increases in aquatic resource functions and services.”²⁰

NWP 27 clearly defines specific activities that are eligible to be authorized through the nationwide permit, and lists reporting, notification, and general permit conditions required for authorized projects. Additionally, NWP 27 states that eligible projects are not required to conduct compensatory mitigation because they must result in net increases in aquatic resource functions and services. Combined, these definitions and consistent requirements provide clarity for both project proponents and staff reviewing permit applications of specific projects.

To account for regional variation within the U.S., the Sacramento District of USACE also issued region-specific conditions under NWP 27 for projects in the Delta.²¹ Specifically, the Sacramento District requires all projects in the Delta applying under NWP 27 to provide a preconstruction notification, including:

“Sufficient justification to determine that the proposed activity would result in a net increase in aquatic resource functions and services. Functions and services to be considered in the justification include, but are not limited to: short- or long-term surface water storage, subsurface water storage, moderation of groundwater flow or discharge, of energy, cycling of nutrients, removal of elements and compounds, retention of particulates, export of organic carbon, and maintenance of plant and animal communities.”²¹

The Sacramento District office also requires that the preconstruction notification includes: descriptions of how the project design minimizes adverse temporary and permanent effects to waters of the U.S., drawings and plans depicting the proposed project and its location relative to delineated waters of the U.S., delineation of aquatic resources consistent with Sacramento District standards, and proposed Best Management Practices during construction.

Section 401 of the Clean Water Act requires states to certify that projects permitted by a NWP meet all state water quality requirements; and under California's Porter-Cologne Water Quality Act, waste discharge requirements are also necessary. For NWP projects, the State Water Resources Control Board or Regional Water Quality Control Boards may streamline Section 401 and Porter-Cologne requirements by combining or even waiving them for small projects that meet certain CEQA exemptions. When taken together, the guidelines, definitions, and requirements outlined in NWP 27 and the Sacramento District NWP regional conditions provide clear guidance to project proponents and regulatory staff and should help improve the efficiency of conservation project planning and implementation.

US Fish & Wildlife Service Programmatic Biological Opinion for US Army Corps of Engineers 404-Permitted Projects with Small Effects on Giant Garter Snake

STRATEGY F3, REGIONAL
PERMITTING TOOL

In 1997, USFWS issued a programmatic biological opinion to USACE for individual projects permitted under Section 404 of the Clean Water Act with impacts on giant garter snake in northern and central California (USFWS Programmatic Biological Opinion).²² Projects with less than three acres of permanent impacts, or less than 20 acres of temporary impacts to giant garter snake habitat were eligible to seek take authorization under the USFWS Programmatic Biological Opinion. It includes descriptions of procedures required to implement specific projects, mitigation required to offset impacts of individual projects, and clear definitions of key terms necessary to assess impacts to giant garter snake, including disturbance area, temporary impacts, and permanent impacts.

“The purpose of this programmatic consultation is to expedite Corps permitted projects, including activities which may qualify for authorization under nationwide permitting, with relatively small

effects on the giant garter snake and its habitat. Projects, which exceed the programmatic threshold, will require individual biological opinions. The Service will re-evaluate this programmatic consultation annually to ensure that its continued application will not result in unacceptable effects on the giant garter snake or its habitat. Restricting this programmatic consultation to projects with permanent impacts of less than 3.00 acres (1.21 hectares) and temporary impacts of less than 20.00 acres (8.09 hectares) of giant garter snake habitat per project will limit the effects of the programmatic process on the giant garter snake and its habitat. Tracking and restricting project effects over time will serve to minimize cumulative effects at local and regional levels.”²¹

The clear guidelines, definitions, and mitigation requirements in the USFWS Programmatic Biological Opinion enable USFWS and USACE staff to more efficiently discuss and permit individual projects that require take authorization for giant garter snake. Although this biological opinion has expired, USFWS staff continue to use it as a set of informal guidelines when evaluating individual projects with low-level impacts to giant garter snake habitat.



Giant garter snake. Photo: CDFW

SHORT-TERM FUNDING

California Department of Fish & Wildlife Wetlands Restoration for Greenhouse Gas Reduction Grant Program

STRATEGY G1, SHORT TERM FUNDING

In 2014, CDFW developed the Wetlands Restoration for Greenhouse Gas Reduction Grant Program²³ in response to the Global Warming Solutions Act of 2006 (Assembly Bill 32, Nunez, Statutes of 2006). California's Cap-and-Trade Program includes an auction system where a portion of the tradable greenhouse gas emission permits (called allowances) can be purchased at quarterly auctions.

*“Cap-and-Trade is a market-based regulation that is designed to reduce greenhouse gases (GHGs) from multiple sources. Cap-and-trade sets a firm limit or cap on GHGs and minimize the compliance costs of achieving AB 32 goals. The cap will decline approximately 3 percent each year beginning in 2013. Trading creates incentives to reduce GHGs below allowable levels through investments in clean technologies. With a carbon market, a price on carbon is established for GHGs. Market forces spur technological innovation and investments in clean energy. Cap-and-trade is an environmentally effective and economically efficient response to climate change.”*²³

Proceeds from the sale of state-owned allowances are deposited in the Greenhouse Gas Reduction Fund (GGRF). Appropriations from the GGRF support California Climate Investments that provide greenhouse gas reductions and other important co-benefits for California. CDFW is administering a portion of these funds, through this grant program, to support the restoration or enhancement of Sacramento-San Joaquin Delta wetlands, coastal wetlands, and mountain meadow ecosystems in order to reduce GHG emissions and provide co-benefits. To date, CDFW has received two appropriations that included local

Guide to Related Tools, Permits, Requirements and Programs - continued

assistance funds for grants (FY14-15 and FY17-18). Future funding is dependent upon GGRF budget appropriations enacted by the Governor and Legislature. Examples of potential co-benefits this program provides include enhancing fish and wildlife habitat, protecting and improving water quality and quantity, and helping California adapt to climate change. Public agencies, recognized tribes, and nonprofit organizations are eligible to apply.

Increasing the quality and quantity of key wetlands in California will provide measurable carbon sequestration benefits consistent with the most recent climate change adaptation and mitigation strategies, and wildlife and fisheries management and recovery plans.²³ This is critical because wetlands have among the most efficient carbon sequestration rates per unit of all habitat types, allowing both effective and extensive carbon sequestration, and only about 10 percent of the wetlands that existed in California 200 years ago remain today. Funding such efficiencies will help optimize use of limited financial resources for conservation in the long term.



Photo courtesy Delta Protection Commission

California Farmland Conservation Program Grants

STRATEGY G1, SHORT-TERM FUNDING

The California Farmland Conservation Program, under the California Department of Conservation, provides grants for farmers and landowners to enter into easements that maintain their properties' farmland values and agricultural production. These easements provide long-term protection of farmlands against development pressure and other land use changes (Pub. Resources Code, §§ 10211, 10237). Funding for easements may be granted to local governments, nonprofit organizations, resource conservation districts, or regional park or open space districts that have farmland conservation as a stated purpose of their easements (Pub. Resources Code § 10211). Under the federal Farm and Ranch Lands Protection Program, a survey found that farmers that enter into long-term easements to protect their agricultural practices often use the funding for multi-benefit purposes, such as wildlife-friendly habitat or the public benefits of protecting soil and water quality.²⁴

California Wildlife Conservation Board

STRATEGY G1, SHORT-TERM FUNDING

The WCB offers a number of funding programs in California aimed at ecosystem conservation.²⁵ These include programs for land acquisition; ecosystem restoration on agricultural lands; habitat enhancement and restoration; public access development; streamflow enhancement, rangeland, grazing land, and grassland protection; riparian habitat and inland wetlands conservation; and a Natural Heritage Preservation tax credit.

Through the **Land Acquisition Program**, WCB acquires real property or rights in real property on behalf of CDFW, or provides grant funds to other governmental entities or nonprofit organizations to buy real property or rights in real property. All acquisitions are made via a Department of General Services approved fair market value appraisal on a "willing seller" basis. The acquisition activities generally entail CDFW evaluating the biological values of property through development of a Land Acquisition Evaluation (used for a single property) or a Conceptual Area Protection Plan (used for multiple properties).

The WCB's **Ecosystem Restoration on Agricultural Lands** program provides funding to assist landowners in developing sustainable wildlife-friendly practices on their properties that can co-exist with agricultural operations.

The **Habitat Enhancement and Restoration Program** is WCB's general restoration program. It comprises all projects that fall outside WCB's and other mandated programs, and it includes native fisheries restoration and restoration of wetlands such as coastal, tidal, or fresh water habitats that fall outside the jurisdiction of the Inland Wetlands Conservation Program. It also contains other projects that improve native habitat quality within the state.

The **Public Access Development Program** aims to improve public access to hunting, fishing, or other wildlife-oriented recreation throughout California. Financial assistance is available to develop public access facilities such as fishing piers or floats, access roads, boat launching ramps, trails, boardwalks, interpretive facilities, lake or stream improvements, and restrooms and parking areas.

The **Rangeland, Grazing Land and Grassland Protection Program** aims to protect the long-term sustainability of livestock grazing; ensure continued wildlife, water quality, watershed, and open space benefits to Californians as a result of livestock grazing; and support innovative uses of grasslands compatible with sustainability. The Program encourages projects to address regional landscape issues.

The **California Riparian Habitat Conservation Program** (CRHCP) aims to identify areas critical to riparian ecosystem maintenance; pinpoint areas in imminent danger of destruction or significant degradation; prioritize protection needs based on site significance and potential habitat loss or degradation; develop and fund project-specific strategies to protect, enhance, or restore significant riparian habitat; develop, administer, and fund a grant program for riparian habitat conservation; and provide a focal point for statewide riparian habitat conservation efforts.

The **Inland Wetlands Conservation Program** (IWCP) was created to help the Central Valley Joint Venture achieve its goal of increasing bird populations through land acquisitions, wildlife friendly agriculture, conservation easements, and restoration or enhancement of habitats within the CVJV basins, including Yolo, Suisun Marsh, and the Delta.



Pheasant hunting in the Delta. Photo: CDFW

The WCB's **Natural Heritage Preservation Tax Credit Program** (Public Resources Code Section 37000 et seq) provides state tax credits for donations of qualified land (fee title or conservation easement) and water rights. The program demonstrates the state's commitment to natural resources protection by rewarding landowners who perceive habitat as an asset rather than a liability. Initially implemented in 2001, the Tax Credit Program to date has resulted in the approval of \$54.5 million in tax credits and the donation and transfer of ownership of more than 9,407 acres of critical parkland, open space, agricultural conservation easements, wildlife corridors, and archaeological resources.

Central Valley Project Improvement Act

STRATEGY G1 SHORT-TERM FUNDING

The Central Valley Project Improvement Act (CVPIA)²⁶ established certain actions to restore, protect, and enhance fish, wildlife, and associated habitats in the Central Valley—including the San Francisco Estuary (Bay-Delta) and Trinity River basins of California—and to address impacts of the Central Valley Project (CVP) on fish, wildlife, and associated habitats. To provide irrigation and municipal water to much of California's Central Valley, the CVP regulates and stores water in reservoirs in the northern half of the state and transports it to the San Joaquin Valley via a series of canals, aqueducts, and pumping plants. To offset CVP impacts, the CVPIA provides restoration funds available from Central Valley water and power users. This restoration fund may be appropriate to fund conservation projects in the Delta, Suisun Marsh, and Yolo Bypass.

Guide to Related Tools, Permits, Requirements and Programs - continued

Proposition 1 Water Quality, Supply, and Infrastructure Improvement Act –Delta Programs

STRATEGY G3, SHORT TERM FUNDING

The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1; California Water Code §79700 - §79798) provides funding to implement the objectives of the *California Water Action Plan* (CWAP-see also p.31): more reliable water supplies, restoration of important species and habitats, and a more resilient and sustainably managed water infrastructure.²⁷ Chapter 6 of Proposition 1 authorizes funding, upon appropriation by the Legislature, for competitive grants for “Protecting Rivers, Lakes, Streams, Coastal Waters, and Watersheds.” Delta-focused Proposition 1-funded grants, established by the California Department of Fish and Wildlife (CDFW) and the Delta Conservancy, offer short-term support for scientific studies; water quality improvement projects; and acquisition, planning, and implementation of projects that align with *Delta Conservation Framework* goals and strategies. California public agencies, nonprofit organizations, public utilities, Native American tribes recognized by federal and state entities and listed on the Native American Heritage Commission’s Tribal Consultation List, and mutual water companies are eligible to apply (California Water Code §79712[a]). Projects that are undertaken to meet mitigation obligations, or projects that are under an enforcement action by a regulatory agency, are not eligible for funding.

In 2015, CDFW established the Delta Water Quality and Ecosystem Restoration Grant Program to administer \$87.5 million of Proposition 1 funds for projects that benefit the Delta (California Water Code §79738). CDFW will distribute these funds on a competitive basis through annual proposal solicitation notices issued

over a 10-year period. The program focuses on water quality, ecosystem restoration, and fish protection facilities that benefit the Delta. Projects must be consistent with the purposes of Proposition 1 and contribute to implementation of the CWAP, *State Wildlife Action Plan*, *Delta Plan*, *Delta Science Plan*, Central Valley Flood Protection Plan Conservation Strategy, and/or California EcoRestore²⁸ (see Guide pp. 30-37).²⁹

Also in 2015, the Delta Conservancy launched a grant program to award \$50 million (identified in Chapter 6 of Proposition 1) over a five-year period “for competitive grants for multi-benefit ecosystem and watershed protection and restoration projects in accordance with statewide priorities” (California Water Code §79730 and §79731). Proposition 1 and the Delta Conservancy’s enabling legislation both focus on projects that use public lands and maximize “voluntary landowner participation in projects that provide measurable and long-lasting habitat or species improvements in the Delta.” To the extent feasible, projects need to promote state planning priorities and sustainable communities strategies consistent with Government Code 65080(b) (2)(B). Furthermore, all proposed projects must be consistent with statewide priorities as identified in Proposition 1, the CWAP, the Delta Conservancy’s enabling legislation, the *Delta Plan*, and the Delta Conservancy’s Strategic Plan.³⁰

LONG TERM FUNDING

Conservation Easements for Mitigation

STRATEGY G2, LONG-TERM FUNDING

There are several types of state conservation easements used for project mitigation that provide for long-term monitoring and management funding provided by the project. A conservation easement is a grant by a landowner to an eligible easement holder, which restricts the use of the conserved property to natural, scenic, historical, agricultural, or open-space purposes in perpetuity (Civ. Code § 815.1). The state requires adequate funding to implement measures required by a CESA permit (14 CCR 783). Such measures often require monitoring and adaptive management for the duration of the easement. Some non-statutory easements may provide long-term mitigation funding but are more flexible for the landowner. Such easements may not provide funding in perpetuity, but they may provide longer-term funding than short-term grants, and they are generally used when mitigation requirements are compatible with existing land uses. These include open space easements (Civ. Code §§ 51070, 51075, 51080 - 51093); agricultural easements (Cal. Pub. Resources Code, § 10211, Civil Code section 815.1); or deed and covenant restrictions (Civ. Code §§ 1461, 1462, 1468, 1469, 1471). The U.S. Fish and Wildlife Service established mitigation guidelines to evaluate financial assurances for ESA mitigation that contain a landscape-scale approach to conservation and long-term monitoring and adaptive management (USFWS 2017).³² Landowners engaged in regional conservation partnerships that are interested in entering into conservation easements for mitigation can do so through habitat exchange programs, becoming a mitigation bank sponsor, or other mechanisms specified by the regulatory agencies (see FR 81 95316, Section 6.2 – Eligible Lands).

Donor-Based Funding

STRATEGY G2, LONG-TERM FUNDING

Delta conservation partnerships, such as the Yolo Basin Foundation-Yolo Bypass Working Group, Central Valley Joint Venture, and Migratory Bird Conservation Partnership, include a number of NGO partners (e.g., The Nature Conservancy, Audubon California, Ducks Unlimited, CalTrout, and American Rivers). These NGOs rely partially on donor funding for their programs, which ultimately benefit Delta conservation efforts. For example, over the past decade, the private David and Lucile Packard Foundation (Packard Foundation) has supported a number of NGOs to advance conservation and underlying science in the Delta.³³ The Packard Foundation has also been active in attempting to increase federal conservation funding for western states. The Resources Legacy Fund, with core funding from the Packard Foundation, is leveraging additional support from foundations and individuals to implement their California Conservation Innovations initiative (CCI).³⁴ This initiative focuses on:

1. Conservation policies that will “advance state climate change adaptation and resiliency policies and will monitor and engage strategically in sea level rise and energy development policy areas, adapting its engagement to changing needs and opportunities;”
2. Conservation funding to “develop new, stable sources of conservation funding by identifying viable approaches at local, regional, and state levels;” and
3. Conservation constituencies to “engage with younger and more ethnically diverse populations on important CCI policy and funding priorities statewide and in Los Angeles, the Bay Area, and portions of the San Joaquin Valley.”

The National Fish and Wildlife Foundation (NFWF) also use their programs to leverage public with private funds to achieve lasting conservation solutions across the nation. Through their Western Water Program, NFWF is currently working to develop freshwater restoration initiatives in the Sierra Nevada, Central Valley, and Bay-Delta watersheds of California.³⁵ With appropriate planning and coordination, these donor-related funding sources could be leveraged to support upcoming Delta-related conservation projects and implement *Delta Conservation Framework* goals.

“In a habitat exchange, landowners such as farmers and ranchers create, maintain and improve habitat on their property and earn credits for their efforts. Landowners sell these credits to offset impacts from development, such as roads, transmission lines and wind turbines, that impact species and habitat. An independent habitat exchange administrator monitors and verifies credit transactions and reports on progress to ensure species protection. Every credit sale makes species and habitat better off.”

ENVIRONMENTAL DEFENSE FUND

Endowments for Conservation

STRATEGY G2, LONG-TERM FUNDING

Conservation trusts or environmental trust funds (ETF) created with an endowment are suited to be a long-term source of funding for conservation.³⁶ Most ETF that finance conservation are legally independent institutions (i.e., established outside of government) managed by an independent board of directors. Many existing ETF have a permanent endowment that has received grants from government and international donor agencies. They may also manage sinking funds, created through debt-for-nature swaps, in which a portion of a developing nation's foreign debt, for example, is forgiven in exchange for local investments in environmental conservation measures, or revolving funds financed through specially designated user fees or taxes that are only to be used for conservation. Environmental trust funds are an independent legal entity and investment vehicle to help mobilize, blend, and oversee the collection and allocation of financial resources for environmental purposes. It is a solution that facilitates strategic focus, rigorous project management, solid monitoring and evaluation, and high levels of transparency and accountability. The term encompasses conservation trust funds, wildlife trusts, climate and forest funds, and other funds established to deliver environmental, social, and economic benefits.

Participants in the *Delta Conservation Framework's* 2016 workshops suggested endowments for the operation and management of conservation lands should be incorporated into the planning process in the early stages. Although they don't fund restoration projects, endowments required by CESA permits for other projects also contribute to perpetual management of conservation lands that may be interconnected across the landscape.

Guide to Related Tools, Permits, Requirements and Programs - continued

Market-Based Opportunities and Payments for Ecosystem Services

STRATEGY G2, LONG TERM FUNDING

Payments for Ecosystem Services (PES) have the potential to serve as long-term market-based revenue systems and supply long-term funding for Delta conservation. PES is the mechanism for payments when a beneficiary or user of an ecosystem service (such as a business) makes a direct or indirect payment to the provider of that service; in other words, whoever preserves or maintains the ecosystem (such as farmers, landowners, or other natural resource owners) gets paid for doing so. Opportunities through growing American Carbon Registry (ACR)³⁷ carbon markets are emerging as another source of conservation funding, particularly in the context of implementing solutions to the land subsidence prevalent in the Delta (see Section II, p.57). In both voluntary and regulatory carbon markets, the ACR oversees registration of carbon offset projects, which pay for carbon credits to be used for emissions reduction in the Cap-and-Trade Program (including wetland restoration). The California Department of Fish and Wildlife's Wetlands Restoration for Greenhouse Gas Reduction Grant Program (see p.159) is based on this new market-based model for funding conservation.²³

Other ecosystem services related opportunities for Delta conservation include funding obtained from tourism fees. In the Delta, tourism fees can be collected, for example, from visitors to parks and refuges by California Department of Parks and Recreation, CDFW, and the Stone Lakes National Wildlife Refuge. These user fees may be, in part, utilized for operations and management of these parks and reserve lands.

Fitting under the broad umbrella of green bonds, environmental impact bonds (EIBs), are

beginning to gain some traction with private-sector investors willing to bet on a “pay-for-success” bond offering. The EIBs are a new financial tool that ties rewards to water infrastructure or wetland restoration projects, for example, or other measurable social or environmental outcomes. Three key components must be present to make an EIB successful as a financing tool: 1) Returns must be determined by outcomes; 2) EIBs should generate savings on overall project cost; and 3) Performance metrics must be well defined.

Leveraging water markets is another financing concept developed by The Nature Conservancy, utilizing an innovative conservation and impact investment model called Water Sharing Investment Partnerships.³⁸ This investment partnership concept is focused on soliciting investor capital, as well as government grants and philanthropic donations, to acquire a water rights portfolio (similar to stocks or commodities). Most of the water rights are leased or sold back on the market, ensuring a financial return for investors and access to water for farmers and cities. A portion of these water rights are used to divert water back to natural ecosystems and to generate funds for ongoing ecological monitoring. This idea has been tested in a number of places, including San Diego. To know whether it can be applied to the Delta will take further investigation.

Emerging habitat exchanges also have the potential to provide an indirect long-term funding mechanism to support multi-benefit conservation activities. The Central Valley Habitat Exchange³⁹ (Exchange) is one example of a voluntary program that creates new financial returns for private landowners willing to engage in sustainable land management practices and restoration activities that have quantifiable benefits to the environment. The Exchange facilitates investment in conservation through private and public investors, managing the transactions of a market of habitat credits

by leveraging wildlife habitat created by willing landowners. Through the Exchange, farmers are essentially paid to use management practices that provide habitat for wildlife, such as migratory birds. This new funding stream can create revenue landowners can earn by employing new strategies to manage or restore functional habitat. Habitat exchanges are being considered for other Delta wildlife—including riparian songbirds, shorebirds, waterfowl — and for sandhill cranes, monarch butterflies, and greater sage-grouse.⁴⁰

QUICK LINKS

Environmental Trust Funds

www.undp.org/content/sdfinance/en/home/solutions/environmental-trust-funds.html

Environmental Defense Fund Habitat Exchanges

www.edf.org/ecosystems/habitat-exchanges-how-do-they-work

Resources Legacy Fund

<http://resourceslegacyfund.org/>

Wildlife Conservation Board Grant Programs

<https://wcb.ca.gov/Programs>

CDFW Proposition 1 Restoration Grant Programs

www.wildlife.ca.gov/Conservation/Watersheds/Restoration-Grants

SECTION VI

**Conservation
Pathways
to 2050**



Illustration: Alison Pizzari

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Common permits, agreements,
disclosures required for
conservation projects

Introduction

The *Delta Conservation Framework* is a guide for all Delta stakeholders suggesting how best to approach conservation planning and project implementation. The Framework builds on a strong foundation of existing plans and stakeholder feedback. As described in Section II, this critical feedback was gathered from a series of public workshops and comment letters in 2016 and 2017. The Framework also represents a careful vetting of myriad plans, programs and approaches, and a first-ever effort to combine and organize all these resources within a single framework and guide, in a summary style. All too often anyone launching a new conservation project can become overwhelmed by the complexities.

The Framework's strategic approach to conservation offers tools, processes, and opportunities for partnerships that can be used by any individual, landowner, agency, or organization on any scale (Sections II-V).

As the practice of conservation is inherently multi-disciplinary — relying upon expertise from ecology, engineering, sociology, agriculture, local land use, public policy and regulation, as well as on local knowledge of the landscape and its history — it requires regular communication and collaboration. Implementation of this ambitious 30-year vision must include every possible stakeholder, not just state agencies. In partnership, and with a commitment to honoring each others' perspectives, residents, businesses, stewards, and managers can all build a healthier, more sustainable Delta together.



Flowering willow, a riparian tree.
Photo: Amber Manfree

Nationwide, conservation planners and advocates are wrestling with the same questions and hurdles we confront in the Delta. Many have developed tools to help structure difficult conversations and work together collectively to implement conservation. Descriptions and examples appear in the Guide to Planning Tools pp.184-187.

This following section of the Framework describes two approaches to strategic conservation planning and implementation— a regional approach and an individual project approach.

Both approaches require attention to monitoring and adaptive management based on conservation outcomes as described in Section IV, and to funding needs as described in Section V.

Workshops gathering stakeholder input to the Delta Conservation Framework in 2016.
Photo: Christina Sloop



Regional Approach to Conservation

As described in prior sections, the *Delta Conservation Framework* suggests that a collaborative, regional approach to conservation planning is an important key to successful implementation on a landscape scale. To recap, regional partnerships can be initiated by any interested Delta stakeholder, with a purpose of developing and implementing a regional conservation strategy. The Framework identifies seven possible conservation opportunity regions within the Delta (see p. 170) though working on a sub-regional or individual project scale is also possible (see next sections)

Regional conservation partnerships should include all local stakeholders: local, state, and federal agencies, landowners, and business owners and others. Inclusivity from partnership inception ensures consideration of a diversity of perspectives and prevents unanticipated conflicts and challenges.

Regional conservation strategies should reflect the Framework's Guiding Principles (see p. 189) and align with the relevant goals and strategies described in Sections 2 - 5. In developing a regional conservation strategy, partnerships should evaluate regional datasets on vegetation, habitat quality, presence of species, agricultural and other land use patterns, water management, existing infrastructure (e.g., levees and water diversions), and other relevant socioeconom-

ic information like land values, projected sea level rise, and flood risk. If regional partnerships overlap with existing plans (such as Regional Conservation Investment Strategies, Habitat Conservation Plans, or Natural Community Conservation Plans), they should include experts involved in implementing these plans and defer to plan goals and objectives within plan boundaries. Consideration of all of these factors should provide a comprehensive picture of where conservation will work or won't work on a specific Delta landscape.

Costs for engaging in a nine-month partnership-oriented process are estimated at \$300,000 but could range widely. This includes administrative support and facilitation of twelve partner meetings and several workshops, technical expertise utilizing visualization tools and analyses, honoraria for participation as needed, and development of a regional conservation strategy report.

It is important to recognize that partnership work is not always easy. In some regions there is a foundational distrust between members of the Delta public and government agencies, or between special interest organizations and municipalities, regardless of their good intentions. Acknowledging this distrust and welcoming all participants to the planning table to achieve the most acceptable solution, despite differences in individual roles, is the foundation of a successful partnership. Participants should be ready to commit time and energy to build trust and

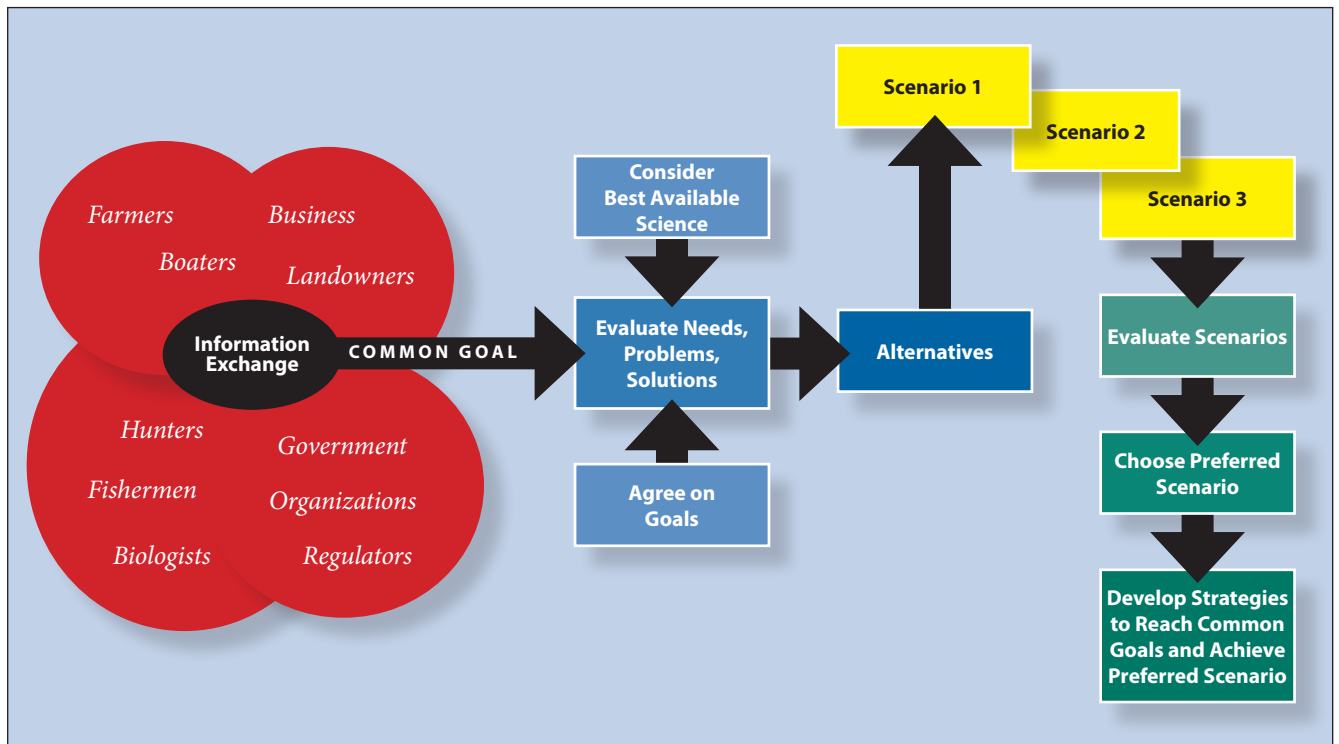


Figure 6.1: How a regional conservation partnership works, a sample process.

strong working relationships with diverse interests within their region.

See Figures 6.1 and 6.2 for suggested sample steps in any regional planning process.

A variety of tools and processes are available to help regional partnerships succeed. For starters, regional partnerships should engage independent facilitators

familiar with these tools to guide the process. Available conservation tools include scenario planning,^{1,2} the Open Standards for the Practice of Conservation,³ and Structured Decision Making,⁴ among a variety of others.^{5,6,7,8,9,10,11,12,13} The Guide to Planning Tools at the end of this section provides short overviews of these three approaches.

Regional Conservation Planning Template

Stage 1- Partnership Initiation

A local champion, agency, non-profit organization or other stakeholder gathers support for initiation of a regional conservation partnership in a given Delta region. This small group of visionaries becomes a core planning team that launches and coordinates the partnership. As a first step, the team develops a scope of work and proposals to obtain funding to support the planning phases. Once funding is available, the team hires an independent facilitator to guide the planning process. The facilitator helps the team to conduct outreach to potential partners and to hold public meetings inviting interested stakeholders to join the partnership.

Stage 2- Scenario Planning

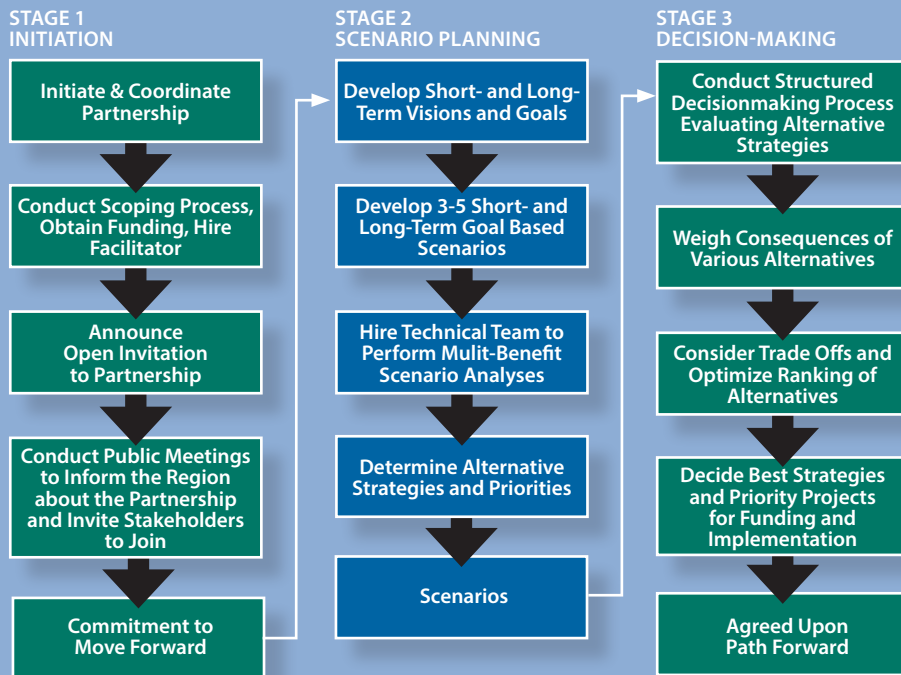
The newly formed regional conservation partnership develops two visions, one short-term, one long-term. Through a facilitated process, each partner can inform the visioning exercise by sharing their interests, mission, goals, and constraints. These factors all exert an important influence on each individual partner's respective level of cooperation and collaboration in the planning partnership. The partnership then creates a set of goals for each finalized vision, guided by the overarching goals of the *Delta Conservation Framework* and partner interests and constraints.

At this stage, the partnership is ready to hire a technical team which can perform goal-based scenario analyses using modeling, GIS overlays and other data sets and tools. For each goal, the partnership, with help from the technical team, then develops three to five possible outcome scenarios for evaluation. These scenarios capture various combinations of important actions to reach the desired outcome for a given goal. The technical team then offers a set of alternative scenarios to the regional conservation partnership for prioritization.

Stage 3- Decisionmaking

The regional conservation partnership uses a structured decision making process to decide which scenarios and related actions to prioritize for implementation. With help from the technical team, the partnership develops criteria to weigh the consequences of the various alternatives, produce an initial ranking of alternatives, consider trade-offs, and optimize the ranking. As a final step, the regional conservation partnership identifies priority projects and best scenario actions needed to reach each of the outlined goals. Ultimately, the technical team develops work and adaptive management plans as final deliverables that enable the partnership to find funding for high priority projects. If all proceeds as planned, most regional conservation partnerships can complete all three stages of this example process in six to twelve months, depending on individual partner availability.

Figure 6.2 Sample Planning Steps



Conservation Opportunity Regions

Each section of the Delta Conservation Framework includes on-the-ground examples of the different conservation opportunities to be found in various sub-regions of the Delta.

These regional sub-divisions – as a planning tool – were vetted during the 2016 Delta Conservation Framework public workshops. Divisions were loosely based on variation in local land use, communities, ecosystem types, and the location of existing publicly owned lands.

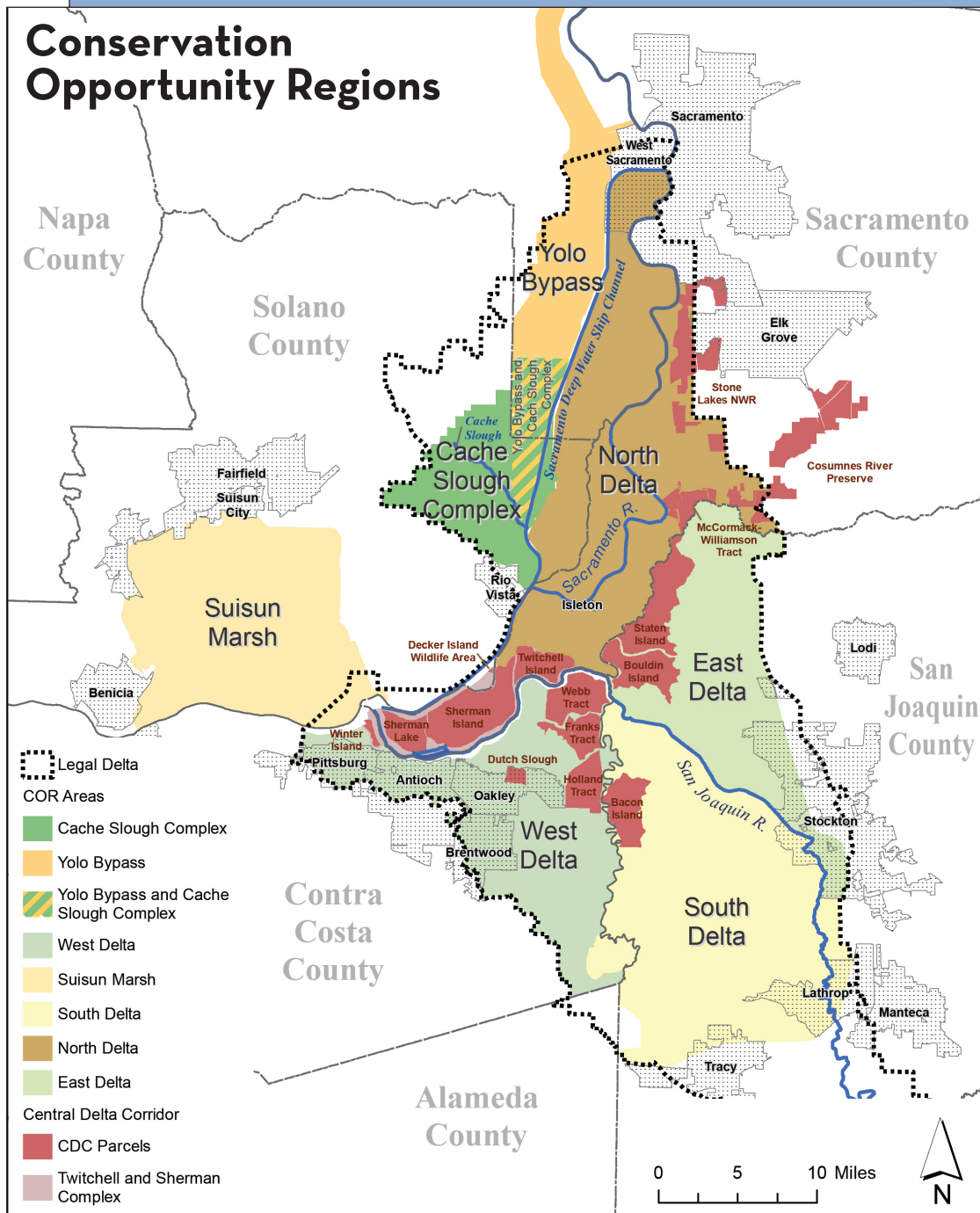
While the result of this process was eight sub-regions, only seven were further described in the Framework (Central Delta Corridor, Yolo Bypass, Cache Slough, Suisun Marsh, and the North, South and West Delta); details on opportunities in the East Delta are less developed.

Within these sub-regions of the Delta, public lands, existing conservation lands, and existing planning partnerships already offer many opportunities for conservation. In many areas, willing private landowners are also contributing to the conservation efforts with the help

of nongovernmental organizations like The Nature Conservancy or California Waterfowl Association, partnerships such as the Central Valley Joint Venture or the Migratory Bird Partnership,¹⁴ and agricultural practitioners working with these and other entities.

The information presented in the Framework on each conservation opportunity region includes planning history, activities, conservation projects and challenges.

All of this information is intended to provide a springboard for building regional conservation partnerships and strategies.



Source: CDFW, 2018

Individual Project Approach to Conservation

The *Delta Conservation Framework* also encourages implementation of individual projects in areas without an established regional partnership or regional conservation strategy. The Framework recommends that individual conservation projects should be implemented on publicly owned lands first, or through collaborations between willing landowners and local, state, or federal agencies. Individual projects in areas where no regional partnership exists should adhere to good neighbor practices, such as making contact with neighbors, encouraging regular

communication, and discussing important issues like access needs, on-site management practices, agricultural infrastructure, how to avoid increased flood or fire danger, and potential impacts of species movement onto neighboring land.¹⁵ This will help avoid or minimize short- and long-term impacts on neighboring land uses. Proponents of individual projects should also understand how they align with the overarching goals of the *Delta Conservation Framework* and consider using some of the suggested strategies to help achieve each goal during the process of planning, implementing, and managing conservation over the long term.

Windmills in the Montezuma Hills.

Photo: Francis Parchaso, USGS



Long-term Sustainability through Delta Conservation

In the context of ecology, the term sustainability describes the ability of ecological systems (ecosystems) to persist indefinitely by remaining diverse and productive. As described throughout this document, conservation is needed to reestablish degraded ecological functions within many Delta ecosystems. Making the connection between the people of the Delta and those entities committed to implementing conservation is vital. Effective education and outreach regarding the benefits of lasting and sustainable Delta ecosystems—their ecosystem services for all Californians—is a key goal with important political, economic, social, and environmental ramifications. Heightening public awareness of the direct connection between a sustainable and healthy environment and the socioeconomic well-being of all Californians is critical to sustaining the motivation to support and implement ecosystem conservation over the long term.¹⁶

Ecological systems function on many interrelated scales. Untangling this functional complexity to identify key actions that will improve ecosystem function is a daunting task, especially when the drivers of ecosys-

tem function are intermingled with human land uses in the Delta. Great strides have been made in developing a strong, science based understanding of how the Delta functions, and what its species and people need to enjoy a sustained future. However, there will always be numerous uncertainties surrounding our understanding of how each driver of Delta ecosystem function interacts with others, and how climate change will affect our future options and livelihoods, that must be recognized to effectively plan conservation for long-term outcomes.

As described above and in the following Guide, there are a number of effective tools to help planners untangle this complexity and make the best possible decisions concerning conservation goals, actions, strategies, and priority projects. Tools can also help conservation partnerships to manage adaptively once strategies are implemented. Regional conservation partnerships should consider using these tools, along with available Delta science, to ensure full consideration of the influence of conservation actions on ecosystem function. Instead of basing decisions on short-term thinking, conservation planners and stakeholders should be able to rely upon an evolving knowledge of what makes our Delta healthier and more sustainable.



The bridge over Three Mile Slough, one of many intersections of waterways, roads, levees, and landscapes that evoke challenges to long term sustainability, as sea levels rise, in the Delta.

Photo: Christina Sloop

The Way Forward

Following the initiation of California WaterFix¹⁷ and EcoRestore,¹⁸ the California Department of Fish and Wildlife committed to leading a high-level planning effort to advance the conservation of the Delta, the Yolo Bypass, and Suisun Marsh. The resulting document — the *Delta Conservation Framework* — is intended to serve as a guide for Delta stakeholders interested in planning for and implementing conservation actions. The Framework includes an array of tools, and summarizes

a selection of well-thought out plans and programs, that should enable stakeholder integration, conservation, and adaptive management of Delta ecosystems to benefit both human and natural communities.

Building on prior Delta planning efforts, the *Delta Conservation Framework* also provides a shared vision and long-term, landscape-scale goals in the context of the rapidly changing planning parameters associated with climate change. Some of the goals and strategies, for example Goal E, highlight pre-existing and ongoing efforts to successfully implement conservation in the Delta that should be used as resources moving forward. In contrast other goals, such as Goals F and G, highlight the need to consider and motivate new approaches to implementing conservation.

As described throughout Sections II-V, there are many current efforts that align with the Framework and collectively move the Delta closer to the vision for 2050 (for a reminder in brief see right).

Long-term conservation of Delta ecosystems can and will benefit both people and the environment. The *Delta Conservation Framework* embraces this premise with seven broad goals supporting stakeholder communication and outreach, decision making based in science, and thinking ahead collectively to improve permitting and funding. The Framework's goals offer collaborative approaches to conservation challenges, potential regulatory conflicts, and other impediments to conservation initiatives. The Framework also embraces regional-scale conservation goals based on multi-interest partnerships, and supports the strong scientific foundation reflected in the substantive, forward-thinking

Soaring white
tailed kite.
Photo: Rick
Lewis



map for future ecosystem function described in *A Delta Renewed* (see Section IV). Going forward, the *Delta Conservation Framework* will serve as one of several resources informing the amendment of ecosystem elements of the *Delta Plan* and state funding priorities. It should also inform the myriad different plans, programs, projects, and initiatives all in some state of progress as of December 2018, the Framework's publication date. So much is going on all around the Delta that the Framework can only provide a strong vision for integration as of this moment.

Current Major Initiatives Aligned with the Delta Conservation Framework

- Agricultural Lands Stewardship Framework and Toolkit:** A working group launched by the Department of Water Resources in 2014 to develop a list of strategies to provide project proponents and those affected by proposed conservation projects with an integrated and collaborative approach to address protecting and changing uses of agricultural land.
- California Department of Fish and Wildlife Grant Solicitation Guidelines:** Draft 2018 Proposition 1 solicitation guidelines make it a priority to fund the development of regional planning partnerships and to facilitate the collaborative development of regional conservation strategies or plans in the Delta.
- Central Delta Corridor Partnership:** A partnership launched in 2017 to coordinate planning and restoration on a network of roughly 50,000 acres of publically-owned or funded lands in the central Delta.
- Delta Plan Interagency Implementation Committee:** A committee established in 2013 to facilitate *Delta Plan* implementation through increased coordination and integration among local, state and federal agency participants. The committee has encouraged the development of programmatic permitting tools for conservation projects.
- Delta Science Program Social Science Task Force:** The Delta Science Program is coordinating a Social Science Task Force tasked with developing a strategic plan to strengthen and integrate social sciences into the science, management, and policy landscape of the Delta. Composed of individuals with a diverse set of expertise in the social sciences, the task force's key goal will be to develop a set of recommendations that can be acted upon by the Delta science community.
- Franks Tract Feasibility Study:** A study led by the California Department of Fish and Wildlife aimed at restoring portions of Frank's Tract to tidal marsh. This effort solicited feedback from local residents, boaters, and anglers and includes a locally proposed design.
- Yolo Bypass Cache Slough Partnership:** A partnership of representatives from local, state, federal agencies who signed an memorandum of understanding to oversee collaborative implementation of conservation in this region, all before initiation of the Framework in 2016.



Communities like Discovery Bay will be at the frontlines of Delta adaptation to future conditions. Increasing the acreage of absorbent wetlands, riparian zones, and multi-benefit floodplains (farm fields that can flood occasionally) will vastly improve the safety of Delta communities in the future. But planning and action must occur now, in the small window of time before the Delta faces a marked acceleration in the frequency of extreme flood events and the rate of sea level rise. Efficiencies and cost effectiveness are always lost with crisis management. A Delta in Common, planned now, can benefit both people and the ecosystem. Photo: Christina Sloop

Delta in Common

The path toward more ecologically functional Delta ecosystems within a thriving Delta community remains controversial. Despite mitigation requirements for infrastructure projects and the state and federal water projects, and a long history of public investment in Delta ecosystems through bond funds, few projects have been initiated and managed over the long term. Implementing conservation in the Delta will continue to stall unless Delta stakeholders are willing to work collaboratively, knowing they may have to be open to considering and accepting tradeoffs. If no solutions can be found, Delta ecosystem conservation will remain on hold, or occur in a piecemeal fashion. In the meantime, Delta ecosystems and their important services to humans and wildlife will continue to decline.

Multi-benefit projects that float all boats may seem like an impossible dream. But in reality, what local landowners, hunters, farmers, fishers, and boaters want may not be that far off from what species need to survive and what public infrastructure projects need to provide the greatest good for the lowest price. Every interest – both human and wild – faces the common uncertainty of drought, fire, earthquakes, and political change. There is an equally common reverence, however, for the Delta landscape and a desire to renew the riches of the past in the future.

The *Delta Conservation Framework* reminds the public, farmers, legislators, and water managers about how essential it is to recognize that Delta ecosystems provide services to both people and wildlife. It is an invitation to all interested stakeholders to come to the table. It is a call to continue the work of improving ecosystem health, supporting and recovering Delta wildlife, and growing the science capacity to learn from conservation actions. It is a warning of the urgency of facing the challenges of climate change, drought, and flooding head on.

Progress on key Delta conservation decisions has been stalled for far too long. Collaborative conservation must be in everyone's future.

Find your place, your region, your partners, review the goals and tools provided in the *Delta Conservation Framework*, and set out to make positive progress.

It's up to each and every one of us to build the conservation commons of the future within the unique landscape, and among the unique people, that comprise the Delta.

North and South Delta — The Way Forward

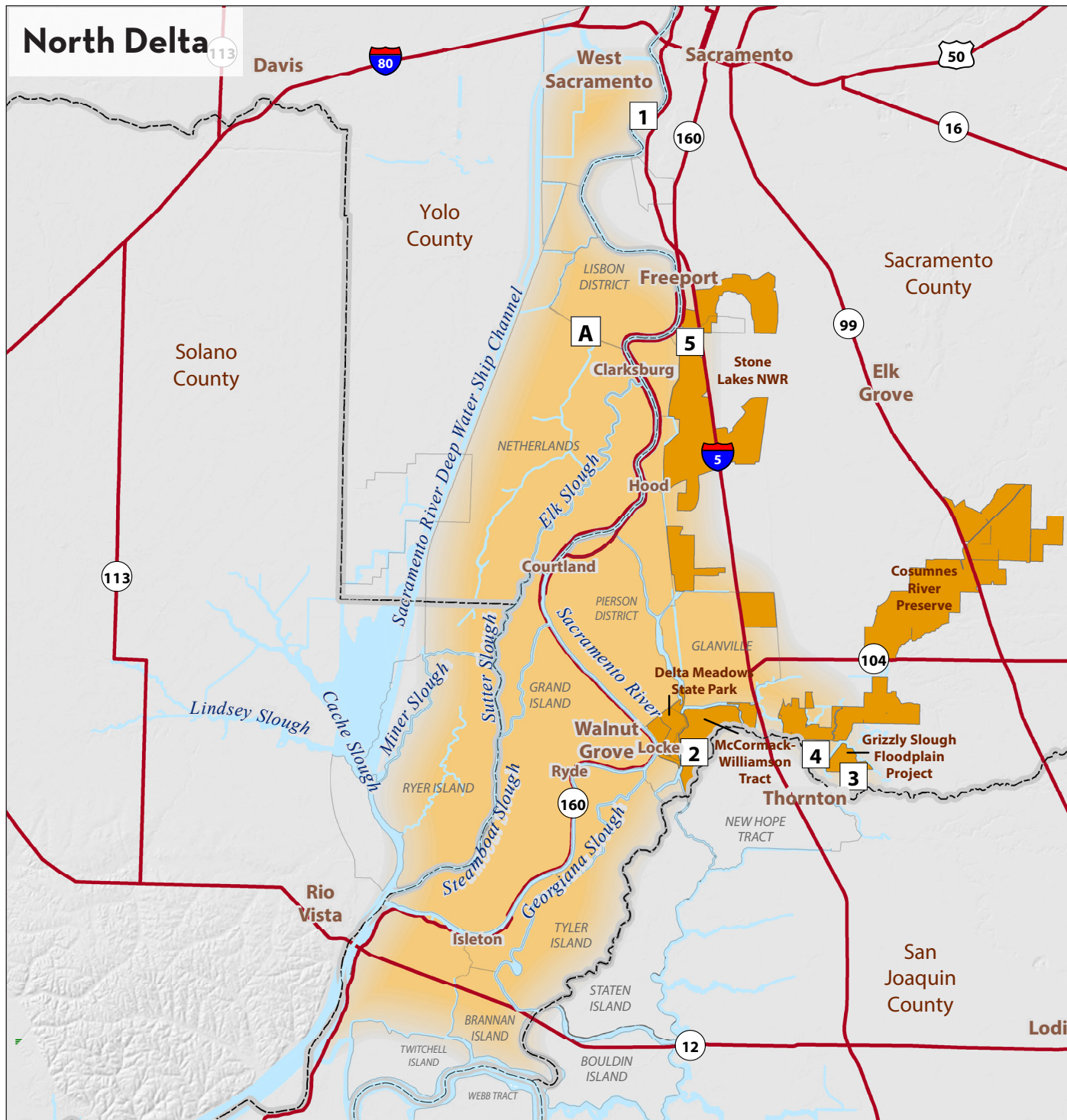
Photo: Amber Manfred

Many of the most obvious and ongoing conservation opportunities in the Delta lie around the edges and on public lands in and around the Yolo Bypass, Cache Slough, Suisun Marsh and in the West Delta (see pp. 90, 121 & 149). However, the heart of the Delta, east of the Yolo Bypass and west of the San Joaquin River, encompasses two productive and important agricultural zones. In the North Delta region, high value orchards and vineyards and numerous historic small towns dominate the landscape. In the South Delta region along the San Joaquin, Middle and Old Rivers, agricultural lands predominate with farmers growing tomatoes, corn, and peas, or grazing cattle. In both these regions, where there is little publicly owned land, conservation opportunities lie more with wildlife-friendly farming, improvements around the margins of channels, and

optimization of new investments in levees, floodways and bypasses to protect towns and farms.

While supporting the Delta way of life in these regions remains central to the conservation of both people and place, it is important to also recognize from an ecosystem perspective that fish, wildlife, migratory birds, and water still move through these heartland regions. In these regions, no regional partnerships or vast areas of public land exist as opportunity areas for ecosystem improvement, as they do in other areas of the Delta. However it is still worthwhile to consider providing healthy corridors along farm edges and riverfronts, and to build on existing flood management projects, as part of the holistic, landscape scale approach to conservation recommended by the *Delta Conservation Framework*.

CONSERVATION OPPORTUNITY REGION

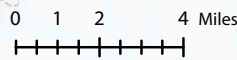


Conservation Projects

| Key | Project Name | Source | Type |
|-----|--|------------|------------------------|
| 1 | Southport Levee Setback and Floodplain Restoration | EcoRestore | Setback Levee |
| 2 | McCormack Williamson Tract | EcoRestore | Floodplain Restoration |
| 3 | Grizzly Slough Floodplain Project | EcoRestore | Floodplain Restoration |
| 4 | Cosumnes Floodplain Mitigation Bank | CDFW | Floodplain Restoration |
| 5 | Beach Lake Mitigation Bank | CDFW | Wetland Restoration |

Referenced Features

Key Feature
A Winchester Lake



Central Delta Corridor Parcels and Suisun Marsh have firm boundaries. All other COR areas do not.



- North Delta COR
- County Lines
- Reclamation Districts
- Central Delta Corridor Parcels

Map: CDFW, 2018

Regional Setting

Seen from the air, the two conservation opportunity regions on the north and south sides of the Delta are a patchwork of orchards, vineyards, crops, waterways, islands and rural

North & South Delta Regions At A Glance

- **Size**
NORTH: 140,000-150,000 acres
SOUTH: 220,000 – 250,000 acres
- **Location**
NORTH: from approximately west sacramento to just south of State Route 12
SOUTH: west of the San Joaquin River and generally east of Contra Costa County
- **Elevation Range**
NORTH: -23 feet below to 45 feet above sea level
SOUTH: -23 feet below to 331 feet above sea level
- **Land Use**
NORTH: 75-80 percent agriculture; 5-10 percent public lands
SOUTH: 65-70 percent agriculture; 1-5 percent public lands
OTHER PRIMARY LAND USES: flood protection, wildlife habitat, residential, water supply and storage, recreation, legacy towns, tourism
- **Natural Communities**
NORTH: managed wetland, tidal wetland, freshwater emergent wetland, floodplain, grasslands, riparian, vernal pools, channel margin, perennial aquatic, alkali seasonal wetland
SOUTH: managed wetland, freshwater emergent wetland, floodplain, grasslands, valley foothill riparian, channel margin, perennial aquatic, vernal pool complex
- **Urban/Town Population**
NORTH: 20,000 – 30,000
SOUTH: 100,000 – 110,000
- **Rural Population**
NORTH: 5,500 – 6,000
SOUTH: 7,000 – 8,000
- **Recreational Opportunities**
NORTH: wildlife observation, picnic areas, hiking trails, boating, water skiing and water excursions, fishing, hunting, photography, interpretative services, camping, water sports (e.g., windsurfing, swimming), heritage sites, scenic highways.
SOUTH: boating, water skiing, water excursions, fishing, hiking and cycling trails. (proposed: picnic areas, interpretive water trails, and camping)
- **Sampling of Listed Species**
NORTH: greater sandhill crane, Delta smelt, longfin smelt, Chinook salmon, Central Valley steelhead, green sturgeon, giant garter snake, Swainson's hawk, tricolored blackbird, vernal pool fairy shrimp, vernal pool tadpole shrimp, California black rail, western yellow-billed cuckoo
SOUTH: Fish, shrimp, snake and several bird species listed above plus riparian brush rabbit, riparian woodrat, San Joaquin kit fox, California red-legged frog, California tiger salamander, Delta button celery

communities. Most are closely tied to a diverse agricultural way of life. These two regions also host a number of high-value ecosystems supporting people and wildlife.

The North Delta conservation opportunity region loosely straddles Highway 160, and crosses several counties as it extends from West Sacramento down to Highway 12. The South Delta region begins slightly south of Highway 12, and occupies an area in San Joaquin County that flanks Highway 4 to the west of I-5. Some of the legacy towns within these conservation areas include Freeport, Clarksburg, Hood, Courtland, Isleton, Walnut Grove, Ryde, and Locke in the North Delta, and Lathrop in the South Delta. No major urban developments encroach into these areas, though they are bounded by Sacramento to the north and Stockton to the southeast (see maps).

Compared to other conservation opportunity regions described in the *Delta Conservation Framework*, the North and South Delta regions include little public land (1-10 percent). Most of the public land is in the North Delta region within the 17,640-acre Stone Lakes National Wildlife Refuge,¹ a refuge partially owned and managed by the U.S. Fish and Wildlife Service. Entirely within the Sacramento River's 100-year floodplain, Stone Lakes' strategic location prevents urban encroachment into the Delta and provides a habitat link with the neighboring Cosumnes River Preserve.² In addition, Elk Slough, near Clarksburg, remains as one of the most intact riparian ecosystems of its kind in the Delta. Due to the proximity of the Sacramento River and its tributaries, including the American River, flood risk remains an important consideration for the North Delta region's lands, citizens, infrastructure, and environment.

In the South Delta conservation opportunity region, one of the most important planning features is the Paradise Cut. This slough protects the River Islands development from flooding and directs floodwaters away

CONSERVATION OPPORTUNITY REGION - CONTINUED

from the urbanized floodplains in Lathrop and Stockton.³ Historically, the Paradise Cut was one of the chief distributary branches of the San Joaquin River and, given high enough flows, connects the San Joaquin with Old River downstream. Twice during the 19th century, the main floodwaters of the San Joaquin River flowed through Paradise Cut and will likely do so again.

Planning History

The North Delta's planning history is shaped by the 2016 Community Action Plans for the three largest north Delta communities: Clarksburg, Walnut Grove, and Courtland.^{4,5,6} These plans were developed in response to the 2009 Delta Reform Act and the *Delta Plan* (Chapter 5),⁷ and recognize the "Delta as Evolving Place" concept (see Section II, p. 43). These plans — whose main themes include transportation, communications, and community amenities — lay out goals, actions, and implementation steps based on community input. Though the plans don't have any specific focus on conservation, community members generally voiced an appreciation for the Delta's open space, fresh air, scenic views, and recreational opportunities, as well as a desire to expand access to the Sacramento River and other natural areas. Community members also valued the economic benefits of tourism (sandhill crane festivals etc.). Their major concerns included flood insurance, the state's plans for twin tunnels that might have a diversion point along the Sacramento River within the North Delta region (California WaterFix), and aquatic invasive species.

In the South Delta, most planning activities have focused on protecting the Stockton area from flooding and improving the Paradise Cut, a flood bypass in the region. Improvements to the cut, as well as expansion of the lower San Joaquin River's flood capacity and

levees, have been the subject of more than 15 years of studies on the part of the US Army Corps of Engineers and the state's Central Valley Flood Protection Board, along with many local partners. Various feasibility studies and overlapping projects, including those referring to a project called the Lower San Joaquin River Bypass, and more recent recommendations developed by the board in the 2017 *Central Valley Flood Protection Plan*, and also endorsed in the 2013 *Delta Plan*, feature some related conservation elements. These include multiple setback levee projects to restore connectivity between the river and portions of the floodplain, and the enhancement of native vegetation.



Legacy town of Walnut Grove in the North Delta. Photo: Amber Manfree

At the 2016 *Delta Conservation Framework* workshops, stakeholders praised the Central Valley Flood Protection Plan's Conservation Strategy. In terms of the larger conservation opportunities in the South Delta, they envisioned a corridor of functional riverine and riparian ecosystems between Highway 5 and the San Joaquin River National Wildlife Refuge near Vernalis, providing a connection to the floodplains in Paradise Cut and restored channel margin habitat in the legal Delta.

North and South Delta Planned or Existing Restoration Projects

NORTH

- Habitat enhancement for Swainson's hawk at Elliot Ranch (approximately 215 acres)
- McCormack Williamson tract floodplain restoration (approximately 1,498 acres)
- Grizzly Slough floodplain restoration project (approximately 400 acres)
- Southport setback levee project (four miles of levee setback creating up to 152 acres of mixed floodplain and riparian habitat)

SOUTH

- Fish barriers
- Paradise cut and Lower San Joaquin Bypass floodplain, levee, and riparian habitat, projects (including 19 miles along the San Joaquin and Old Rivers)
- River Islands mitigation



Riparian brush rabbit in San Joaquin Valley National Wildlife Refuge. Photo: H. Grimes

Opportunities for Conservation

Conservation opportunities in the North Delta include wildlife-friendly agriculture and improvement or expansion of floodplain, tidal marsh, nontidal marsh, riparian, and channel margin habitat for Delta wildlife, including special status species such as the greater sandhill crane, Delta smelt, and tricolored blackbird. Juvenile salmon may benefit from improved channel margins along the Sacramento River and Steamboat and Sutter sloughs, which could provide an alternative route for passage through the Delta to the Sacramento

River. Stone Lakes National Wildlife Refuge provides opportunities for wetland and riparian conservation. Washington Lake could also offer terrestrial oak woodland habitat conservation opportunities for wildlife in the North Delta. Other conservation opportunities include continued support for the state's aquatic invasive species management programs^{8,9} and efforts to better understand how to avoid blooms of cyanobacteria, such as *Microcystis*, in the Delta.¹⁰

In the South Delta, the planned expansion of Paradise Cut offers numerous conservation opportunities, with a strip seven miles long and at least 1,000 feet wide permitting seasonal inundation.^{11,12} This could offer the potential for riparian forests to reestablish, as well as for large areas of restored freshwater marsh downstream from Paradise Cut, into which floodwaters could feed. The South Delta region also supports a remnant population of the endangered riparian brush rabbit and

these actions could support recovery of the species, as well benefitting sensitive fish and plants.^{13,14}

Potential Solutions to Recognized Challenges

Consideration for the safety, well-being and sustainability of local communities may be one overriding challenge in the North and South Delta. In the North, small legacy towns represent a historic and current agricultural way of life important to the Delta as an evolving place. In the South, areas of the cities of Manteca, Lodi, and Stockton that lie around the edges of the conservation opportunity region have disadvantaged community status. With very little public land available in either of these Delta regions the challenges of undertaking conservation become even more complex and multi-faceted.

WILDLIFE-FRIENDLY AGRICULTURE

In the North and South Delta, local farming communities remain concerned that the push for more conservation will displace agriculture and its supporting industries. As described in Section II of the *Delta Conservation Framework*, however, there is growing recognition that conservation in areas with little public land should focus more on integrated, dynamic land use management that continues wildlife-friendly agriculture,¹⁵ and on existing flood and channel management projects, than on land purchases from unwilling sellers. The Framework also recognizes that agricultural commodities and their related industries change over time.

In the North Delta, one focus of conservation could be Elk Slough, where a remnant mature riparian zone provides aquatic, transition, and terrestrial habitat for Delta wildlife. Planning for conservation could address existing flood protection needs while potentially restoring an alternative migratory corridor for salmon by expanding its width, where possible, and encouraging maintenance

CONSERVATION OPPORTUNITY REGION - CONTINUED

of adjacent wildlife-friendly farming operations with field crops rather than permanent row crops. Such steps could provide high-quality habitat and connectivity for riparian zone wildlife to the larger Delta landscape.

In the South Delta, conservation in collaboration with agriculture could continue to maintain wildlife-friendly grazing, seasonal crops, and alfalfa adjacent to enhanced riparian vegetation projects along the San Joaquin River and other south Delta channels. This would help expand wildlife movement corridors beyond the riparian zone. The Middle River, which is silting up and mires irrigation intakes, could be a focal point of future multi-benefit conservation initiatives focused on improving channel depths and creating more riparian channel margin habitat.

INTEGRATED FLOOD MANAGEMENT

In the North Delta, areas best suited for shoreline enhancement along the Sacramento River, where floodplain or low riparian bench habitats could be established, were evaluated as part of the *Bay Delta Conservation Plan Channel Margin Opportunities Assessment*.¹⁶ One project broke ground in May 2017 in West Sacramento, a setback levee aimed at improving nearly six miles of vulnerable levee along the west bank.¹⁷ This multi-benefit Southport levee project contributes toward California EcoRestore¹⁸ floodplain and riparian habitat restoration goals, and will provide additional flood protection for the North Delta's legacy communities. To further expand habitat in the area and provide an alternative migratory route for salmon through Elk, Sutter, and Steamboat sloughs, improvements to Elk Slough would need to be considered, including re-establishing a functional connection to the Sacramento River.

In the South Delta, planned projects along the Paradise Cut described above would lower

Important Planning Documents**NORTH DELTA****South Sacramento Habitat Conservation Plan**

This HCP is currently under development (2010 working draft). Its primary focus is to protect vernal pool and other upland habitats that are being diminished by vineyards and development, but it also protects wetland and riparian habitats and agriculture.¹² The plan covers several special status terrestrial species. The geographic scope includes a small portion of the Delta in Sacramento County, extending from the Stone Lakes National Wildlife Refuge in the north to Tyler Island in the south. Portions of the plan area are included in the *Delta Conservation Framework's* extended planning zone, where habitat could become important for species such as sandhill crane and giant garter snake as sea levels rise and other future conditions render legal Delta habitat less suitable. Reserve areas adjacent to the Delta could also provide stepping-stone connectivity between Delta wildlife populations and populations to the east. (See also p.33)

Yolo Habitat Conservation Plan and Natural Communities Conservation Plan

This countywide HCP/NCCP conservation plan is focused on endangered species and associated mitigation for infrastructure projects (e.g. roads and bridges) and development activities (e.g. agricultural facilities, housing, and commercial buildings). It is coordinated by the Yolo Habitat Conservancy and has a strong link to agricultural preservation, aiming to strike a sensible balance between natural resource conservation and economic growth in the region. Yolo County only overlaps the Delta in the Yolo Bypass and the area between the Sacramento Deep Water Ship Channel and the Sacramento River. However, many special status species are found in this area, including valley elderberry longhorn beetle, giant garter snake, and least Bell's vireo. (See also p 34 and pp.91-101)

Yolo Regional Conservation Investment Strategy

This voluntary, landscape-scale conservation plan serves to identify conservation priorities to guide public and private conservation actions and investment, such as habitat restoration and protection. It will provide a blueprint for additional voluntary, non-regulatory conservation in Yolo County that addresses conservation needs that are not covered in the Yolo habitat conservation plan (HCP/NCCP, see above and also pp. 91-101)

SOUTH DELTA**Bay Delta Conservation Plan Public Draft**

The 2013 BDCP plan considered the potential for floodplain restoration and enhanced riparian corridors along the San Joaquin River which traverses the South Delta region.¹³ The evaluation of conservation potential in the BDCP focused on a) increased inundation acreage to benefit listed fish species and b) increased frequency of inundation and residence time to improve production of listed fish species food resources.⁹ Overall, potential actions for riparian corridor and seasonal floodplain improvements include levee setback installation, creation of flood bypasses, riparian planting, and channel margin enhancement. The BDCP also includes a number of conservation actions in the North Delta region.

Central Valley Flood Protection Plan and Conservation Strategy & San Joaquin Basin Feasibility Study

The 2017 CVFPP serves as a guide to the state's participation in managing flood risk (see Guide p. 31). Various related basin specific plans are pertinent to this conservation opportunity region and suggest options for reducing flood risk, improving wildlife habitat, and adapting to climate change in Paradise Cut, the San Joaquin River Bypass, and the San Joaquin River Basin. (Appendix 10 of the basin feasibility study includes ecosystem restoration concepts).

San Joaquin County Multi-Species Habitat Conservation and Open Space Plan

Approved in 2001, this HCP was developed to provide guidelines for preserving agriculture and protecting species in the context of open space conservation and conversion to other land uses.¹⁴ The geographic scope includes all lands within the legal Delta that overlap with San Joaquin County, as well as secondary zones to the east and southwest of the Delta. (See also p. 34)

the San Joaquin River flood stage by over two feet where Interstate Highway 5 crosses the river. Modeling suggests they would also

substantially reduce flood risk between I-5 and Stockton. Expanding the floodway at Paradise Cut will also improve sensitive species habitat without changing most agricultural production, because farmland in the expanded floodway would only likely be inundated every 12 years. Goals for the Lower San Joaquin River Bypass project, which encompasses Paradise Cut, include maintaining existing agricultural operations; restoring shaded riparian aquatic habitat along decommissioned levees; providing riparian cover for riparian brush rabbit, riparian woodrat, and valley elderberry longhorn beetle; removing revetment to restore geomorphic process along decommissioned levees; and restoring the southern portion of the current in-channel bar for salmon floodplain rearing habitat. In addition, related plans for new, stronger levees setback from the San Joaquin and Old rivers offer similar, multiple, integrated benefits.

Paradise cut.
Photo: Patrick Kelly,
<http://sfoap.com>



RECYCLED WATER USE

Underlying many Delta conservation projects is a concern about impacts on water supply and efficiency. In the North Delta, the South County Ag Program¹⁹ (Sacramento County) represents a new water recycling and reuse project designed to provide a sustainable, drought-proof water supply for agriculture, urban, and environmental purposes. The program is supported by a broad group of local and regional stakeholders and aims to: recharge groundwater supplies and increase groundwater levels up to 30 feet; increase flows in the Cosumnes River in the Highway 99 area during critical fish passage and spawning periods; promote ecosystem restoration and viability of unique habitats and special status species; enhance smart irrigation

practices through the use of recycled water; and provide groundwater storage opportunities for regional water supply reliability.

INVASIVES SPECIES MANAGEMENT

The South Delta remains ground zero for the greater Delta in terms of the extent of invasions from floating and submerged aquatic invasive plant species. Poor circulation exacerbates this problem. The North Delta also suffers from impacts from invasives. Agricultural welfare and efficiencies in both areas can be impacted by plants clogging irrigation intakes, invading levee banks and waterways, and preventing access and navigation. The *Delta Conservation Framework* recommends that planning for any conservation project, channel margin improvement, floodway expansion, setback levee or riparian habitat development should include an aggressive and adaptive invasive species management component.

CLIMATE CHANGE AND ADAPTATION OPPORTUNITIES FOR LONG-TERM SUSTAINABILITY

In general, the Delta region is expected to experience more intense winter flooding and storm effects due to climate change, causing greater erosion of riparian areas.^{20,21,22,23} In the North and South, as in other Delta regions, more intense winter storms with increased winter river flows will likely significantly increase the hydraulic pressure on levees which could lead to flooding.²⁴ Climate change induced sea level rise could also affect tidal dynamics and exacerbate existing salt water intrusion into the Delta.

Additionally ongoing subsidence in these areas releases greenhouse gases and increases potential flood risk. Conservation planning should identify tools to stop or reverse subsidence, through alternative cropping focusing on alfalfa and rice which both build bulky organic matter (adding elevation) and provide benefits to waterfowl, cranes and Swainson's hawks.

CONSERVATION OPPORTUNITY REGION - CONTINUED

Scenario planning²⁵ is a critical tool that conservation planners can use to help anticipate impacts of climate change on ecosystems, species, infrastructure, agricultural practices, recreation, and inform other land uses and integrate these into the long-term planning picture.²⁶ A scenario planning approach integrated within a structured decision making process²⁷ could also incorporate long-term adaptive management and funding planning to anticipate the evolution of near-term conservation actions into the future. See Guide to Planning Tools p.184 for more details.

Looking Ahead

In regions with limited public lands, conservation efforts must continue to focus on multi-benefit land and flood management driven by local support. The *Delta Conservation Framework* supports the expansion of all such efforts. Opportunities to implement conservation in collaboration with private landowners, and areas where conservation is not compatible with local land uses, should be clearly identified as a first step in regional planning.

A partnership process could be a valuable asset in moving integrated planning forward in both the North and South Delta. In the North Delta, any new partnership should be inclusive of very diverse interests, ranging from residents, businesses, and agricultural practitioners to local, state, and federal agencies. Other valuable partners could be non-governmental organizations with a track record of expertise in the North Delta, as well as local reclamation districts, agricultural commissioners, the local farm bureau, and the North Delta Water Agency.

In the South Delta, while there is no current regional partnership focused on conservation, there are a lot of existing partnerships focused on flood management. Efforts could be made to

build on the multi-benefit aspects of flood management and riparian habitat improvement here, with important potential partners for continued planning including: the San Joaquin Area Flood Control Agency, the Southern Delta Levee Protection and Channel Maintenance Authority, San Joaquin County, the San Joaquin County Council of Governments, the San Joaquin Farm Bureau, the San Joaquin Valley Resource Conservation District, the River Islands Development, LLC, American Rivers, and the Natural Resources Defense Council. The Resource Conservation District is emerging as a local champion for planning with available funding. The South Delta Water Agency and Reclamation Districts 17 and 2062 are the primary leaders and entities that could engage landowners in the South Delta during planning and implementation of the bypass project. The bypass project would also benefit from an established permitting liaison to resolve permitting issues as they arise, and to potentially develop a Memorandum of Understanding between participating entities.

QUICK LINKS

Central Valley Flood Protection Plan

www.water.ca.gov/cvfm/docs/CVFPP-2017-CVFPP-Update-Draft.pdf.

Southport Setback Levee Project

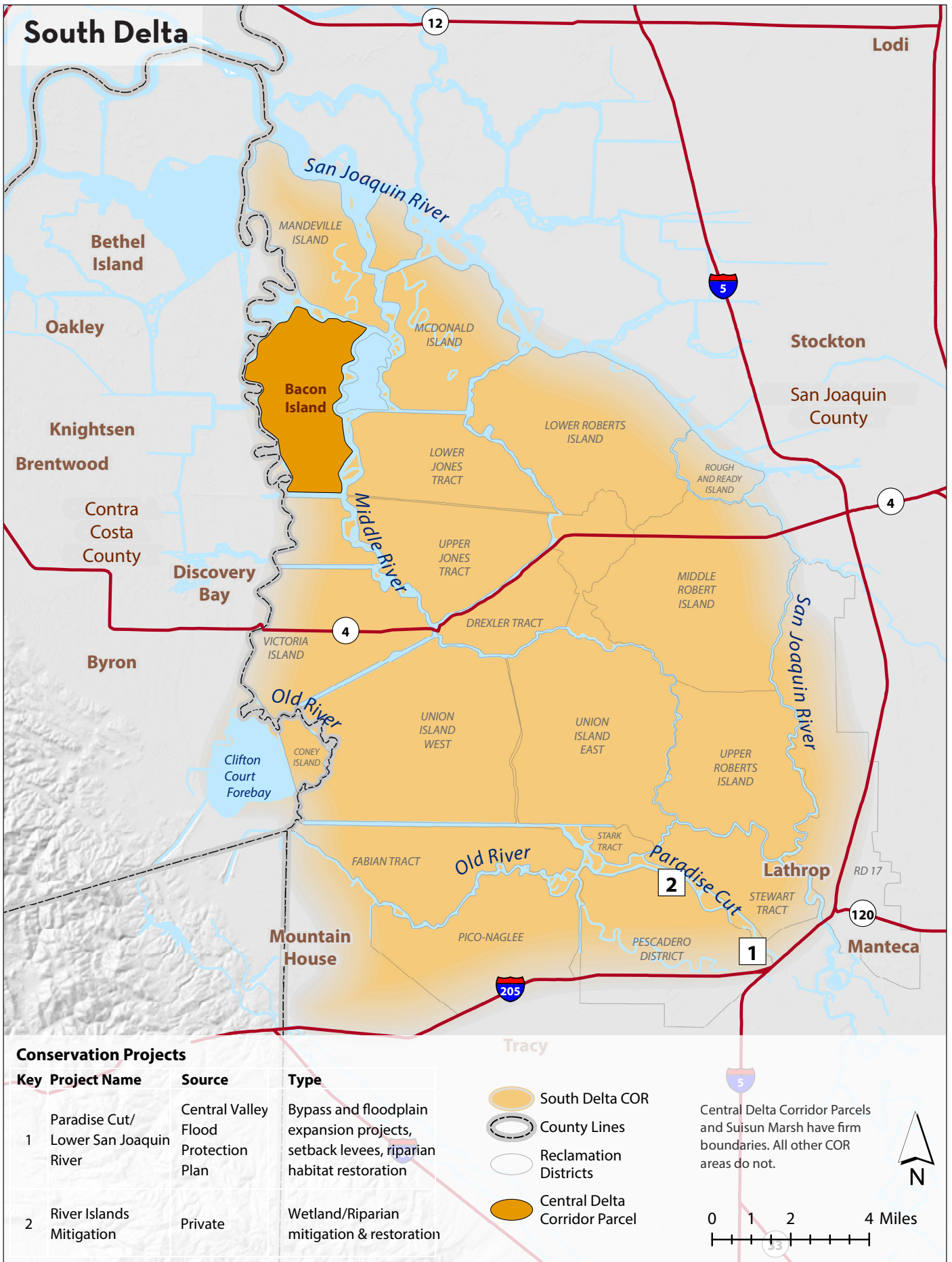
<http://resources.ca.gov/ecorestore/2017/05/southport-setback-levee-project-breaks-ground-in-west-sacramento/>

Stone Lakes National Wildlife Refuge

www.fws.gov/refuge/stone_lakes/.

For expanded, more detailed descriptions of these conservation opportunity regions, see Appendix X.

For more detailed descriptions of these conservation opportunity regions, see Appendix 2.



Map: CDFW, 2018

Guide to Planning Tools

Open Standards

The Open Standards for the Practice of Conservation (Open Standards) provide a well-established conceptual framework and tool set for conservation project planning, implementation, and monitoring. The California Department of Fish and Wildlife employed this practice in developing the 2015 *California Wildlife Action Plan*.

The five main Open Standards process steps are: 1) conceptualize the project; 2) develop a formal action plan; 3) implement actions; 4) analyze, use, and adapt; and 5) capture and share learning. These steps align closely with adaptive management frameworks. The Open Standards also offer a software tool called Miradi for use throughout the planning process. The tool allows users to create conceptual models; analyze factors in light of their impact on the conservation targets (e.g., specific ecosystem types, species, human-oriented benefits) and desired outcomes; and create implementation, management, and monitoring plans and project budgets.

The Open Standards' concepts are applicable at any stage in the conservation process, and they allow planning teams to specifically consider the benefits of conservation to human communities and integrate socioeconomic aspects. Additional planning tools include an in-depth, rational analysis of actions to implement individual strategies called Results Chains. Use of Results Chains allows planning partners to evaluate whether actions are linked, focused, feasible, and appropriate for reaching the targeted goal.

The Open Standards also facilitate long-term planning in the context of climate change by encouraging planners to 1) understand and respond to existing and future impacts of climate change, alongside other conventional threats or pressures; and 2)



develop and implement actions that do not erode options for responding to future climate change impacts.

The Open Standards represent the state-of-the-art in the conservation community's knowledge of the process for designing, managing, and monitoring conservation activities. Use of the practice can support the development of regional conservation strategies in the Delta by providing a consistent structure for conservation planning. Open Standards can be used in concert with scenario planning and structured decision-making, and decision support models such as Marxan. The Bay Area Conservation Lands Network successfully uses Marxan for prioritization of Bay Area conservation lands.

The Open Standards help conservation partnerships learn what works, what does not work, and why. Ultimately, this process allows conservation partnerships to adapt, improve their future efforts, and link to other efforts that use the same approach to planning.

Low pressure grade vehicles move dirt to increase elevations and recreate marsh plain on a Delta wetland restoration project benefitting wildlife.

Photo courtesy: CDFW

The Open Standards involves five main process steps:

1. Conceptualize Project

The first steps to conceptualize a program or project involve defining the vision and geographic, temporary, and sociopolitical scope; selection of the planning and implementation team and their roles and responsibilities; identification of conservation target (species, habitat, or ecosystem biodiversity) and human wellbeing aims (aims are focus items, such as reestablishing fluvial processes along streams, integrating recreation and other human benefits into conservation outcomes, or incorporating agricultural sustainability into Delta landscape-scale conservation); description of the current status of these aims; identification of direct threats, pressures, or contributing factors with regard to key ecological, biophysical, or human wellbeing attributes; and performing a situation analysis. This involves creating a conceptual model of how all key factors—including threats, enabling conditions, and potential opportunities—affect the aims. A built-in technique for evaluating and ranking factors helps to identify critical threats/pressures for which priority goals and strategies can then be determined.

2. Develop a Formal Action Plan

With a conceptual understanding of the underlying assumptions of how pressures and contributing factors influence the aims, the next process step is to develop goals for each aim and identify key factors and strategies to reach the identified goals. Linking the strategies to the desired goals and ultimate outcomes allows the determination of key intervention points and related actionable objectives that may involve intermediate outcomes on the path to reaching a desired goal. Performing this in-depth, rational analysis of individual strategies allows the evaluation of whether they are linked, focused, feasible, and appropriate for reaching the targeted goal. By following “if, then” logic steps along a “results chain,” this evaluation will ultimately result in prioritization of strategies and related actions.

3. Implement Actions and Monitoring

With the set of priority strategies in mind, the next step is to develop short- and long-term work plans and timelines for implementing and monitoring actions. This can then support the solicitation of necessary implementation funds. In addition to, or as part of, the work plan, it is critical to develop a monitoring plan with identified indicators, performance measures and metrics to evaluate the progress toward goals, or the status and trends of aims. Incorporating targeted, goal-oriented assessment in the project budget increases the likelihood of funding support for the adaptive management and monitoring aspect of the program or project.

4. Analyze, Use, Adapt

Once actions and monitoring have been implemented, a system for handling the project data has to be made available to support data analysis. In this respect, shared, easy access data management portals have been shown to be successful tools. Project results and assumptions, and operational and financial data, are then analyzed at set intervals over time, followed by documented discussions and decisions that may or may not lead to the revision of project plans at given points in time.

5. Capture and Share Learning

Key results and lessons are documented throughout program or project implementation to serve as the foundation for sharing insights and knowledge gained throughout. Depending on identified key audiences, communication strategies can be developed and executed. It is important to create a learning environment where regular feedback can be shared formally or informally, regular evaluations that demonstrate a commitment to learning are carried out, and a safe environment for experimentation is provided, allowing sharing of successes and failures with other teams.

Measuring salmon carcasses as they complete their life cycle after habitat restoration work in Putah Creek, one example of checking on conservation outcomes. Photo: Robin Meadows



Guide to Planning Tools - continued

Scenario Planning

Scenario planning is a strategic way to plan. It helps to achieve desired outcomes over the long term by evaluating the consequences of alternative pathways to achieve a defined goal. Also called scenario thinking, or scenario analysis, it is a structured way for agencies, organizations, or partnerships to think about how a variety of strategies and actions will likely affect the future by developing and evaluating a small number of scenarios. Scenarios are essentially stories of how the future might unfold and how this might affect the issues at hand over the short and long term.

To develop and evaluate a suite of representative scenarios to reach a goal, potential prejudices and preconceived notions influencing the decision-making process need to be brought to light and acknowledged by the partnership. In the first step of scenario planning, participants are asked to recognize and let go of prior misunderstandings to identify known facts (see Figure 6.3 – Step 1 – Rules of the game). This helps uncover what can and cannot be controlled.

In the second step, recognizing what participants cannot control will help them to identify factors that can be influenced by the actions proposed to reach desired outcomes. In addition, identifying the main drivers and related key uncertainties (Figure 6.3 – Step 2) helps to uncover the potential for affecting them. As participants clarify misunderstandings, prejudices, and key uncertainties, and begin to understand likely difficulties and divergent viewpoints, they will build trust (see Table 6.1 for Delta examples).

The three to five scenarios developed in Step 2 are to be presented as sequential stories. Each scenario then serves to “visualize” the possible steps toward achieving a goal and potential pitfalls to reaching them relative to the existing uncertainties. These

Table 6.1: Examples of prejudices and key uncertainties affecting successful conservation implementation in the Delta.

| Misunderstandings – Prejudgments – Key Uncertainties | Controllable? | Potential Approach/Solution |
|--|---------------|--|
| Delta conservation is independent from other land uses | yes | Good neighbor practices |
| People do not benefit from Delta conservation | yes | Multi-benefit conservation |
| Conservation area managers are bad neighbors | yes | Good neighbor practices |
| Delta conservation is incompatible with agriculture | yes | Wildlife-friendly agriculture |
| People’s needs don’t matter to conservation decision makers | yes | Multi-benefit conservation |
| Conservation areas do not offer opportunities for recreation | yes | Multi-benefit conservation |
| Impacts of conservation (e.g., tidal wetland flooding) will negatively affect other land uses, especially agriculture (e.g., levee seepage affecting prime agricultural soils) | yes | Multi-benefit conservation |
| Status quo of subsidence is not a problem and does not have to be addressed through change in agricultural practices | yes | Education and outreach on carbon farming to reverse subsidence |
| Conservation areas invite threatened and endangered species that could spread into neighboring lands. | yes | Employ Safe Harbor Agreements/ Neighboring Landowner agreements. |
| Climate change effects will change the Delta ecosystems | somewhat | Maintaining or increasing ecosystem and infrastructure resilience through restoring ecosystem function and establishing transition zones |
| Will Delta stakeholders be able to move Delta conservation forward in collaboration? | yes | Outreach and inclusive planning partnerships |



Photo: Rick Lewis

scenarios can then be individually evaluated and ranked. Evaluation of their strengths, weaknesses, opportunities, and threats—scenario by scenario—allows identification of the most promising options for moving forward (Figure 6.3 – Step 3). Once the most promising options rise to the top, the partnership can develop SMART objectives (specific, measurable, attainable, result-oriented, and time-bound), followed by implementation of related actions (Figure 6.3 – Step 4).

Scenario planning in conservation is a vital tool that enables planners to consider landscape-scale and long-term dynamics. For example, it could be used to help anticipate impacts of short- and long-term changes (e.g., land use or climate change, respectively) on ecosystems, species, infrastructure, water management, agricultural practices, and recreation, and then to evaluate them together as part of the long-term conservation-planning picture.¹⁹ A scenario planning approach could be

integrated within structured decision making (see page 188). It could also incorporate long-term adaptive management planning, and consideration of funding needs when anticipating how near-term conservation actions may evolve into the future. Scenario planning can also integrate open standards (see page 184) into the “conceptualize-project” step to evaluate several possible options for reaching the desired outcomes within varied timelines.

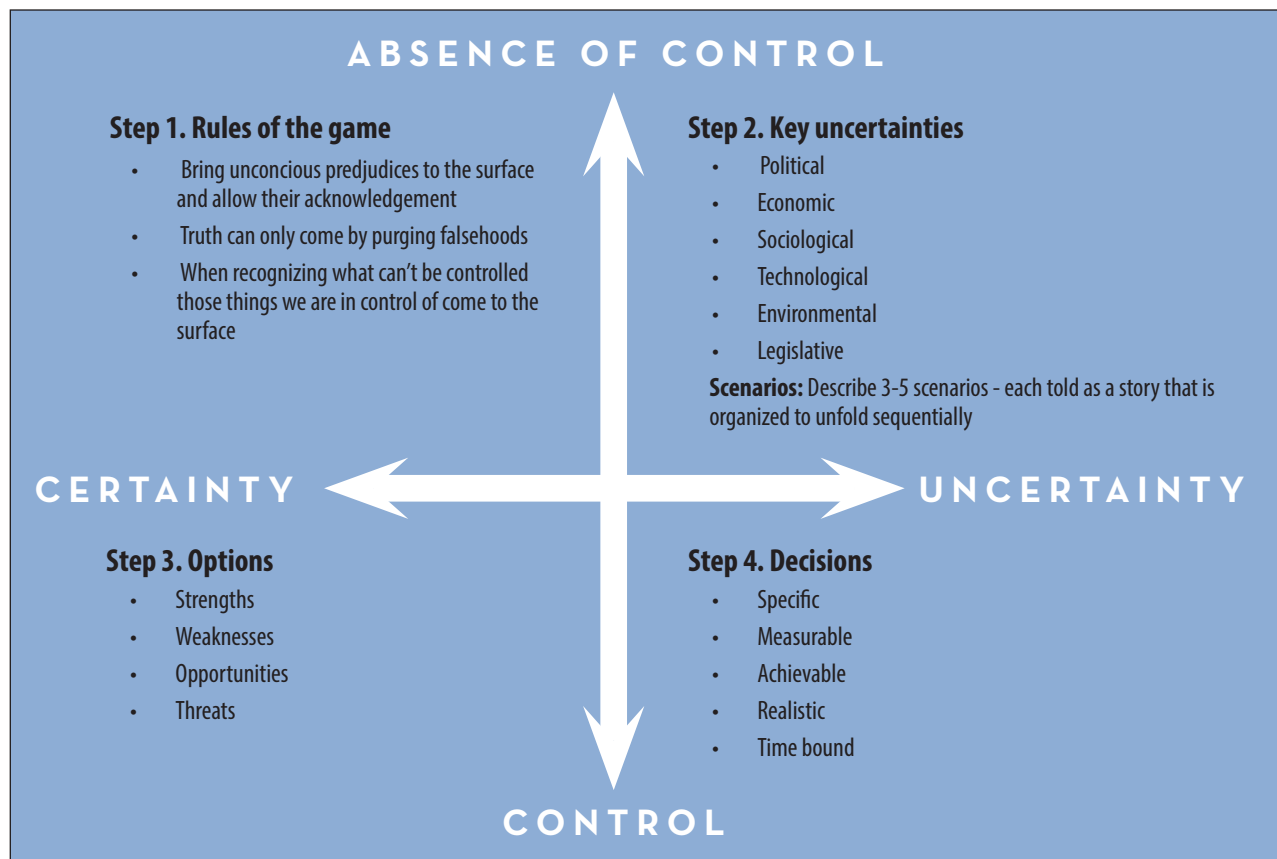


Figure 6.3. Key considerations in the scenario planning process with levels of certainty and control. Source: Brefi Group Limited, www.brefigroup.co.uk

Guide to Planning Tools - continued

Structured Decision-Making

Resource management and conservation investment decisions involve complexity and uncertainty. Regional conservation partnerships will therefore have to deliberate on a wide range of factors with complex links between ecosystem function, existing land uses, and local communities. These factors include 1) multiple objectives and stakeholder perspectives; 2) overlapping jurisdictions of local, state, and federal agencies; 3) short- and long-term effects of land use and climate change on regional sustainability and ecosystem function; 4) cumulative effects of all factors combined over time and space; and 5) high levels of uncertainty. All these necessary considerations create an intricate web of potentially competing or confounding factors when planning conservation. As a result, the decisions made by a regional partnership must consider a combination of subjective judgments made by experts about the potential consequences of proposed alternatives, as well as difficult, value-based judgments about priorities, preferences, and risk tolerance. In the case of the Delta, these decisions are associated with high-stakes economic, environmental, social, and political implications; and technical, public, and political interests will closely scrutinize them. Arriving at the best decision is even more difficult because stakeholders participating in a regional conservation partnership are usually working with limited resources. For example, government agencies are increasingly required to do more with less, on short timelines, and with rising expectations for quality, consistency, and transparent decision-making.

Structured decision-making is a process based in decision theory and risk analysis. It offers an organized and transparent approach to identifying and evaluating alternatives that integrates science and policy explicitly; and it focuses on engaging stakeholders, experts, and decision-makers in productive decision-oriented analysis and dialogue. The dialogue established

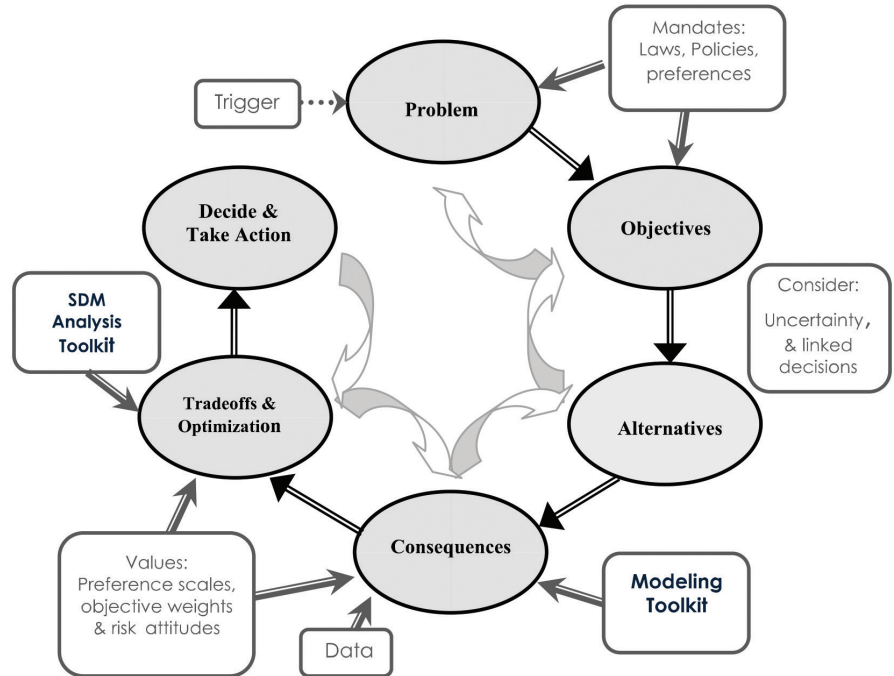


Figure 6.4. Structured Decision-Making Steps

by this approach allows participants to deal proactively with complex problems and judgments by following a decision-focused roadmap for integrating activities related to planning, analysis, and consultation (see Figure 6.4).

Structured decision-making incorporates a simple set of concepts and helpful steps for problem solving focused on achieving fundamental goals/objectives. Within this approach, every decision consists of several primary elements: management goals/objectives, decision options (alternatives), and predictions of decision outcomes (Consequences). As a result, making decisions based on clearly articulated fundamental goals/objectives includes crucial concepts in structured decision making such as dealing explicitly with uncertainty and responding transparently to legal mandates and public preferences or values in decision-making. Structured decision-making is often incorporated in adaptive management.²⁰

Scenario planning results directly contribute to the “alternatives” and “consequences” steps of the structured decision-making cycle. Individual planners and land managers, or regional conservation

partnerships, can use these and other tools to plan a strategic, coordinated approach to conservation. Prioritizing conservation actions based on the likelihood of long-term effectiveness in achieving objectives highlights the potential for outcomes to evolve over time, and the short- and long-term cost effectiveness of projects. By regularly re-evaluating factors, scenarios, strategies, and decisions over time, conservation partners will better understand how early projections played out and how to adjust management actions of conservation lands over time.

QUICK LINKS

Open Standards Practice for Conservation (Miradi software)

www.miradi.org/open-standards/

Scenario planning

<http://sloanreview.mit.edu/article/scenario-planning-a-tool-for-strategic-thinking/>

Scenario planning for climate change adaptation

<http://scc.ca.gov/climate-change/climate-change-projects/#slr-adaptation>

Structured Decision Making

www.fws.gov/science/doc/structured_decision_making_factsheet.pdf

C O D A

Delta Conservation Framework Guiding Principles



Developed by Stakeholders in 2016 Workshops

Guiding Principles for the Framework

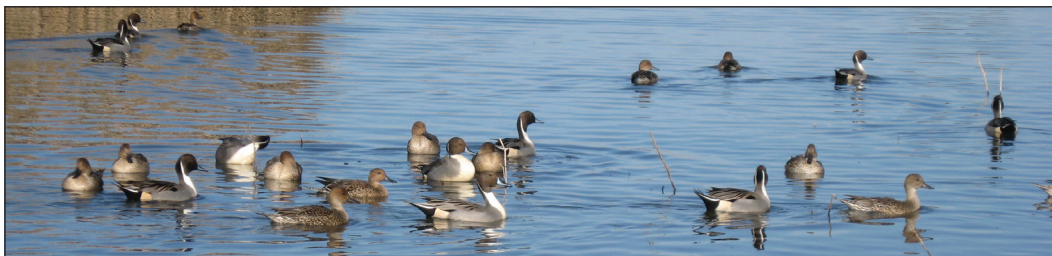
1. **PEOPLE AND PLACE:** Recognize the Delta as an evolving place with unique agricultural, cultural, recreational, and natural resource values. Section II outlines related goals and strategies to this guiding principle, and section V offers information on permitting and potential funding.

- a. Seek integrated, collaborative conservation and land management solutions while being sensitive to specific local, cultural, and environmental circumstances.
- b. Consider geographic setting and context in order to select the appropriate conservation strategies within individual regions and their social and biological legacies.
- c. Use available public lands suitable for achieving conservation objectives, as well as available incentives for willing private landowners to preserve land.
- d. Implement good neighbor policies and other stewardship practices (particularly as outlined in ALS Strategies 3, 7, 9, 12, 13, 14, 15, 16, 17, 18, 19, and 23 by the Agricultural Lands Stewardship Workgroup).
- e. Integrate ecological, social, and economic resilience into Delta conservation goals.
- f. Consider conservation values of agricultural and urban lands, where appropriate.
- g. Promote agricultural and socioeconomic research in the Delta to continue to inform conservation planning and implementation.
- h. Coordinate conservation policy, planning, and implementation among agencies and stakeholders.

2. **BUILD COMMUNITY AND FOSTER PUBLIC EDUCATION AND OUTREACH:** Support outreach, education, and communication across interests, where participants are encouraged to hear all perspectives, interact with respect and humility, and shift focus away from strict traditional roles toward a better understanding of the big picture to promote multi-benefit solutions. Section II outlines related strategies to this guiding principle, and section V offers information on potential funding.

- a. Foster communication and education that focuses on the role each individual can play to improve the Delta.
- b. Conduct regular public outreach and engagement with Delta stakeholders to plan, implement, and evaluate Delta conservation efforts.
- c. Promote early and consistent coordination among resource agencies, practitioners, local residents, land- and business owners, and other stakeholders to develop regional conservation strategies, related funding support, and general regional permitting frameworks.
- d. Expand planning efforts to include multiple sectors and stakeholders and ensure broad consensus.
- e. Seek a better understanding of each other's needs and interests, such as ensuring economic vitality and investing in local interests while finding solutions to benefit wildlife.
- f. Support Delta outreach and education campaigns that teach the importance, status, and value of the Delta at local, state, and national levels, with a strong focus on younger generations.

continued



Pintails in Susiun Marsh. Photo: Cliff Feldheim

Guiding Principles for the Framework - continued

3. **MULTIPLE BENEFITS:** Integrate conservation with other land use practices, where possible, to provide simultaneous benefits for wildlife and people at a landscape scale over the long term. Section II outlines related goals and strategies to this guiding principle, and section V offers information on permitting and potential funding.

- a. Foster more natural hydrologic processes and use conservation to sequester carbon and reverse subsidence (sinking land) to benefit people and the Delta ecosystem.
- b. Evaluate the current geographic distribution of natural and agricultural ecosystems across the Delta landscapes in developing regional conservation strategies. Consider how the strategy fits into the broader landscape level mosaic of land uses of the Delta (e.g. sandhill crane foraging and roosting sites in close proximity within the natural-agricultural interface).
- c. Reduce the abundance and occurrence of noxious invasive species, where possible, to benefit ecological communities, enhance recreation, and benefit agriculture.
- d. Coordinate flood projects with restoration projects through a landscape-level floodplain restoration planning approach to achieve multiple benefits

4. **PROCESS-BASED ECOSYSTEM CONSERVATION:** Focus conservation practices on reestablishing natural ecological processes and promoting the functions and adaptive capacity of Delta ecosystems, rather than restoring the Delta to pre-Gold Rush Era conditions. Section III outlines related goals and strategies to this guiding principle, and section V offers information on permitting and potential funding.

- a. Protect, enhance, or restore critical ecosystem processes with a focus on complexity and diversity, to promote resilience and adaptability.
- b. Create functional redundancy by replicating landscape elements across space and by increasing linkages among landscape elements to support wildlife movement.
- c. Provide ecosystem and wildlife connectivity across the landscape and through time.
- d. Design and coordinate conservation projects and regional conservation strategies as part of a larger mosaic at the landscape scale, with consideration of the position, future trajectories, and existing and historical biological conditions of projects.
- e. Where feasible, conserve large areas, with a long time period in mind.
- f. Promote biodiversity in human-dominated landscapes according to the principles of reconciliation ecology and a focus on tying conservation efforts to benefits of wildlife-friendly agricultural lands and urban areas as part of the larger landscape mosaic.

5. **PROMOTE ECOSYSTEM SERVICES:** Highlight the societal values of the many services healthy ecosystems provide to humans by emphasizing these services as benefits to society. Delta ecosystem services include open space, opportunities for outdoor recreation and tourism, pollination services, flood protection, clean water, clean air, biodiversity, and others. Sections II and III outline related goals and strategies to this guiding principle, and section V offers information on permitting and potential funding

- a. Evaluate and communicate the societal values of ecosystems to humans in the context of conservation.
- b. Educate the public about how healthy ecosystems benefit them through the many services they provide.

continued

Guiding Principles for the Framework - continued

6. **DECISIONS GROUNDED IN SCIENCE:** In light of continuing ecosystem stressors and accelerating changes from climate shifts and other drivers, as well as changeable socioeconomic conditions, utilize scientific approaches to inform and evaluate conservation practices and projects and conservation-related human needs. Section IV outlines related goals and strategies to this guiding principle.

- a. Conduct research and adaptive management, including modeling, ecological monitoring, and evaluation at project-specific and regional scales to continually improve the scientific basis of planning and management decisions and measuring the achievement of goals over time.
- b. Understand long-term agricultural and other socioeconomic trends and goals, and evaluate those in light of impending changes from sea level rise, conservation goals, and other uses.
- c. Weigh long-term gains against potential short-term impacts, ecologically, socially, and economically.
- d. Recognize a larger landscape-scale, long-term framework, where small pieces are implemented in stages to increase cost-effectiveness, and give opportunities for checks and improvements along the way.
- e. Utilize conservation planning tools and processes based in social sciences, such as the Open Standards for the Practice of Conservation and Structured Decision Making.

7. **INCREASED EFFICIENCY:** Utilize processes that minimize project costs, and provide consistent and integrated tools to support decision-making, evaluation of success, environmental compliance, and permitting; build on past planning documents and existing efforts. Sections IV and V outline related goals and strategies to this guiding principle.

- a. Use standard approaches for achieving goals and implementing multi-benefit objectives aimed at maintaining, enhancing, or restoring system-wide aquatic, fluvial, transitional, and terrestrial ecosystem functions, while benefiting people.
- b. Utilize opportunities for infrastructure upgrades, such as setback levees or fish screens, to achieve ecological benefits, where possible.
- c. Find mechanisms to improve the efficiency of environmental compliance and permitting requirements by working directly with regulatory agencies.

8. **ACKNOWLEDGEMENT OF LONG-TERM FUNDING NEEDS:** Recognition that long-term funding is necessary for successful Delta conservation and management through 2050 (see Section V for more details on funding; Section VI for more information on implementation).

- a. Explore opportunities for stable long-term funding sources to develop and implement conservation projects in the Delta.
- b. Utilize endowments for long-term operations and management of conservation lands, when possible.
- c. Through legislation, appropriation, or ballot initiatives, secure state funding for long-term operations and management of publically owned wildlife areas and ecological reserves and federal funding for long-term management of national wildlife refuges and other federally-owned lands.
- d. Promote programs that provide incentives for wildlife-friendly farming practices and landowners who achieve conservation objectives on their lands, such as Habitat Exchanges (see Section II for more information).



Endangered kit foxes. Photo: CDFW

Acknowledgements

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The Department of Fish and Wildlife would also like to thank all 2016-18 workshop participants and 2017 reviewers of the Delta Conservation Framework public draft.

Editors Note: The Delta Conservation Framework is a living document, written by several authors, assembled from myriad sources using many different languages (legal, policy, scientific, bureaucratic etc), and gathering input from stakeholder workshops, and public reviews over a long period of time. Stylistically, norms relating to consistency in the use of grammar, capitalization, or acronyms may have been stretched to make it more readable from many starting points.

