Delta Conservation Framework

Section II

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II. Integrating Delta Community with Conservation

Today, the Delta is at a crossroads between a long legacy of change as a result of reclamation and agricultural development and an uncertain future over the next 100 years, with pressures to change water conveyance,1 and restore habitat as the climate changes and sea levels rise. Restoring ecological processes will nurture ecosystem resilience in the face of future changes and will ensure continued and improved ecosystem services to local Delta communities and agriculture. This includes, but is not limited to: open space; opportunities for hunting, fishing, boating, and other recreation that also promote tourism; clean water and fertile soils; subsidence reversal; carbon sequestration; crop pollination; biodiversity; and flood control.

There is growing recognition that to be successful, it is essential for conservation practices to be better reconciled with the needs of Delta community members and all Californians.2 Improved alignment between conservation goals and the needs of Delta stakeholders, including the agricultural and local community (see box), will be a critical component in planning for the successful implementation of future conservation projects in the Delta.

Section II of the Delta Conservation Framework highlights the need for a more inclusive approach to conservation improving stakeholder communication and integrating socioeconomic considerations (Goal A). Goal B emphasizes the need to increase Delta-focused education and outreach. Goal C focuses on multi-benefit solutions (“floating all boats”) by integrating the needs of people and Delta ecosystems and offers strategies for implementing conservation projects that also benefit agriculture and the Delta community over the short and long term (Figure 2.1).

It should be acknowledged that win-win solutions intended to benefit the Delta ecosystem and local communities do not always distribute wins equally. In fact, multi-benefit solutions may sometimes include disadvantages or even losses for some stakeholders.2,3,4,14 Recognizing the potential for inequality of benefits is critical for gaining the trust and cooperation of all stakeholders. According to 2016 Delta Conservation Framework workshop participants, Delta farmers, business owners, and residents feel that they have gotten the “short end of the stick” in the past. It is important to find appropriate conservation solutions with long-term benefits for all stakeholders whenever possible and

DELTA STAKEHOLDERS

- Residents and landowners;
- Agricultural, recreational and other businesses operating or situated in the Delta;
- Native American tribes;
- The public, including citizens who rely on the Delta for water supply or for recreational uses;
- Beneficiaries up- and downstream of the estuary;
- Restoration practitioners;
- Local, state, and federal agencies; nongovernment organizations;
- Academic and other science-focused institutions;
- Private entities; and
- Policy makers.
to minimize impacts to landowners by focusing conservation efforts on public lands first, while remaining open to potential opportunities with willing private landowners.

Although there is potential to plan conservation projects with minimal impacts and multiple benefits, the degree of agricultural and community benefits from conservation will likely vary within the Delta and over time. It is imperative to engage stakeholders collaboratively in conservation planning efforts to make “all boats float” in the Delta in the long term.

Participants in the 2016 Delta Conservation Framework stakeholder workshops (2016 workshops) expressed concern about the possible impacts of conservation on agriculture and Delta counties and communities. Many of these concerns pertain to the economic impacts of conversion on productive agricultural lands—including loss of a local tax base for Delta counties—and associated decreases in processing, labor, and equipment sales. Other concerns include the potential for constrained agricultural operations as a result of listed or invasive species encroachment near conservation areas, potential drainage and seepage issues in agricultural lands adjacent to restoration or levee setback sites, and other negative effects associated with implementation, management, and, in some instances, public access to conservation lands.

Section V offers potential solutions for concerns regarding permitting and funding conservation projects. Despite their concerns regarding potential impacts of conservation on local communities, workshop participants also acknowledged possible benefits of conservation through ecosystem services.

Specific physical, societal, and economic benefits of conservation for Delta communities could include control of invasive aquatic vegetation in both conservation areas and adjacent agricultural waterways; removal in or near conservation sites of submerged debris and abandoned vessels; installing and managing water gates, screens, and barriers for the benefit of fisheries and irrigation systems; improved water quality; beneficial reuse of dredge sediment in restoration of tidal wetlands (e.g., subsided lands or flooded islands); improved fishing access from levees and public conservation staging areas; enhanced wildlife viewing.

**DELTA COMMUNITY** refers to the residents; landowners; and agricultural, recreational, and other businesses operating or situated in the Delta.
destinations accessible from boats (e.g., Calhoun Cut Ecological Reserve); direct public access in certain conservation areas;\textsuperscript{5,6,7,8} subsidized business from increased tourism; and improved air quality and scenic value from the planting of trees.

This section also highlights the Delta Reform Act concept of “Delta as an evolving place” and outlines the suggestions and feedback received from Delta stakeholders during the 2016 workshop series. It offers an overview of Goal C, and associated strategies and objectives, with a detailed discussion of the need to seek multi-benefit outcomes and integrate conservation with community through collaborative partnerships in the Delta.

The Delta as an Evolving Place

The concept of “Delta as Place” emerged from the 2007 Delta Vision Blue Ribbon Task Force process\textsuperscript{9,12} and connects to the language in the Delta Reform Act of achieving the coequal goals “in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place” (California Water Code §85054). This language calls for including the human dimension in ecosystem conservation, and by extension, ensuring a place for people and wildlife in a changing Delta. However, it is necessary to clearly articulate how to integrate or reconcile human uses with the Delta ecosystem in the future.\textsuperscript{2,10} Chapter 5 of the Delta Plan outlines regulatory policies and recommendations to carry out strategies aimed at protecting and enhancing the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place. It also contains several performance measures that track progress in achieving those policies and recommendations.\textsuperscript{11}

The concept of “Delta as Place” acknowledges that the Delta is a place for people, homes, and businesses, filled with history, cultural richness and diversity, in addition to being the hub for water distribution in California and a crucially important ecosystem.\textsuperscript{12} Stakeholder workshop participants described “Delta as Place” as the locals’ great love of the Delta as a home, rooted in a multi-generational linkage to the land and a different way of life founded on farming and land management (Appendix VI). The concept, therefore, captures residents’ deep connections to the Delta as their roots and their ties to its unique communities, land, heritage, and legacy throughout the last 160 years.

Along with the strong ties between communities and the landscape of the Delta, local Delta stakeholders expressed a reluctance to embrace change, especially if change is initiated from outside of their communities. The Delta community members who participated in the 2016 workshops expressed concerns that their lifestyle would cease to exist or drastically change if state agencies manage more land in the Delta and agriculture and residents are displaced. In particular, they commented that conversion of agricultural lands through restoration by state agencies or other outsiders could adversely affect water quality and availability and increase regulatory restrictions. In order for Delta conservation to succeed, these concerns must be part of a continued socioeconomic research program; and they need to be acknowledged and taken into consideration to inform ongoing planning and implementation of conservation projects.\textsuperscript{13,14,15,16,17,18} Addressing these may also help to achieve buy-in for long-term solutions. For example, some loss of agriculture could be balanced by improved long-term economic
sustainability or other benefits, as current agricultural operations may change in the future due to direct climate change impacts or changes in markets.

“I think the biggest risk is, if there isn’t community buy-in on the restoration projects, then oftentimes they’re seen as an imposition rather than a type of amenity for the community. Those projects that have a good connection with the local community really increase their rate of success, because you have those communities looking out for those projects. If restoration is imposed, it plays itself out where it can get sabotaged, and there isn’t support for it. I think most of the scientific community is aware of this now. I’m not sure it has been put in a set of best practices yet. But I think that has come to light through trial and error.”

(Brett Milligan, UC Davis)\(^{10}\)

The Delta as Place Interagency Working Group (DPI-WG) was conceived by the Delta Protection Commission in the spirit of the “Delta as Place” concept. This working group focused on implementing policies and recommendations identified in the Delta Plan and advancing Delta values by coordinating activities across federal, state, and local agencies to promote Delta agricultural sustainability, culture, economic development, energy and transportation infrastructure, recreation, and subsidence reversal/carbon markets.\(^{12}\) Recent DPI-WG actions include several initiatives: Community Action Planning, Delta Narratives, a Delta Awareness Campaign, a Delta Leadership Program, and a proposal for a federal designation of the Delta as a National Heritage Area (NHA). An NHA is defined as “a region designated by the United States Congress, where natural, cultural, historical, and recreational resources combine to form a cohesive, nationally-distinctive landscape arising from patterns of human activity shaped by geography.”\(^{12}\)

Among Delta stakeholders there is growing recognition that building a socioeconomically and ecologically sustainable Delta must go hand in hand, as sea levels rise and other impending environmental and related economic changes unfold during the upcoming decades.

(2016 Delta Conservation Framework workshop participants)

The understanding of “Delta as Place” has evolved over time and will continue to do so. By integrating the concept of “Delta as an evolving place” (as phrased in the Delta Reform Act) into conservation planning, local community initiatives could be considered alongside conservation planning as the Delta “evolves” into the future. It is best to prepare for future changes through a forward-thinking collaborative effort, rather than deeply divided factions that are rooted in the past or status quo.

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

Richard Norgaard, Professor Emeritus of Energy and Resources, UC Berkeley\(^{19}\)
Integrating the Human Dimension with Conservation

It is necessary for public agencies, restoration practitioners, and scientists to work collaboratively with Delta residents, landowners, farmers, and nongovernmental organizations in collaborative partnerships, at the local and regional levels, to plan conservation projects that will be successful over the long term and achieve ecosystem sustainability in the Delta. The intention of these partnerships is to overcome the current climate of wariness and doubt and move toward productive regular communication and collaboration. Mutual respect and a commitment to evaluating challenges and opportunities together are essential to the success of conservation, since Delta ecosystem function could be improved through multi-benefit projects, when feasible.

Therefore, the Delta Conservation Framework includes Goal A: Integrate regular stakeholder communication and socioeconomic considerations into Delta conservation planning, implementation, science, and adaptive management processes (Table 2.1). Two strategies focus on 1) utilizing collaborative regional partnerships and regular coordinated forums to plan, implement, and manage conservation and evaluate progress; and 2) aligning conservation practices with best practices (BPs) for supporting Delta agriculture and community needs. Associated implementation objectives are outlined in the text boxes below.

Table 2.1: Goal A and related strategies and objectives for implementation.

<table>
<thead>
<tr>
<th>GOAL A: Integrate regular stakeholder communication and socioeconomic considerations into Delta conservation planning, implementation, science, and adaptive management processes.</th>
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<tbody>
<tr>
<td><strong>Strategy A1:</strong> Utilize collaborative regional partnerships and regular coordinated forums to plan, implement, and manage conservation and evaluate progress.</td>
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<tr>
<td>o <strong>OBJECTIVE A1-1:</strong> By 2019, establish a permanent public advisor position to serve as:</td>
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<tr>
<td>o Liaison between Delta community members, agency representatives, scientists, and other stakeholders;</td>
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<tr>
<td>o Coordinator of regularly scheduled meetings to develop Regional Conservation Strategies with regionally focused conservation targets and timelines.</td>
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<tr>
<td>o <strong>OBJECTIVE A1-2:</strong> By 2022, identify a lead organization that develops web tools and content to include recommended collaboration and coordination practices and links to other existing resources.</td>
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<tr>
<td>o <strong>OBJECTIVE A1-3:</strong> By 2022, continue existing partnerships, and initiate new partnerships, to engage stakeholders (conservation practitioners, federal, state, and local planning and permitting agencies, willing farmers, landowners, and other community members) when planning Regional Conservation Strategies, implementing conservation projects, and managing conservation areas.</td>
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<tr>
<td>o <strong>OBJECTIVE A1-4:</strong> By 2022, initiate two new Regional Conservation Strategy planning processes, or similar partnership planning processes, as suggested in the Conservation Opportunity Regions (COR) outlined in the Delta Conservation Framework.</td>
</tr>
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**Strategy A2:** Align conservation practices with best practices for supporting Delta agriculture and community needs.

- **OBJECTIVE A2-1:** By 2019, engage with existing and establish new public advisors to help farmers and landowners navigate regulatory requirements associated with agricultural areas near conservation lands, and advocate for funding to provide financial incentives for implementing wildlife-friendly agricultural practices and associated research and evaluation.

- **OBJECTIVE A2-2:** Within four years after initiation of a *Regional Conservation Strategy* or similar planning process, conduct at least two region-specific socioeconomic research projects investigating the costs and benefits of Delta conservation (including ecosystem services) and show how findings can be incorporated into conservation project planning and evaluation.

- **OBJECTIVE A2-3:** By 2022, regional partnerships and individual project proponents consider inclusion of applicable Department of Water Resources (DWR) *Agricultural and Land Stewardship Workgroup strategies* and available socioeconomic and natural resource management research outcomes, in the planning of *Regional Conservation Strategies* and for project implementation and management.

- **OBJECTIVE A2-4:** By 2022, regional planning partnerships implement and evaluate efficacy of DWR *Agricultural and Land Stewardship Workgroup strategies* intended to minimize the impacts of conservation projects on agricultural productivity and maximize societal benefits from ecosystem services according to a suite of relevant performance measures.

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**Incorporating Regular Stakeholder Communication into Conservation Practice**

The Delta Conservation Framework provides general landscape-scale goals, strategies, and objectives that are relevant throughout the Delta. Specific goals, strategies, and objectives are outlined as boxes throughout the document as relevant to the topics of specific sections. Collaborative regional partnerships among public and private stakeholders should be used to develop and implement *Regional Conservation Strategies* within sub-regions of the Delta, which focus on local ecosystems, land uses, and communities. Existing regional partnerships and newly-formed *Regional Conservation Strategy* partnerships should be organized by a lead organization or agency and consist of conservation practitioners, federal, state, and local planning and permitting agencies, scientists, willing landowners, and other community members. A public advisor role should be established to function as a liaison between the Delta community and agency representatives. These cooperative regional partnerships should hold regular meetings over the long term and focus on collaboration to plan, implement, and manage conservation projects within a specific Delta opportunity region. Potential regional conservation opportunity regions (COR) are described in Appendix II and include the Suisun Marsh, Yolo Bypass, Cache Slough Complex, Central Delta Corridor Partnership, South Delta, North Delta, and Contra Costa (see Section VI).
Easily accessible web tools and content should be made available to support Regional Conservation Planning Partnerships. These resources could include existing conservation planning frameworks such as the Open Standards of the Practice of Conservation21 (Appendix XV) and web links to current agency webpages, including California Department of Fish and Wildlife (CDFW), DWR, the Delta Conservancy, the Delta Protection Commission, the Delta Stewardship Council, and the Good Neighbor Checklist prepared by DWR.22 Websites and online communication forums (e.g., blogs, email list serves) should be designed to facilitate early and consistent communication among all Delta stakeholders. Physical mailings, published announcements, and posted flyers should also be used to inform potentially interested Delta community stakeholders about conservation-related meetings within each Delta region.

Existing and Emerging Conservation Partnerships

Suisun Marsh Habitat Management, Preservation and Restoration Plan

The Suisun Marsh Habitat Management, Preservation and Restoration Plan (SMP)23 was established in 2013 to provide a structure for conservation planning and implementation in the Suisun Marsh region. The SMP is a 30-year comprehensive conservation plan that balances protection and enhancement of managed wetlands and the restoration and protection of tidal wetlands (SMP Final EIR/EIS, Volume II, App E, and Page E-4). It addresses habitats and ecological processes, public and private land use, levee system integrity, and water quality through tidal restoration and managed wetland activities.

Implementation of the SMP is overseen by the Principal Agencies Adaptive Management Advisory Team,24 made up of the Suisun Principal Agencies: U.S. Fish and Wildlife Service (USFWS); U.S. Department of Interior, Bureau of Reclamation; CDFW; DWR; National Marine Fisheries Services; Suisun Resource Conservation District; and the Delta Stewardship Council (successor to the CALFED Bay-Delta Program; please see Appendices II and VII for more information).

Central Valley Joint Venture

The Central Valley Joint Venture (CVJV) is another long-standing and cooperative partnership in the region. The CVJV programs focus on all migratory birds found in the Central Valley, including waterfowl, shorebird, and waterbird species, and on special status species such as western yellow-billed cuckoo (Coccyzus americanus), bank swallow (Riparia riparia), least Bell’s vireo (Vireo bellii pusillus), California black rail (Laterallus jamaicensis otuniculus), Swainson’s hawk (Buteo swainsoni), and greater sandhill crane (Antigone canadensis tabida). The CVJV is led by a management board of 21 public and private entities and has been successfully championing wetland conservation to benefit migratory birds and other wildlife throughout the Central Valley since 1988.25 The CVJV is one of 18 Joint Ventures throughout North America formed under the North American Waterfowl Management Plan that leverages public and private resources for projects throughout the Central Valley. The CVJV has a long history of success bringing partners together to focus on coordinated regional bird conservation efforts, including wildlife-friendly agriculture.25,26

The 2006 CVJV Implementation Plan outlines objectives for Central Valley habitats that support shorebirds, waterbirds, and riparian songbirds.27 A revised CVJV Implementation Plan with updated bird population objectives is slated for release in 2017.28,29,30,31,32,33,34,35 The objectives set by the CVJV for the Yolo-Delta, Delta Basin, and Suisun Marsh are relevant to Delta Conservation Framework Goal C,
Strategy C2, “Support sustainable wildlife-friendly agriculture to provide additional wildlife and migratory bird habitats”; Goal D, Strategy D1, “Restore, enhance, and manage ecosystem processes Delta-wide, as identified and specified by existing or emerging Regional Conservation Partnerships in Regional Conservation Strategies, to improve function and life history support for native and migratory wildlife”; and Goal D, strategy D2, “Through technical analyses conducted by given Regional Conservation Partnerships, identify and prioritize available areas to protect Delta ecosystems and transition zones with the potential for providing landscape connectivity and resiliency to ecosystem function.”

Updated CVJV Habitat Objectives for Bird Species

- **Riparian** bird species habitat objectives for the Sacramento, Yolo-Delta, San Joaquin, and Tulare Basins include restoring 5,900 acres of riparian habitat in the Yolo-Delta Basin within the next 10 years, and up to 108,627 acres within the next 100 years.\(^{29}\)
- **Shorebird** species habitat objectives for Butte, Colusa, American, Sutter, Yolo, Delta, San Joaquin, and Tulare Basins include making available 12,943 acres of wetland habitat for nonbreeding shorebirds and other bird use, including 5,213 acres flooded agricultural habitat for rice, 213,926 acres of corn, and 183,124 acres of other crop types.\(^{31}\)
- **Waterfowl** habitat objectives are also being developed as part of the updated CVJV Implementation Plan to be released in 2017.

Regional conservation strategy partnerships or individual project proponents should work closely with the CVJV and, in their planning and implementation efforts consider and reference the geographically relevant habitat objectives for resident and migratory birds.

**Yolo Bypass-Cache Slough Complex Planning**

Several partnership efforts have focused on conservation and floodplain management issues in the Yolo Bypass-Cache Slough Complex. At the government agency level, the Yolo Bypass-Cache Slough Complex Partnership offers a way for high-level collaboration among agencies and other stakeholders. The Corridor Management Framework allows local and regional agencies to engage more specifically in the Yolo Bypass partnership efforts. As a long-standing stakeholder partnership, the Yolo Bypass working group has engaged local stakeholders, especially in the southern Yolo Bypass region. Combined, with sufficient coordination, these partnerships can serve as a conduit for successful conservation planning and management in the Yolo Bypass-Cache Slough region.
In 2016, the policy-level Yolo Bypass and Cache Slough Partnership was initiated via a Memorandum of Understanding that emphasizes the importance of achieving across-the-board improvements in habitat, flood protection, agricultural sustainability, recreation, and other public values. Made up of 15 local, state, and federal agencies, its purpose is to improve executive-level interagency coordination. The high-level partnership has set the stage for improved trust between stakeholders, a key ingredient in successful efforts of this scale. It also provides a vehicle to incorporate local governments into planning and decision making, relative to restoration actions in the Yolo Bypass and Cache Slough (see Yolo Bypass COR summary in section VI for further details).

Corridor Management Framework
In 2015, local reclamation districts, counties, and flood control agencies developed the Corridor Management Framework (CMF), a vision for the integration of local, state, and federal interests in the region (including the Cache Slough Complex). The CMF continues to guide local agency participation in the Yolo Bypass Partnership and other forums.

Yolo Bypass Working Group
The Yolo Bypass Working Group, established in 1998, is a grassroots example of a multi-stakeholder partnership approach to conservation planning. Forty regular attendees represent a wide range of stakeholders interested in managing the multiple uses of the Yolo Bypass for flood control, agriculture, recreation, and floodplain habitat supporting juvenile salmon, waterfowl, and other waterbirds. Figure 2.2 shows the existing Yolo Bypass Partnership structure.

YOLO Bypass Working Group

“Every working group agenda contains specific and new issues as they develop. Topics include flood protection; improvement of salmon passage and rearing habitats; vector control; water quality, especially methylmercury production; changes in land ownership; and land use and habitat restoration and maintenance. Preservation of agricultural productivity is another important topic. Participants include landowners (farmers, ranchers, duck clubs), Department of Water Resources, Central Valley Flood Protection Board, CA Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Dixon and Yolo Resource Conservation Districts, Sacramento Area Flood Control Agency, Yolo County, City of West Sacramento, City of Davis, California Waterfowl Association, Ducks Unlimited, Sacramento-Yolo Mosquito Vector Control District, American Rivers, and others.”

(Yolo Basin Foundation 2017)
Figure 2.2 Existing Yolo Bypass Partnership Structure

Cache Slough Complex Planning Partnership
The Cache Slough Restoration Planning (CSRP) effort is an example of a new regional conservation partnership process underway in the Delta. The CSRP partnership was launched in 2016 by the Delta Conservancy and includes Solano and Yolo counties, Solano County Water Agency, Reclamation District 2068, agricultural community stakeholders from Resource Conservation Districts, and government agency representatives from the Delta Stewardship Council, California Natural Resources Agency, DWR, and CDFW. The CSRP’s purpose is to develop a regional conservation strategy for the Cache Slough Complex (CSC) that identifies areas for habitat restoration and projects that would be eligible for Proposition 1 funding and avoid or minimize potential conflicts between land uses. The CSRP has been incorporating existing land use plans and input from local stakeholders to develop a locally supportable vision using a strategic planning approach. Ultimately, the CSC conservation strategy will integrate with adjacent planning efforts in the Yolo Bypass (upstream) or Suisun Marsh (downstream). This regional planning compliments ongoing collaborative work among local, state, and federal agencies in the Suisun Marsh and the larger Yolo Bypass/Cache Slough region, and it builds on past efforts by the coalition of local agency partners in the Lower Sacramento/Delta North Region Corridor of important habitat for birds and other wildlife.

Central Delta Corridor Partnership
The recently formed Central Delta Corridor Partnership is currently evaluating conservation opportunities available on Delta islands recently purchased by the Metropolitan Water District of Southern California, including Webb Tract, Holland Tract, Bacon Island, and Bouldin Island; lands owned by DWR on Sherman and Twitchell Islands, and their upstream neighbors on Staten Island and McCormack-Williamson Tract in the Cosumnes River Preserve, managed by The Nature Conservancy.
(TNC). These Delta islands are central to a potentially emerging landscape-scale conservation “corridor.” This corridor is uniquely promising, as a large portion is publically owned or publically financed, and it would link together approximately 49,000 contiguous acres in the northeastern and central portions of the Delta (Figure 2.13, see a more detailed description in Appendix II).

**Figure 2.3: Map of Central Delta Corridor Source: SFEI**

**North Delta Habitat Arc**

Landscape-scale connectivity is emerging as an important emphasis for Delta conservation. Connecting a series of habitats across regions allows for continuous habitat “corridors” that are more ecologically valuable than individual disconnected parcels. The “North Delta Habitat Arc,” as another example, is a reconciled ecosystem strategy that creates an arc of habitats connected by the Sacramento River to benefit native fish and other wildlife.\(^{44}\) The upstream end of the arc starts in the Yolo Bypass, continues through the Cache-Lindsey Slough-Liberty Island region (CSC) into the Sacramento River, includes Twitchell and Sherman Islands, and ends in Suisun Marsh. Regional conservation plans for the two southern components of this “arc” (Suisun Marsh and CSC) are already being implemented by conservation partnerships. The northern portion includes public lands managed by CDFW (Yolo Bypass Wildlife Area) and has several existing successful planning efforts underway, including the CMF, Yolo Bypass working group, and the CVJV. While all the geographic subregions of this arc have benefited from
conservation planning, there may be an opportunity to tie these efforts together through a landscape-scale approach.

**Aligning Conservation Practices with Agriculture and Land Stewardship**

Delta communities have two primary concerns regarding conservation projects in their region. They believe:

1. Conservation projects will undermine the long-term viability of Delta agriculture by converting productive lands into restoration projects, and
2. Agricultural operations will be negatively impacted by insufficient long-term management of neighboring conservation areas.

Local landowners are concerned that conservation projects will spread invasive species, provide mosquito habitat, impact water supply, increase the risks of drainage and seepage, and draw scrutiny from regulatory agencies if listed species move onto their lands. In the 2016 workshops, stakeholders pointed out that public lands are generally not well managed, due to insufficient staffing and funding for long-term monitoring and maintenance. They suggested that public agencies focus on finding solutions to improve land management (Strategy A2, Table 2.1) and stewardship practices (this is addressed below by Goal C, Strategy C4). Several solutions were proposed to address potential conflicts between conservation projects and local community goals (see textbox for details).

### Potential conflicts between conservation projects and local community goals could be resolved by:

- Inviting stakeholder participation and incorporating stakeholders’ perspectives during the conservation planning and implementation processes;
- Using good-neighbor practices when managing conservation lands over the long term;
- Offering financial, regulatory, or other incentives to compensate landowners for their participation in conservation.

**REGIONAL CONSERVATION STRATEGIES** and individual conservation project implementation in the Delta should aim to minimize the impacts of conservation projects on agricultural productivity and consider the region-wide consequences of converting agricultural lands through restoration. However, small-scale impacts on agriculture should also be compared to the potential direct and indirect landscape-scale benefits of ecosystem conservation to society. There is a need for all Delta stakeholders to recognize that Delta agriculture and local communities are fundamentally supported by functional ecosystems. Ultimately restoring ecosystem processes via conservation may provide more valuable benefits to stakeholders and may contribute more to local and statewide economies than maintaining marginal agricultural lands in perpetuity.
Conservation partnerships, state agencies, local agencies, and project proponents should utilize the 2014 DWR Agricultural and Land Stewardship (ALS) framework and strategies to minimize potential impacts of conservation projects on agricultural lands. The ALS strategies contain specific tools for conservation project proponents to minimize potential impacts on agriculture and ensure solutions that balance the needs of agriculture and conservation. They provide an outline for assessing the ecosystem benefits of a given project, while ensuring that local landowners can achieve or maintain agricultural and economic viability in the surrounding region.

During conservation planning efforts, effective coordination among agricultural practitioners (or their local representatives), local planners, conservation planners, and other stakeholders is essential to ensure that potential impacts to agricultural lands and the environment can be recognized promptly and evaluated. To balance agricultural goals and emerging conservation projects in the Delta, farmers and landowners should be involved in planning from the start. Assistance and incentives for farmers and landowners to engage in conservation partnerships are essential. Because landowners and farmers are understandably busy managing their own lands, the ALS strategies include a suggestion to appoint a public advisor for government projects aimed at conservation. Besides providing support to landowners navigating regulatory requirements, the advisor would be responsible for informing farmers and landowners about ongoing conservation planning processes and would advocate for funding to provide incentives to farmers willing to use wildlife-friendly farming practices.

Promoting Delta Cultural and Ecological Values at Local, State, and National Levels

To acknowledge the ecological and economic value the Delta provides California and the nation, California residents need to gain a better understanding of these values and the Delta’s unique history and culture. Most Californians who live and work outside the Delta don’t easily grasp its sense of place and don’t understand how the Delta natural ecosystems support local and state-wide economies through water supply and other ecosystem services. Some only drive “through the Delta without a clear sense of being in it and less notion of where it begins and where it ends.” Statewide and national Delta education initiatives should work in concert with ongoing efforts through the Delta Awareness Campaign to focus a spotlight on the Delta’s historical legacy and economic importance, as well as the urgency of transforming its degraded natural areas into novel, functional ecosystems that are important to Delta residents and native wildlife. Accordingly, 2016 workshop participants developed a goal and related strategies to promote public education and outreach relative to integrating the “Delta as an evolving place” with ecosystem conservation. The aim is to build on existing initiatives—such as the Delta Awareness Campaign and the Delta Narratives led by the Delta Protection Commission and Delta Conservancy—to promote education and outreach programs at the national, state, and local levels (Strategy B1, Table 2.2).
Table 2.2: Goal B and related strategies and objectives for implementation.

**GOAL B:** Support and expand existing public education programs and run state and national outreach campaigns focused on Delta values and ecosystem conservation.

**Strategy B1:** Support and expand existing public education programs to include a focused curriculum on integrating agriculture, Delta communities, and ecosystem conservation that also communicates impending changes to resources and ecosystem services from climate change.

- **OBJECTIVE B1-1:** By 2019, secure funding support for the 5-year implementation of a coordinated Delta public education program integrating a conservation focus into existing curricula.
- **OBJECTIVE B1-2:** By 2022, lead organization initiates the expanded 5-year Delta public education program focused on multiple local audiences, including community groups and schools.

**Strategy B2:** Continue support for the expansion and implementation of existing outreach and education campaigns to promote the Delta and the importance of multi-benefit conservation outcomes to a wide audience at both state and national levels.

- **OBJECTIVE B2-1:** By 2020, secure funding support and expand existing programs to continue statewide and national outreach with a focused campaign about water, people, and wildlife in the Delta.
- **OBJECTIVE B2-2:** By 2022, lead organizations secure funding support and build on initial efforts to launch a three-year statewide and national media campaign to promote the Delta widely and build support for conservation.

**Delta Public Education Programs**

Several organizations are engaged in public education in the Delta, such as the Delta Regional Foundation, Delta Conservancy, Delta Protection Commission, and Water Education Foundation. Their programs include Delta-focused public education components on Delta issues, water, environmental health, and activities and resources for people. For example, the Delta Heritage Area Initiative has resulted in the creation of a defined area, with specific boundaries within which projects and resources are focused to preserve the human heritage of the Delta. The nonprofit Delta Regional Foundation was formed by members of the public in 2015 to highlight *Delta as Place* values, with a mission to promote cultural and historical preservation, education, and events; tourism and recreation operations; and agricultural projects and programs. Example efforts by the Delta Regional Foundation include the Delta Leadership Program and the Delta FOREVER art show, presented at California State University, Sacramento, in March of 2016.

The Delta Regional Foundation or another organization could also coordinate an expanded Delta public education program focused on promoting the Delta values, including the importance of ecosystem services for people.
conservation to the local Delta community. A well-coordinated, widely accessible local education program that includes a focus on conservation would heighten awareness around the benefits and challenges of Delta conservation. This increased awareness can foster ongoing local collaboration in conservation planning, and it will heighten recognition and appreciation of the direct and indirect contributions of ecosystems to human well-being that support our survival and quality of life. For example, these ecosystem services supported through conservation—including maintained or expanded areas for recreational activities such as boating, fishing, and hunting—benefit Delta residents and all of California. Increased awareness will also help to highlight how the integrated Delta Conservation Framework goals for combined conservation and community benefits aid both humans and wildlife.

Engaging the local community through regular Delta conservation-focused educational opportunities is critical to keeping conservation-related discussions current and ongoing.

**State and National Delta Outreach Campaigns**

In 2013, the Delta Protection Commission and the Delta Conservancy joined forces in response to a statewide survey that showed that 78% of voters had never heard of the Delta. In a two-stage effort they initiated a Delta Awareness Campaign to help raise Californians’ awareness of the Delta as a historic, cultural, recreational, and ecological treasure of the State. As part of this, the Delta branding effort—led by the Delta Protection Commission—supported tourism research, identified market trends that offer opportunity to the Delta, and commissioned logos and brand standards for the Great California Delta Trail and the proposed Delta NHA. The second phase, led by the Delta Conservancy, is creating a Delta-focused web presence linked to Visit California, which will provide a more comprehensive overview of the Delta’s cultural, recreational, historical, ecological, and agricultural tourism opportunities to potential visitors.

"Where does your water come from?" was suggested as the theme of a statewide and national outreach campaign by 2016 workshop participants, to inform people throughout California and the U.S. about the Delta as a major source of water and ecosystem services for the sixth largest world economy (Strategy B2, Table 2.2). In addition to highlighting the role of the Delta in statewide water distribution, culture, recreational value, and history, the current state and nationwide outreach campaigns should be expanded to also promote an appreciation for the unique ecosystems and wildlife in the Delta, as well as the impending changes associated with climate change. Effective public education that clearly links the value of the Delta to the rest of California would heighten awareness, appreciation, and commitment to Delta conservation, including future conservation funding initiatives.
"Floating all Boats" by Seeking Multiple Benefits

It is important to balance environmental and human needs when developing Delta conservation strategies. When stakeholders and conservationists are able to collaborate, it is possible to identify effective “win-win” projects that simultaneously improve ecosystem function and provide human benefits. Examples of “win-win” conservation strategies include wildlife-friendly farming, multi-use floodplains with annual crops, and low-impact outdoor recreation in conservation areas. For example, the Cosumnes River Preserve encompasses 46,000 acres of conservation lands with extensive recreational and educational opportunities, including hiking trails, canoe and kayak launches, waterfowl hunts for youth and mobility-impaired hunters, fishing, and classroom field trips (www.cosumnes.org/activities/). The Preserve also includes agricultural lands (e.g., row crops such as corn) mainly farmed in a manner that benefits wintering migratory waterfowl and waterbirds, especially sandhill cranes and Swainson’s hawks. In addition to recreational and agricultural opportunities, conservation lands also provide benefits to local Delta economies through improved flood protection, maintaining and improving in-Delta water quality, and trees planted along channels and in riparian areas to improve aesthetics.

LANDSCAPE-SCALE BENEFITS

It is essential to plan conservation at a landscape scale. As long as individual projects fit within a larger context and are connected across a landscape over the long term, not every project needs to result in multiple benefits.
Conservation includes the protection, enhancement, restoration, and long-term adaptive management of Delta ecosystems. The benefits of conservation actions to ecosystems and Delta communities can be realized immediately after construction of restoration actions or more slowly after a project is established over the course of years or decades. Individual conservation projects can be designed to achieve multiple benefits on a short time frame, such as incentives for farmers to use wildlife-friendly practices or restoration sites with hiking trails and boat launches. Benefits can also accrue more slowly, over the long-term, by improving ecological function after multiple projects become established in a region.

Forward-thinking strategies and attitudes will be especially critical for all Delta stakeholders considering and preparing for prolonged drought, extreme runoff events, potential levee failures, and seepage causing water-logged soils or increased soil salinity levels that prevent productive agriculture in adjacent fields. These are of particular concern on subsided lands (e.g., at the southern end of Staten Island). Any one of these factors could threaten agricultural productivity. In order to effectively explore a variety of possible solutions that make sense economically and ecologically, all Delta stakeholders should focus on science-based approaches, such as projections of long-term climate; ecological trends; and economic, social, and land-use drivers. These approaches have the potential to develop meaningful multi-benefit solutions and make community-supported conservation a reality. If all stakeholders are willing to give a little and embrace certain tradeoffs—for example, short-term losses in light of longer-term gains—multi-benefit conservation is a real possibility.

Sandhill Cranes in the Delta

Conservation of wintering sandhill cranes not only benefits recovery of the species, but provides cultural and economic benefits to the people in the Delta. Conservation on Staten Island and Brack Tract (Isenberg Sandhill Crane Reserve) is not only a result of wildlife friendly agriculture, but also draws enthusiastic visitors to the Delta, who in turn bring in local revenue. Local residents regard the sandhill crane as an icon of their Delta; for example, the Lodi Crane Festival celebrates the anticipated event of the cranes’ winter arrival, showcasing the Delta’s natural beauty.
**Table 2.3:** Goal C and related strategies and objectives for implementation.

**GOAL C:** Develop multi-benefit-focused conservation and land management solutions to balance environmental and human needs.

**Strategy C1:** Incorporate conservation goals with levee maintenance and flood management practices to provide habitat along Delta channels, river corridors, and riparian zones.

- **OBJECTIVE C1-1:** By 2022, identify and implement conservation opportunities for enhancing wildlife habitat along Delta channels, river corridors, and riparian zones in the context of flood management within regions identified by the 2017 Central Valley Flood Protection Plan (CVFPP) Conservation Strategy and in collaboration with the Delta Levee Habitat Advisory Committee.

**Strategy C2:** Support sustainable wildlife-friendly agriculture to provide additional wildlife and migratory bird habitats.

- **OBJECTIVE C2-1:** By 2019, create a common understanding of science-based wildlife-friendly agricultural practices and their potential benefits to wildlife in the Delta.

- **OBJECTIVE C2-2:** By 2022, utilize existing incentives (including agricultural conservation easements) and develop new incentives, such as Habitat Exchange programs run by non-governmental organizations or state agency-run funding programs, to support wildlife-friendly farming conservation projects in the Delta.

- **OBJECTIVE C2-3:** By 2019, appoint a local farmer Ombudsman for all Delta counties to provide outreach and support to willing agricultural practitioners and landowners about economic and other incentives to help expand wildlife-friendly agriculture in the Delta.

**Strategy C3:** Control and reverse land subsidence and support climate change mitigation efforts by implementing carbon farming projects where plants sequester carbon and build up soils over time.

- **OBJECTIVE C3-1:** By 2030, at least quadruple the number of Delta “carbon farming” projects that aim to manage lands to reverse land subsidence and sequester carbon with funding support through available carbon market opportunities.

- **OBJECTIVE C3-2:** Prioritize carbon management activities that are consistent with the carbon sequestration strategies, such as carbon farming practices, for Natural and Working Lands presented in the state’s 2017 Scoping Plan.
Table 2.3 continued: Goal C and related strategies and objectives for implementation.

**Strategy C4:** Advance state and local agency and stakeholder land management processes and procedures.

- **OBJECTIVE C4-1:** By 2022, identify a suite of 5-10 recommended tactics to improve cross-agency and stakeholder communication and coordination related to the management of state-owned lands.

**Strategy C5:** Develop best practices for assuring reliable water distribution for in-Delta uses and when implementing conservation.

- **OBJECTIVE C5-1:** By 2022, develop a suite of 5-10 best practices to help preserve reliable in-Delta water supplies when implementing conservation projects.

- **OBJECTIVE C5-2:** By 2020, assess the need to install fish screens at agricultural water diversions throughout the Delta and make recommendations for appropriate action.

**Strategy C6:** Integrate solutions for improving surface- and groundwater quality into conservation project planning and implementation.

- **OBJECTIVE C6-1:** By 2022, integrate and/or expand existing best practices for improved water quality into conservation projects, where appropriate, with focus on both surface- and groundwater.

“**FACING FORWARD** will entail envisioning and implementing preferred transitory futures. We will need to drop old battles more quickly and look ahead to what the future holds for our environment and how it fosters our economy and well-being.”

*Richard Norgaard, Professor Emeritus of Energy and Resources, UC Berkeley*\(^\text{19}\)
The following conservation and restoration measures may be beneficial to the Delta economy through improved recreation, ecotourism, and flood control, without substantial adverse effects on agriculture in the Delta (adopted from Delta Protection Commission 2012):°

- Encourage more farms to adopt wildlife-friendly agricultural practices based on successful examples in the Delta, such as sandhill crane habitat on Staten Island.

- Construct new flood bypasses, or improve existing bypasses, to provide habitat and improve flood protections; for example, in Yolo Bypass and McCormack-Williamson Tract-Cosumnes (north and central Delta) and Paradise Cut (south Delta).

- Conduct restoration on already flooded islands like Frank’s Tract to reestablish habitat for listed species, according to the Delta Smelt Resiliency Strategy, before converting agriculturally productive land.

- Focus restoration efforts on the mid-channel berms or islands that are in danger of being lost, before converting agriculturally productive land, as a wide variety of species are dependent on those types of habitats, including Delta smelt (*Hypomesus transpacificus*), chinook salmon (*Oncorhynchus tshawytscha*), Sacramento splittail (*Pogonichthys macrolepidotus*), western pond turtle (*Emys marmorata*), and Mason’s lilaeopsis (*Lilaeopsis masonii*).°

- Encourage the growth of native vegetation on the water side of Delta levees, where appropriate, to provide habitat for aquatic and semi-aquatic species and provide recreational and tourism benefits.°

- In some areas, instead of planning restoration across large swaths of land, enhance existing habitat in smaller restoration areas by improving natural slough structure using dredge and fill material in strategic locations, increasing the variability of flows and residence times, and creating more natural channel margins along existing sloughs and waterways by establishing native plants. Examples include Twitchell Island and Southport.°

- Restore historic floodplains to provide ecosystem benefits onsite and in the Delta to enhance, for example, sediment transport and food web support and to improve system-wide flood management (Example: Conaway Ranch in the northern Yolo Bypass).
Integration of Flood Management and Conservation

The 2016 CVFPP Conservation Strategy includes a comprehensive, nonregulatory approach to providing ecological benefits while protecting public safety, with multi-benefit projects that improve riverine and floodplain ecosystems. It offers a regional programmatic framework for increasing the efficiency of planning and permitting, improving individual project cost effectiveness, and enhancing ecosystem benefits associated with flood control projects (Strategy C1, Table 2.3). Planning partnerships and project proponents should follow the more specific guidance in the Central Valley Flood Protection Plan (CVFPP) Conservation Strategy when planning and implementing projects that integrate flood management and conservation in the Delta. Project proponents should also coordinate directly with the Delta Levee Habitat Advisory Committee—a group that has been operating for 25 years to balance the need to conduct regular levee maintenance with habitat conservation efforts—and consult the Delta Levees Investment Strategy Decision Support Tool.

Planned levee adjustments on nearby McCormack-Williamson Tract, where a levee breached in 1997, will also provide tidal habitat for endangered species. Extreme events may become more frequent as the climate changes.

Planning partnerships and project proponents should further consider lessons learned from past projects, including the need for long-term success monitoring and evaluation and accurate cost assessments of levee/habitat enhancement projects. Other recommended considerations include the importance of variations in water elevation for channel margin enhancements; vegetated, gently sloping banks with soft substrates and emergent vegetation to benefit salmonids; and the negative effects of riprapped banks on juvenile salmonids, for example. Combined, these recommendations, the CVFPP Conservation Strategy, the Delta Levees Investment Strategy, and the Delta Levee Habitat Advisory Committee will provide a balance of large-scale Central Valley wide planning and local site-specific expertise, both of which are essential for the success of individual projects that will ensure consistency with the broader goals of the Delta Conservation Framework.

EXTREME WEATHER EVENT EFFECTS

Flooding and levee stress have already started to affect the Delta during extreme weather conditions. In the winter of 2017, heavy rains caused levee damage along the North Mokelumne River, and residents on Tyler Island were advised to evacuate. Flooding caused evacuation of residents in the New Hope Landing Trailer Park and Marina and damage to farmland. This area also contains habitat for wildlife, such as sandhill crane. Farmland was also damaged along New Hope Road at another levee breach. Planned levee adjustments on nearby McCormack-Williamson Tract, where a levee breached in 1997, will also provide tidal habitat for endangered species. Extreme events may become more frequent as the climate changes.
Twitchell Island Setback Levees

Setback levees are designed to provide a functional flood-control system and habitat value to native fish and wildlife. For example, a project on Twitchell Island under the California EcoRestore initiative will stabilize a threatened section of the levee along the San Joaquin River; and at the same time, water-side habitat features will be constructed. These features include riparian, intertidal, and vegetated upland habitats created by waterside beaches, benches, and undulations. The project will span nearly all of the San Joaquin River levee plus a proposed 80-acre tidal marsh restoration site. Funding will come from Cap-and-Trade funds, Proposition 1 grants, and State Water Project mitigation. The project will address a number of problems on the island. Heavy winds cause waves to run up onto the roads and fields, there is inadequate freeboard space between high water levels and farms or structures, and the waterside levee slopes are overly steep. In addition to the benefits of levee stability and additional freeboard, the project will also create waterside habitat and gently sloping “fish friendly levees,” which are generally lacking in the region. The “fish friendly levees” will provide rearing and outmigration habitat for juvenile salmon. Tidally submerged and emergent vegetation will benefit fish and marsh species, and a continuous corridor of riparian and upland scrub habitats will provide a diversity of vegetation and canopy structure for riparian birds and other wildlife. This is an example of a multi-benefit project that meets the needs of both the Delta community and ecosystem function.
Setback Levee Recommendations

Integrating science into setback levee construction will be necessary for the project to succeed. For example, evaluating the effectiveness of different types of habitat improvements in benefitting fish and wildlife species requires monitoring data to evaluate the effects of the project on target species. Considerations to guide future setback levee projects should include monitoring fish (primarily salmonid) responses to habitat levee design and life history requirements for birds using marsh and riparian habitats for protection, foraging, and nesting.

While setback levees provide natural riverine processes that benefit aquatic and terrestrial wildlife, Delta-specific constraints need to be considered in the design. For example, elevation of inundated areas needs to be evaluated to determine if: 1) frequent inundation will support riparian, wetland, and upland habitats and species; 2) the setback distance will be sufficient to allow the channel to reinitiate riverine processes; and 3) the timing, duration, and frequency of flood flows are appropriate for habitat improvement. To create a multi-benefit project, the required setback distance, for example, will need to be balanced with the loss of productive farmland. Other considerations in the Delta include evaluating the costs of constructing setback levees on subsided islands and conditioning Delta peat soil to provide stable levee foundations. Working with willing landowners and ensuring protection of existing structures and utilities are also important consideration.

Risk assessments and outcome strategies will be required when choosing the location and design for setback levee construction. For example, the probability of flooding at a given location due to seismic events needs to be assessed, as well as State priorities for levee improvements. Planning partnerships or project proponents should consult the Delta Levees Investment Strategy and associated tools when planning setback levee projects.
Supporting Economically Viable, Wildlife-friendly Agriculture

Wildlife-friendly agricultural practices are tools farmers can use to improve ecosystem services, including agricultural pest control, maintenance of biodiversity, preservation of soils, and renewal of soil fertility.45,46,70 Wildlife-friendly farming is compatible with, and can even increase crop yields.46 Therefore, wildlife-friendly farming, coupled with financial incentives, offers benefits to both farmers and wildlife (Strategy C2, Table 2.3). For example, wildlife-friendly operations on Staten Island have benefited waterbirds—particularly migratory waterfowl and wintering sandhill cranes (A. canadensis)—while growing crops like corn, triticale, potatoes, alfalfa, and supporting permanent pastures.53,71,72

Wildlife-friendly farming is the attempt to integrate conservation and agricultural production to benefit wildlife and conserve biodiversity on land that is used to produce agricultural commodities.

Crop rotation is another tool that is used to benefit wildlife as well as economic feasibility of the farmland. For example, Swainson’s hawk primarily forages in alfalfa fields within heterogeneous agricultural lands.73 Because Swainson’s hawk also forages in other crop types, they may benefit from crop rotations that follow fluctuating market values, as long as a percentage of the cropland is maintained in high-value foraging crops. For example, fallowed fields, grain crops, sunflower, safflower, dryland pasture, and row crops such as beets or tomatoes are used by Swainson’s hawk and other special status birds, such as white-tailed kite (Elanus leucurus)74,75,76 and tricolored blackbird (Agelaius tricolor). Crop rotation patterns are considered when scoring Swainson’s hawk habitat value for the Central Valley Habitat Exchange program (see box below).77

“Carbon farming” is another example of a multi-benefit approach to agriculture that can occur in subsided areas and provide financial incentives for farmers. Carbon farming occurs when rice or wetland plants such as tules (Schoenoplectus acutus) are planted to replace conventional crops in subsided areas. The rice and wetland plants, in part, sequester carbon, increase organic substrate, reverse subsidence, and provide landowners income through the emerging carbon market78,79 (see Strategy C3, Table 2.3). In this example, tule marshes and rice fields could also support Delta wildlife, including giant garter snake (Thamnophis gigas) and tricolored blackbird.79 If conservation-focused financial incentives are available to allow farmers to continue earning revenue from wildlife-friendly agriculture, despite changes in ground water salinity levels and flooding frequencies, they could bolster long-term agricultural sustainability in the Delta.
WILDLIFE-FRIENDLY AGRICULTURE

Some insights gained from the 2005 Ecosystem Restoration Program grant solicitation that focused on wildlife-friendly agriculture are listed below.70

Examples of typical wildlife-friendly agriculture practices or actions include:

- Deferring fall tillage until later in the year to increase the quantity of forage on cornfields for waterfowl and greater sandhill cranes
- Shallow flooding of seasonal croplands in fall/winter to increase the availability of forage for wintering waterfowl, shorebirds, and other species
- Retaining a percentage of the crop in the agricultural field for wildlife use to enhance the value of flooding
- Screening agricultural water diversions
- Improving fish passage at water diversion structures
- Maintaining individual trees and tree rows at the margins of agricultural fields
- Planting native hedgerows along farm and district waterways to provide wildlife, pollinator, water conservation, and erosion control benefits
- Promoting vegetated waterways and tail-water ponds
- Using livestock for weed control as a key tool to maintaining desirable habitat conditions, for example, in vernal pool grasslands

Potential benefits to agricultural stakeholders from improving conditions for wildlife include:

- Groundwater recharge to aquifers used for summer irrigation
- Leaching salts from soils
- Biological decomposition of crop residue
- Reduction in soil erosion
- Creating an opportunity for income from hunting and increased aesthetic values, both of which may increase property values
- Financial incentives associated with agricultural conservation easements
- Improved relationships with regulatory entities

Habitat Exchanges are voluntary programs that create new financial returns for landowners and utilize habitat credit markets to serve as the currency to leverage wildlife habitat that willing landowners can provide. The Central Valley Habitat Exchange aims to generate a future where landowners are rewarded for sustainable management and restoration activities that result in measurable environmental improvements. This includes healthier streams, resilient floodplains and riparian corridors that translate into more jobs and support benefits for farmers who “grow” habitat.80
Incentives for Wildlife-friendly Agriculture

Programs that work with farmers to create and maintain habitat on private land should be promoted and expanded where possible. Many agricultural fields already contain wildlife-friendly features, such as hedgerows, irrigation canals with vegetation, and tree rows. Governmental and nonprofit entities recognize the value of establishing a mosaic of wildlife-friendly agricultural areas for wildlife habitat. Resource Conservation Districts, the Natural Resources Conservation Service, and Federal Farm Bill Programs—including the Conservation Reserve and Wetland Reserve Programs—have been working in collaboration with farmers to improve wildlife habitat and other aspects of environmental quality on agricultural land. The ALS workgroup developed a series of strategies to expand these existing collaborations between farmers and local, state, and federal agencies. They suggested establishing additional collaborative partnerships to maintain and enhance environmental quality on agricultural land. Examples of wildlife-friendly farming programs that have included incentives are:

- Migratory Bird Partnership
- TNC - Bird Returns program

Considerations for promoting wildlife-friendly agricultural practices include:

- Demonstrating economic benefits of habitat-friendly cultural practices;
- Understanding the social, economic, environmental, and governmental policy hurdles and/or incentives to perform conservation practices;
- Communicating the advantages of wildlife-friendly agricultural practices to landowners.
DIVERSE LANDSCAPE MOSAIC

Guidelines for farming in diverse landscapes with a mixture of restored ecosystems and agriculture:

• Maintain the existing benefits from a mixed landscape of agricultural and natural ecosystems, and encourage agricultural practices that maintain this diversity (e.g., maintain forest remnants, scattered trees, and crop diversity).

• Restore native ecosystem connectivity through agreed-upon projects across property boundaries or strategic land acquisition. These measures will benefit species that need large areas and are sensitive to agriculture.

Guidelines for farming in areas where farming is the predominant land use:

• Protect and expand large patches of native vegetation, because these provide important refuge habitat for species sensitive to agriculture.

• Create connections between existing conservation areas to increase the adaptive capacity of wildlife in the face of climate change. Connections may be created by traditional corridors or by innovative management strategies within agricultural lands, such as temporary fallows or intermittently flooded wetlands.

• Increase landscape heterogeneity by diversifying land use and crops, subdividing large fields to create more, smaller fields, and establishing beneficial vegetation such as hedgerows along field boundaries and roads.

(Fischer et al. 2008)
Solutions for Land Subsidence

In 2006, the Global Warming Solutions Act (AB 32, 2006) was signed by Governor Schwarzenegger to scale back California’s greenhouse gas emissions to 1990 levels by 2020. AB 32 required the California Air Resources Board to develop solutions to meet emission reduction goals, including carbon sequestration and carbon credit trading. The Delta’s peat soils are rich in carbon. “If California converted an area the size of the subsided lands in the Delta into carbon farms, the annual benefits could equal: Changing from standard lightbulbs to compact fluorescents in all California households; turning all SUVs in California into small hybrids; or turning off all residential air conditioners in California.” Therefore, the emerging carbon market might offer some opportunities for reversing land subsidence in the Delta while providing benefits to society in the form of carbon storage and financial incentives. Biophysical benefits of Delta conservation for natural resources and human needs include improved tidal connections to and within tidal marshes, enhanced transition zones between wetland and upland habitats, better floodplain hydrology, upgraded water quality, subsidence reversal, and carbon sequestration (Strategy C3, Table 2.3). 48, 84, 79

In April 2017, the American Carbon Registry (ACR) approved a new carbon offset methodology to scientifically quantify greenhouse gas emission reductions from California wetland restoration efforts in the Delta and the coast. 85 Opportunities for restoring wetlands or converting to rice cultivation in the Sacramento-San Joaquin Delta, Suisun Marsh, and California coastal areas are available. Carbon offsets generated by these projects can be sold by landowners to corporations, to meet their voluntary emissions-reduction goals. Offsets are being considered by California regulators for eligibility in the state’s Cap-and-Trade Program that mandates power plants and oil refineries to reduce or offset their emissions. 85 The passage of AB 398 in July 2017 extended the life of the Cap-and-Trade Program and identified climate adaptation and resiliency projects as eligible funding recipients of Cap-and-Trade auction proceeds. 86 Activities to build ecosystem resilience to climate change—for example, through restoration and enhancement—can have benefits for climate mitigation as well.

“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 ACR 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, Executive Officer, Sacramento-San Joaquin Delta Conservancy 85

On Twitchell Island in the western Delta, USGS is collaborating with a team of university researchers to conduct a large-scale demonstration project, the Carbon Capture Program, 78 to show that flooding tule...
wetlands or rice fields during most of the year (especially during the summer and early fall months) reverses subsidence. Inundated tules and rice halt peat soils from subsiding, and reverse subsidence by increasing root structure (accretion) and producing new soil. The Carbon Capture Program shows promise as a technique to rebuild subsided Delta islands and help combat climate change by taking carbon dioxide (CO$_2$; an important greenhouse gas) out of the atmosphere. This approach could benefit Delta landowners trying to capitalize on the emerging carbon market by switching from growing traditional crops to “farming” carbon by planting tules, rice, or alfalfa and maintaining the land in agricultural use. The potential for multiple benefits associated with carbon farming offers a unique opportunity to increase elevation on subsided lands, restore a large portion of the Delta wetlands, and benefit the local Delta community.

The ALS workgroup recommends ways landowners can take advantage of carbon farming opportunities (Strategy C1) by managing land in ways that sequester carbon and reverse subsidence, while earning revenue from greenhouse gas offset credits.

**BENEFITS OF CARBON FARMING TO REBUILD SOIL AND REVERSE SUBSIDENCE:**

- Reduces the cumulative stress on the levees
- Decreases the risk of levee failure, flooding, and costs of recovery
- Halts the soil loss
- Reverses the effects of subsidence
- Sequesters carbon (captures and converts CO$_2$ to an organic compound and stores it)
- Generates revenue through carbon credits
- Creates habitat for Delta wildlife
- Reduces greenhouse gas emissions to meet the 2020 goal established by AB 32
- Provides room for adaptation to sea level rise associated with climate change
- Preserves open space

While this opportunity has much promise, some issues should be considered and addressed, including the following:

- Potential adverse environmental impacts need to be resolved, including contamination from mercury and dissolved organic carbon, and the need for mosquito control.
- Implementation will be difficult on islands with multiple owners, unless all owners agree to take part in the project.
- Subsidence reversal requires land management practices that differ from much of conventional agriculture in the Delta.
- Expansion of low-carbon agriculture, in the form of rice cultivation, may not be economically feasible for farmers, because rice yields are lower in the Delta than in the Sacramento Valley.
Potential strategies for encouraging and implementing carbon farming in the Delta include the following:\(^1\)

- Provide incentives to stabilize or reverse land subsidence.
- Help farmers and landowners produce and sell greenhouse gas offset credits.
- Investigate options to designate subsidence reduction and carbon sequestration crops as agricultural production for regulatory and incentive purposes.

**Advancing Agency Land Management Processes and Procedures**

Participants in the 2016 workshop series identified a number of challenges with state and federal land management practices in the Delta. Many of the public lands in the Delta are owned and managed by state agencies such as DWR, CDFW, and California Department of Parks and Recreation. County agencies have title to, and responsibility for, other Delta lands including the Petersen property in the Cache Slough region, owned by the Solano County Water Agency. Federal agencies also own land in the Delta, including the Stone Lakes National Wildlife Refuge owned by the USFWS. Recurring messages voiced by Delta stakeholders during the 2016 workshops were that “there are too many agencies involved in the Delta” and government agency landowners can be “bad neighbors.” Because ownership and management of state lands in the Delta are split among several departments, better coordination among state and local agencies could improve land management practices and streamline conservation implementation (Strategy C4, Table 2.3; also see Appendix VI).

**The Cosumnes River Preserve** is an example of conservation lands that are owned and managed by multiple partners, including state and federal agencies (Bureau of Land Management, CDFW, California State Lands Commission, and DWR); Sacramento County; and non-governmental organizations (TNC and Ducks Unlimited). Centered along the Cosumnes River and its floodplains, the preserve is managed to protect riparian, wetland, and vernal pool habitats while utilizing compatible ranching and farming activities to sustain native plant and wildlife communities and ecosystem processes that perpetuate a dynamic mosaic of habitats. To attain this vision, the partners agreed on a set of overarching goals and a management plan to implement practices that would help to achieve the goals.

(Kleinschmidt Associates 2008)
The ALS workgroup provides a checklist for agencies and other conservation practitioners to ensure that they comprehensively consider the impacts of conservation lands on neighbors and the effects of neighboring land uses on the success of conservation when managing lands in the Delta. The checklist includes specific actions including contacting and communicating with neighbors, agreeing upon site access routes, discussing the need for security or law enforcement, evaluating the potential for increased fire danger and introduction of invasive weeds or pests, identifying potential issues with flood control structures or other infrastructure, and understanding how neighboring agricultural operations may affect conservation projects through applications of chemicals or livestock presence (see Appendix IX). Through coordination and the development of standard procedures for management of both farmlands and conservation lands, impacts on either side could be measurably reduced.

Best Practices for Reliable In-Delta Water Distribution

Water diversions are used to distribute water to agricultural fields or ponds throughout the Delta. As a side effect, small fish and other aquatic or semi-aquatic wildlife may be pulled into these diversions and killed. Recent studies show that most small diversions take place at times and places when Delta smelt, especially larval smelt, are not likely to be present. Therefore, while small diversions are found throughout the Delta, few Delta smelt have been entrained at the generally small pump intakes located close to shore. Entrainment of juvenile salmon in unscreened diversions was also low relative to other fish species. A coordinated effort to develop BPs would encourage approaches to the approximately 2,300 mapped water diversions that minimize adverse effects on native fish, wildlife, and water quality and help preserve a reliable water supply for human use. These BPs could include raised awareness of the critical times when native fishes, especially Delta smelt and juvenile salmonids, are most sensitive to entrainment to avoid negative effects. If this is not feasible—since screens are not effective in avoiding take of larval endangered fish species—BPs could also suggest implementing a program to assist conservation practitioners, neighboring farmers, and Delta residents to implement mitigation for the diversion-associated take, and consider safe harbor agreements, where appropriate, as part of the specific activity or restoration project (Strategy 5, Table 2.3).

Where fish screens are needed, there is an opportunity for farmers to receive financial assistance to install them. For example, the Family Water Alliance partners with state and federal agencies and private contributors to fund and install fish screens on small agricultural diversions in the Sacramento Valley. The success of the program has resulted in the delivery of diverted water that is free of fish, protecting both the fishery resource and the local agricultural community. As a further benefit to farmers, certain fish screens can keep fish and debris out of irrigation pipes, saving substantial operational and maintenance costs.

Improving Conservation-Related Water Quality

During conservation project construction and management, certain practices such as the removal of water hyacinth or other invasive floating plants, installing new infrastructure, or breaching levees to reestablish tidal flows into marshes may affect water quality. Potential impacts can include increased turbidity and decreased levels of dissolved oxygen; nutrients and specific toxicants can temporarily be affected. Solutions for improving surface- and groundwater quality should be integrated into
conservation project planning and implementation (Strategy C6, Table 2.3). In some cases, associated negative water quality effects can last over the long term, especially if they affect groundwater and legacy contaminants. For example, because of past extensive mercury use in Sierra Nevada gold mining in the upper watersheds, methylmercury production rates are higher in Delta wetlands than in other California aquatic ecosystems.\textsuperscript{92} In some cases, wetland restoration may release mercury from sediment and increase the potential bioaccumulation of methylmercury in Delta wildlife.\textsuperscript{93,94} Our current understanding is that methylmercury production is generally low in permanent tidal wetlands and some permanent freshwater wetlands, with higher production in seasonally flooded wetlands (see Table 3.3 in Wood et al. 2010a).\textsuperscript{95,96} Bioavailable selenium can also be released from restoration projects and affect water quality, potentially resulting in adverse effects on fish and wildlife.\textsuperscript{97,98}

However, wetland habitat restoration efforts in the Delta provide numerous positive effects, and potential mercury-related negative effects can be minimized (see BDCP Conservation Measure 12).\textsuperscript{97} Best management practices can also be applied to minimize conditions that promote bioaccumulation of selenium in restored areas; for example, developing a selenium monitoring and management plan for each restoration project.\textsuperscript{97}

Some pesticides, such as the banned organochlorine pesticide DDT, are also legacy problems in the Bay-Delta Watershed.\textsuperscript{99} Yet, most contaminants responsible for reduced water quality arise from current-use compounds from industrial, agricultural, urban, transportation, and natural sources, and there is increasing concern over new classes of contaminants, such as pyrethroid pesticides, pharmaceuticals, and personal care products.\textsuperscript{99} Further, major contaminants of California’s groundwater include salt, organic compounds, nitrates, pesticides, and metals.\textsuperscript{100} Such water quality issues may not only affect fish and wildlife, but also recreational waters, fisheries, and farming operations.

Therefore, to minimize adverse effects of restoration on water quality and Delta wildlife, a summary of BPs that align with State and Regional Water Quality Control Board policies for improved surface- and groundwater quality\textsuperscript{101,102} should be developed, or expanded from existing BPs, and applied to conservation project implementation as appropriate to project conditions.
Endnotes


G. Yarris, pers. comm.


