

# Restoring Habitat with Science and Society in Mind

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Habitat restoration is an essential element of restoring the Delta ecosystem while improving water supply reliability and protecting and enhancing the unique values of the Delta, as required by the Delta Reform Act (Water Code Section 85054). The state faces the challenge of designing effective science-based restoration projects within a landscape context while meeting deadlines for its current habitat restoration obligations. The purpose of this paper is to survey restoration activities; describe needs, progress and opportunities related to restoration; and propose key areas of focus for the Delta Stewardship Council (Council) and other agencies to advance habitat restoration over the next two years.

Over the past year, the Council has received reports and presentations on habitat restoration from the Delta Independent Science Board (ISB) and agencies and organizations undertaking restoration in the Delta, and Council staff has participated in several habitat restoration working groups. Through this process, Council staff has identified several key elements that are needed to ensure efficient and effective habitat restoration in the Delta, and has clarified the Council's role in addressing these needs.

**First**, the Council promotes the use of best available science and adaptive management by helping project proponents ensure the consistency of their restoration projects with Delta Plan regulations and implementing the Delta Science Plan. **Second**, the Council works with other agencies to track restoration progress by reporting on Delta Plan performance measures. **Finally**, the Council supports the work of other agencies to identify and promote best practices for stakeholder involvement, agricultural and land stewardship, land acquisition and meeting habitat regulatory requirements, and permit coordination. The Council, agencies and stakeholders have made progress in addressing these needs, but more work is necessary to meet the state's habitat restoration obligations.

## Background

The Council was formed in 2010 under the authority of Delta Reform Act and was directed to, among other things, develop a long-term sustainable management plan for the Delta that furthers the State's coequal goals of statewide water supply reliability and a restored, enhanced and protected Delta ecosystem in a manner that protects and enhances the unique values of the Delta (Water Code Section 85054). The Delta Plan puts forth a long-term vision for the Delta ecosystem that includes "habitats for resident and rearing migratory fish, birds, and upland wildlife...connected by migratory corridors, including areas with high-quality cover and feeding opportunities." These restored habitats, together with other actions such as providing more natural functional flows, are expected to contribute to the recovery of native fish and wildlife.



The Delta Stewardship Council (Council) has both a regulatory role and a coordination role with respect to habitat restoration in the Delta and Suisun Marsh. Habitat restoration projects that are covered actions under the Delta Plan must be consistent with the Council's regulatory policies (Water Code Section 85057.5). In its regulatory role, the Council provides early consultation to project proponents to advise them in preparing to certify their consistency with the Delta Plan.

In its coordination role, the Council surveys restoration activities, tracks progress, and identifies remaining challenges. The Council held an oversight hearing in July 2013 at which the Delta ISB presented its review of the scientific research, monitoring, and assessment programs that support adaptive management of habitat restoration in the Delta (Water Code Section 85280(a)(3)). In addition, several agencies reported on their Delta restoration activities (Water Code Section 85210(h)). In November 2013, the Council received a staff report on progress toward addressing issues raised at the oversight session, including integration of habitat restoration with other Delta Plan goals and the use of performance measures to track progress and guide adaptive management. This paper builds on the oversight session by providing additional analysis of needs, progress, and opportunities. It also incorporates ideas from the Delta Science Plan and the draft Delta Restoration Framework, which are described below, and proposes key areas of focus for the next two years.



### Efforts to build on

In these boxes you will find links to other related documents and issue papers.

- [ISB Habitat Restoration Review](#)
- [Delta Science Plan](#)
- [Draft Delta Restoration Framework](#)
- [Delta Ecosystem White Paper](#)

## Guidance from the Delta Reform Act, Delta Plan and Other Plans

The Delta Reform Act of 2009 (SBX7 1) directs the Delta Stewardship Council to ensure that the Delta Plan furthers ecosystem restoration by setting broad goals and objectives and promoting specific strategies. Water Code Sections 85022 and 85302 provide direction on the implementation of specific measures to promote the coequal goals and inherent objectives related to the Delta ecosystem restoration.

- Water Code Section 85022(d)(5) states, “Develop new or improved aquatic and terrestrial habitat and protect existing habitats to advance the goal of restoring and enhancing the Delta ecosystem.”
- Water Code Section 85302 (c) states:

“The Delta Plan shall include measures that promote all of the following characteristics of a healthy Delta ecosystem:

- (1) Viable populations of native resident and migratory species.
- (2) Functional corridors for migratory species.

- (3) Diverse and biologically appropriate habitats and ecosystem processes.
- (4) Reduced threats and stresses on the Delta ecosystem.
- (5) Conditions conducive to meeting or exceeding the goals in existing species recovery plans and state and federal goals with respect to doubling salmon populations.”

Additional statutory citations that provide the authority for the Delta Plan’s ecosystem restoration policies and recommendations can be found in Chapter 4 of the Delta Plan.

The Delta Plan calls for habitat restoration, yet acknowledges that state agencies, our partners, cannot and should not try to turn back the clock and recreate the historical Delta ecosystem, an expanse of roughly 400,000 acres of tidal marshes and other aquatic habitat linked to several hundred thousand acres of nontidal wetlands and riparian forest. However, we can restore specific areas to conditions that favor native species, taking into consideration changes that have occurred in the past, current land and water uses, and the future impact of climate change and other factors. Habitat protection, restoration and enhancement as envisioned in the Delta Plan are quite broad, encompassing a wide range of planning and implementation activities. These include coordination with the Delta counties’ habitat conservation planning for terrestrial species, and the enhancement of managed wetlands for waterfowl and other important species, as described in the *Suisun Marsh Habitat Management, Preservation and Restoration Plan* (Suisun Marsh Plan).

The Delta Plan’s regulations (23 CCR Section 5001-5016) define the goal of protecting, restoring and enhancing the Delta ecosystem restoration as “successfully establishing a resilient, functioning estuary and surrounding terrestrial landscape capable of supporting viable populations of native resident and migratory species with diverse and biologically appropriate habitats, functional corridors, and ecosystem processes.” Habitat restoration is a key element of ecosystem restoration, which also includes management of water operations to provide more natural functional flows, improvement of water quality, and better management of nonnative invasive species, fish hatcheries and commercial and sport fishing.

More specifically, Delta Plan Recommendation ER R2 calls for prioritizing habitat restoration within six areas, and provides an ecological goal for each area:

- **Yolo Bypass.** Enhance the ability of the Yolo Bypass to flood more frequently to provide more opportunities for migrating fish, especially Chinook salmon, to use this system as a migration corridor that is rich in cover and food.
- **Cache Slough Complex.** Create broad nontidal, freshwater, emergent-plant-dominated wetlands that grade into tidal fresh-water wetlands, and shallow subtidal and deep open-water habitats. Also, return a significant portion of the region to uplands with vernal pools and grasslands.
- **Cosumnes River–Mokelumne River confluence.** Allow these unregulated and minimally regulated rivers to flood over their banks during winter and spring frequently and regularly to create seasonal floodplains and riparian habitats that grade into tidal marsh and shallow subtidal habitats.
- **Lower San Joaquin River floodplain.** Reconnect the floodplain and restore more natural flows to stimulate food webs that support native species. Integrate habitat restoration with flood management actions, when feasible.



- **Suisun Marsh.** Restore significant portions of Suisun Marsh to brackish marsh with land-water interactions to support productive, complex food webs to which native species are adapted and to provide space to adapt to rising sea level action. Use information from adaptive management processes during the *Suisun Marsh Habitat Management, Preservation, and Restoration Plan*'s implementation to guide future habitat restoration projects and to inform future tidal marsh management.
- **Western Delta/Eastern Contra Costa County.** Restore tidal marsh and channel margin habitat at Dutch Slough and western islands to support food webs and provide habitat for native species.

The Delta Plan's performance measures focus on the initiation of pilot projects in six priority habitat restoration areas (Figure 1) and progress toward achieving the targets of 8,000 acres of tidal marsh and 17,000 to 20,000 acres of floodplain habitat. The Council will evaluate progress using these performance measures. Projects not only must be designed to achieve their own objectives, but they must also fit together into a mosaic of diverse habitats and existing land uses, link to functioning migratory corridors, and support reestablishing natural ecosystem processes.

#### Efforts to build on:

- [Delta Plan](#)
- [California Water Action Plan](#)

The Delta Plan policies most relevant to habitat restoration include the following:

- **G P1:** Use best available science and adaptive management.<sup>1</sup>
- **ER P2:** Restore habitats at appropriate elevations.
- **ER P5:** Avoid introductions of and habitat improvements for invasive nonnative species.
- **DP P2:** Site habitat restoration projects to avoid or reduce conflict with existing uses, such as agriculture and managed wetlands for waterfowl, where feasible.

Delta Plan Recommendations **DP R11** and **DP R14** encourage state agencies to provide opportunities for public access and recreation at habitat areas where feasible. Delta Plan Recommendation **DP R7** supports subsidence reversal and carbon sequestration, as well as the development of carbon markets, by growing native wetland plants on subsided islands. Such projects frequently provide habitat benefits for birds and other species.

<sup>1</sup> Adaptive management is defined in the Delta Reform Act as "a framework and flexible decision making process for ongoing knowledge acquisition, monitoring, and evaluation leading to continuous improvements in management planning and implementation of a project to achieve specified objectives" (Water Code Section 85052). The Delta Plan provides a description of the three broad phases of an adaptive management framework of *Plan, Do, and Evaluate and Respond* that should be used as a guideline when preparing adaptive management plans. These three phases are together tied in a feedback loop, so that future actions can be informed based on what has been previously learned. Although science-based planning cannot prevent all unintended consequences, adaptive management "increases the likelihood of success in obtaining goals in a manner that both economical and effective because it provides flexibility and feedback to manage natural resources in face of often considerable uncertainty," according to Appendix 1B of the Delta Plan regulations.



The California Water Action Plan, released by Governor Edmund G. Brown Jr. in 2014, endorses the Council's role in supporting the use of best available science and coordinating habitat restoration within the priority areas listed above. The Action Plan calls for achieving the coequal goals and beginning implementation of the Delta Plan. It states, "The administration directs all of its relevant agencies to fully participate in the Implementation Committee established by the Delta Stewardship Council and to work with the Delta Science Program, the Interagency Ecological Program, and others to implement the Delta Science Plan [Box 1] to enhance water and natural resource policy and management decisions." The Action Plan also endorses habitat restoration within the Delta Plan's priority areas. It states, "The Department of Water Resources, in consultation and coordination with the Department of Fish and Wildlife, the Delta Science Program, and the Delta Plan Implementation Committee will initiate projects to restore 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. These agencies will also coordinate with federal agency partners to ensure consistency with federal restoration efforts or requirements."

#### BOX 1. DELTA SCIENCE PLAN

The Delta Science Plan (2013) states that it "aims to achieve *One Delta, One Science*—an open Delta science community that works collaboratively to build a shared body of scientific knowledge with the capacity to adapt and inform future water and environmental decisions." Some of the Plan's key actions related to habitat restoration include:

- Action 3.1: Provide adaptive management liaisons;
- Action 3.2: Develop and use adaptive management frameworks;
- Action 3.3: Model future scenarios;
- Action 4.2.2: Build a comprehensive Delta monitoring strategy for an integrated program;
- Action 4.4.1: Develop a collaborative community modeling framework;
- Action 4.4.2: Develop, update, and maintain conceptual models; and
- Action 4.5.1: Foster integrative synthetic thinking throughout the Delta science and management communities.

The application of these actions to habitat restoration is described below.

Using the Delta Plan as its foundation, and the ISB's habitat review and Delta Science Plan as its guide, this issue paper reviews the challenges associated with restoring habitat while applying the best available science, respecting existing land uses and enhancing flood protection. Lessons learned from the current pilot stage of restoration are expected to inform more ambitious restoration efforts that will require even more extensive scientific analysis and greater coordination of habitat restoration with farmland preservation, conservation of existing habitat, and flood protection efforts.



## Effective Restoration Requires Balance and Good Judgment

**Restoration Projects Take Time, Yet Deadlines are Looming.** Restoration projects take time, yet the deadlines for meeting the state’s habitat restoration obligations are fast approaching, as discussed below. Time is needed to identify appropriate sites for restoration within a landscape context, negotiate the purchase of property, conduct baseline assessments, identify project objectives, and model linkages between proposed actions and objectives. Time is also needed to select the appropriate project design from a scientific perspective, evaluate potential impacts on neighbors and negotiate mitigation measures, obtain permits, construct the project, and monitor the results. Project managers though must strike a balance between extensive modeling of alternative scenarios to determine the optimal project design and moving forward with a “good-enough” design to use the project as an opportunity for learning. Adaptive management provides a framework for making decisions under uncertainty using the best available science rather than repeatedly delaying action until more information is available. Even in the San Francisco Bay Area, where tidal restoration has been ongoing for 40 years, the time from acquisition to completion of construction has ranged from six to 28 years. Though these restoration timeframes can be shortened, as discussed below, planning and permitting does take time. Agencies, responsible parties, and the public, therefore, need to exercise a combination of patience and pressure.

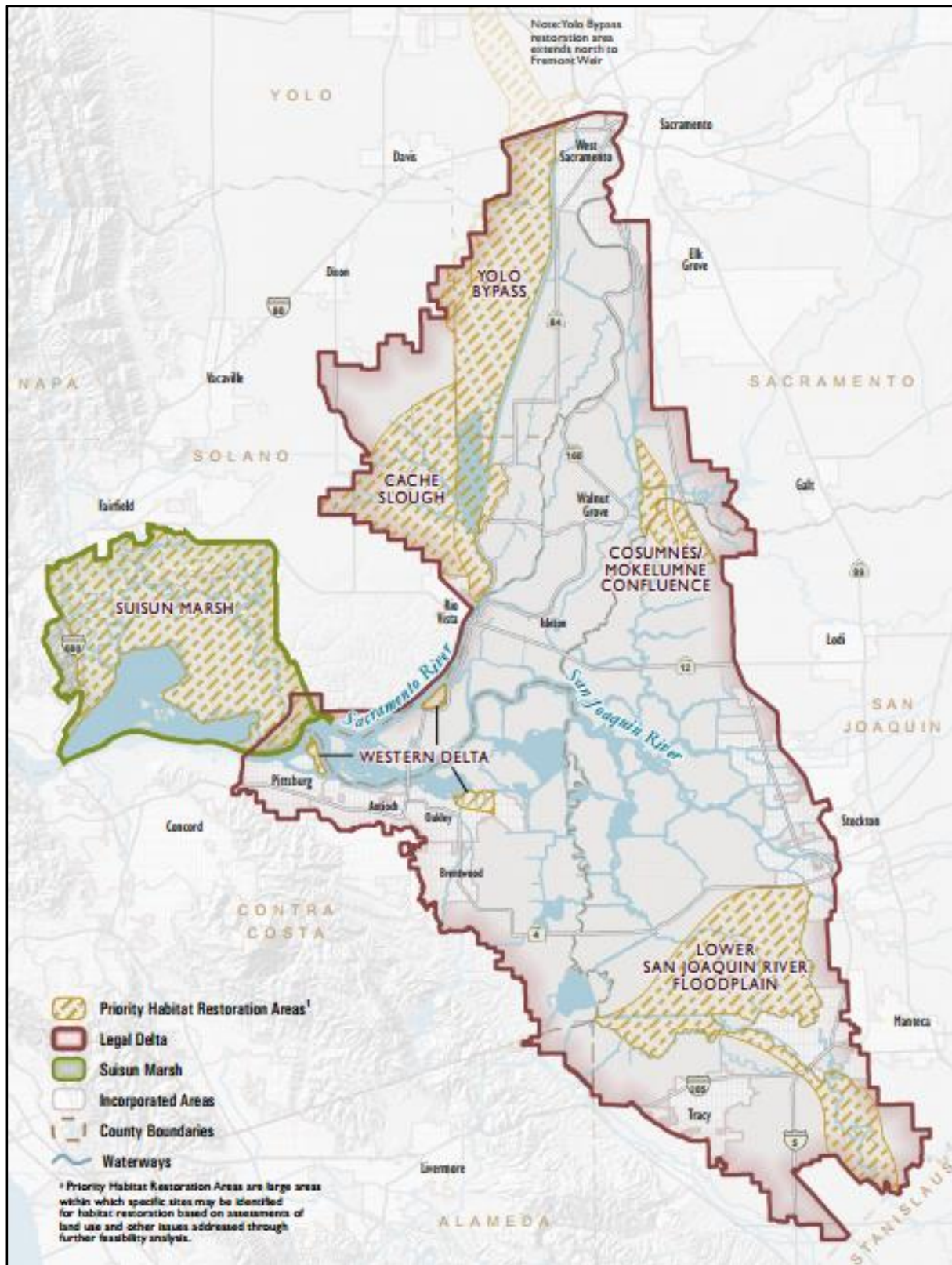
**Size Matters to Outcomes and Costs.** Project size is very important to restoration outcomes as well as to implementation costs. A few large efforts tend to yield far more ecological functions than several small and isolated efforts, and large projects usually result in greater ecosystem diversity. Providing flood protection and obtaining permits for each project is costly, so reducing these costs by aggregating projects is critical in a funding-limited world. Buying, holding and managing properties until an effective restoration unit is achieved for construction may yield the most beneficial ecological and fiscal results, yet adds time to the process. Thus a balance needs to be struck between short-term restoration obligations, and allowing time for ecologically and economically optimal landscape-scale restoration.

**Elevation and Location Matter.** As noted in the Delta Plan, land elevation is a primary constraint on opportunities to establish target ecological functions. Deeply subsided Delta islands offer few opportunities to restore the forms and functions of the historical ecosystem, although they may be managed as wetlands for waterfowl and wildlife-friendly agriculture and to sequester carbon for climate change mitigation. The Delta Plan designates six areas that represent the most promising locations for habitat restoration: the Yolo Bypass, Cache Slough, Suisun Marsh, Lower San Joaquin River Floodplain, Cosumnes-Mokelumne Confluence, and some select areas in the Western Delta (See Figure 1). These areas generally encompass the less-subsided flood basins, river corridors, and brackish tidal marshes on the Delta’s perimeter, as well as areas that could accommodate projected sea level rise associated with climate change, if restored to tidal action. Restoration of these areas is intended to create habitat and support food webs that can help recover native fish species, as well as support native wildlife and plants.

**Continuous Learning is Essential.** Effective restoration of tidal marsh and floodplain habitat requires science-based planning and design applied within an adaptive management framework. Site conditions, the location of levee breaches to allow tidal inundation, the amount of additional flow provided to a floodplain, and evolving regional conditions, including climate change, all drive whether any particular effort succeeds or fails to provide ecological benefits to native species. Appendix 1B of the Delta Plan regulations state, “Adaptive management allows for continuous learning resulting in management decisions based on what was learned, rather than adopting a management strategy and implementing it without regard for scientific feedback and monitoring.”



Figure 1. The Delta Plan’s Priority Habitat Restoration Areas



It is important to learn from both successes and failures of past Delta restoration, including those situations which were unplanned and unmanaged, and synthesize the information into evolving conceptual and quantitative models that can be used to guide the design of future projects. In instances where restoration was the result of unintended levee failures, the results have been mixed. Some areas – like Sherman Lake breached in the 1920s and Liberty Island breached in 1998 – have yielded relatively positive habitat outcomes. Others – like the Franks Tract breach in the 1930s – have experienced rampant colonization by invasive species such as Brazilian waterweed, water hyacinth, Asian clams, carp and largemouth bass that can harm native species like delta smelt or salmon or, at a minimum, do not provide the quality of food and shelter of a tidal marsh dominated by native plants or of a pelagic habitat dominated by native plankton production. Additionally, even when past restoration projects in the Delta were planned, many of those projects encountered major challenges, largely due to severe infestations of the restoration sites by invasive species. Thus, future restoration work must learn from and build upon past restoration projects through adaptive management if successful restoration of the Delta ecosystem is to be achieved.

Once a restoration project is constructed, the manager must allow time for the project to fulfill its targets while being watchful for failing efforts. Information gained through scientific analysis, synthesis, and evaluation of implemented actions must be communicated clearly and effectively, so that managers can respond and adapt appropriately. This communication needs to be ongoing since knowing when to adapt can be challenging. Constructed restoration projects develop along a trajectory, from their conditions the day the levee is breached to some future conditions more typical of a naturally occurring habitat. Monitoring will reveal that some ecosystem functions are present on the first day and remain for the long term, others may rise and fall over time, and yet others that may not develop for years, as in the case of areas that need time to build up elevations on subsided lands. Good communication that involves the public and policy makers, as well as managers, in the learning process will lead to more realistic expectations and fair evaluations of habitat restoration efforts.

**Restoration Acreage and Targets Must Be Tracked.** The Delta Plan's performance measures focus on the initiation of pilot projects in each of the priority habitat restoration areas designated by the Delta Plan and progress toward restoration acreage targets required by the biological opinions controlling long-term operations of the state and federal water projects. The biological opinions require restoration of at least 8,000 acres of intertidal and associated subtidal habitats in the Delta, including the Suisun Marsh (USFWS 2008), and enhancement of 17,000 to 20,000 acres of floodplain habitat (NMFS 2009) to be completed within 10 years, or by December 15, 2019.

The Fish Restoration Program Agreement (FRPA) commits the Department of Fish and Wildlife (DFW) to assist the Department of Water Resources (DWR) in implementing the habitat restoration requirements of the biological opinions. Restoration under FRPA is funded by DWR using funds generated by charges to the state water contractors. The State and Federal Contractors Water Agency (SFCWA) has an agreement with DWR to assist and cooperate in the acquisition and restoration of the required habitat. DWR, DFW, and SFCWA coordinate their restoration activities with the Delta Conservancy.





The Fisheries Agencies Strategy Team (FAST), which is comprised of technical representatives from DFW, the National Marine Fisheries Service (NOAA Fisheries), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Bureau of Reclamation (USBR), reviews projects and determines how many credits will be granted toward compliance with the biological opinions. It important to note that restoration acreage is not always the same as habitat credits granted by FAST. For example, when restoration



*The primary objective of the FRP is to implement the fish habitat restoration requirements and related actions of the Biological Opinions in the Delta, Suisun Marsh, and Yolo Bypass. (DWR photo).*

actions involve cost sharing, acreage credit will be prorated based upon DWR's State Water Project funding contribution towards the project and its associated monitoring and maintenance activities (DWR 2014). Credits will also depend on the relative value of the location to listed fish species, and on whether the project will create additional habitat acreage through restoration or enhance existing habitat.

Table 1 and Figure 2 provide an overview of projects being undertaken by DWR, DFW, SFCWA and others to meet the tidal and floodplain habitat restoration objectives of a range of programs, including but not limited to, the Fish Restoration Program (FRP). Among those projects being undertaken outside the FRPA framework, some are proposed by the Department of Fish and Wildlife using its own funds and lands, rather than resources provided by the water agencies. Others, such as projects led by the FloodSAFE Environment Stewardship and Statewide Resources Office (FESSRO), mitigate activities other than the operations of the state and federal water projects. In addition, two small projects recently were proposed by the U. S. Army Corps of Engineers (USACE). In the case of several projects in the planning stages, the future extent of tidal marsh within the site is still uncertain.

Habitat acreage restored to meet the requirements of the biological opinions will count toward the acreage targets of the proposed Bay Delta Conservation Plan (BDCP), which calls for restoration of 65,000 acres of tidal habitat in the Delta and Suisun Marsh. The BDCP is being developed as a 50-year habitat conservation plan and natural community conservation plan with the goals of restoring the Sacramento-San Joaquin Delta ecosystem and improving the reliability of California water supplies. The BDCP proposes building new water delivery infrastructure and operating the system to improve the ecological health of the Delta. The draft BDCP's tidal marsh restoration proposals are part of an overall program to restore or protect approximately 145,000 acres of habitat, including farmland that provides habitat for species of concern, such as Swainson's hawk and giant garter snake. While the habitat acreage goals of BDCP are far more ambitious than those required by the biological opinions, the BDCP's wider range of covered species and habitats potentially provides restoration practitioners and regulators with more flexibility in working to achieve a functioning landscape of diverse habitats.



**Table 1.** Planned and Potential Tidal and Non-Tidal Habitat Restoration Projects and their Acreage

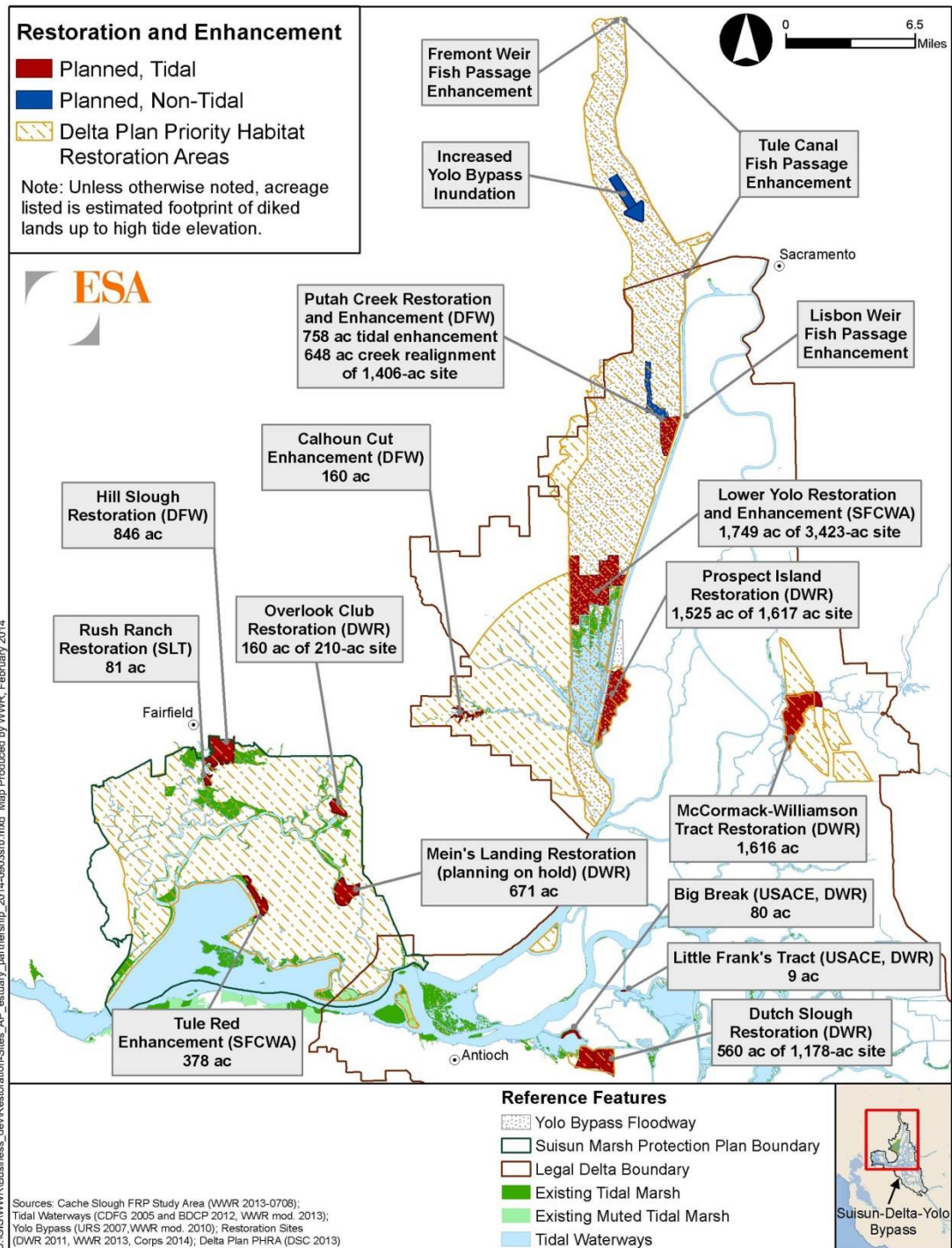
Project	Status	Implementing Entity	Site Acreage	Tidal Habitat Restoration and Enhancement Acreage
Lower Yolo Restoration and Enhancement	In Planning	SFCWA	3,423	1,749 (restoration and enhancement)
McCormack-Williamson Tract Restoration	In Planning	The Nature Conservancy/DWR (FESSRO)	1,595	≤1,595
Prospect Island Restoration	In Planning	DWR (FRP)	1,617	≤1,617
Putah Creek Restoration and Enhancement	In Planning	DFW	1,407	758 (enhancement)
Liberty Island Enhancement	In Planning	DFW	4,341	Modest enhancement potential
Calhoun Cut Enhancement	In Planning	DFW	160	160 (enhancement)
Little Holland Tract Enhancement	Under consideration for acquisition from USACE	None	1,457	Modest enhancement potential
Overlook Club Restoration	In Planning	DWR (FRP)	210	160
Hill Slough Restoration	In Planning	DFW	865	865
Tule Red Enhancement	In Planning	SFCWA	378	≤378 (enhancement)
Meins Landing Restoration	Planning on Hold	DWR (FESSRO)	657	≤657
Rush Ranch Restoration	In Planning	Solano Land Trust	81	81
Dutch Slough Restoration	In Planning	DWR (FESSRO)	1,178	560
Lisbon Weir Fish Passage	In Planning	DWR/USBR	NA	NA
Increased Yolo Bypass Inundation	In Planning	DWR/USBR	NA	NA
Fremont Weir Fish Passage	In Planning	DWR/USBR	NA	NA
Little Franks Tract	Proposed	USACE/DWR	9	9
Big Break	Proposed	USACE/DWR	80	80
<b>Total</b>			<b>17,458</b>	<b>≤ 8,669</b>

**Sources:** DWR, pers. comm., 2014. SFCWA, pers. comm., 2014. Stuart Siegel, pers. comm., 2014.

**Notes:** “Restoration” refers to the creation of new aquatic habitat, while “enhancement” refers to improvement of existing habitat.



Figure 2. Restoration and Enhancement Sites for Tidal and Non-Tidal Habitat



Source: DWR, pers. comm., 2014. State and Federal Contractors Water Agency, pers. comm., 2014. Stuart Siegel, pers. comm., 2014.

## Needs, Progress and Opportunities

Through consultation with the ISB, agencies and stakeholders, Council staff has identified several key elements that are needed to ensure efficient and effective habitat restoration in the Delta and has clarified the Council's role in addressing these needs. First, the Council promotes the use of best available science and adaptive management by helping project proponents ensure consistency of proposed restoration projects with Delta Plan regulations and implementing the Delta Science Plan. Second, the Council works with other agencies to track restoration progress by reporting on Delta Plan performance measures. Finally, the Council supports the work of other agencies to identify and promote best practices for stakeholder involvement, agricultural and land stewardship, land acquisition and meeting habitat regulatory requirements, and permit coordination. The Council, agencies and stakeholders have made progress in addressing these needs, but more work is necessary to meet the state's habitat restoration obligations and goals.

### ✓ Support for Use of Best Available Science and Adaptive Management

**Needs.** At the project level, the Delta Plan's regulations require documentation of the use of best available science, an adaptive management plan and documentation of access to adequate funds to implement the plan. At the program level, the ISB (2013) recommends considering multiple criteria in selecting restoration projects, linking restoration projects together in strategic networks, and using scenario modeling and risk analysis to assess uncertainties and the potential costs and benefits of restoration actions. In addition, the Delta Science Plan's Action 4.4.2 calls for the development of landscape scale conceptual models to guide habitat restoration, and Action 3.3 calls for modeling future scenarios and predicting system-wide responses using interdisciplinary teams. Project and program managers need a trusted source of scientific information and analysis to help them comply with these regulations and recommendations.

#### Efforts to Build On

- [DFW Ecosystem Restoration Program Conservation Strategy](#)
- [Delta Historical Ecology Study](#)
- [Delta Landscapes Project](#)
- [California Essential Landscape Connectivity Project](#)
- [Baylands Ecosystem Habitat Goals Report](#)

**Progress.** The use of best available science and adaptive management is being supported in four main ways. First, Council staff provides early consultation to project proponents to help them ensure consistency of their restoration projects with Delta Plan regulations, including Delta Plan Policy G P1, which requires documentation of the use of the best available science, an adaptive management plan, and documentation of adequate resources to implement the plan. The Council's Science Program has dedicated funding to hiring adaptive management liaisons to support early consultation, as well as facilitate integration of individual projects with other projects and programs across the Delta system, as described in Action 3.1 of the Delta Science Plan.

Second, the Delta scientific community has developed the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) scientific evaluation process. The DRERIP evaluation process was created in 2006 to provide a rational and transparent method for reviewing



**BOX 2. DELTA RESTORATION NETWORK**

The Delta Conservancy has convened the Delta Restoration Network (DRN) as a forum for information sharing and coordination among agencies and stakeholders. Participants include high-level representatives of state and federal resource agencies, water contractors, the Delta counties and reclamation districts, the Suisun Marsh Resource Conservation District, the Delta Protection Commission, and the Delta Stewardship Council, among others. The DRN's goal is to foster a coordinated and integrated ecosystem restoration and habitat management effort in the Delta and Suisun Marsh and to improve the broad understanding of ecosystem restoration activities in the Delta.

The following objectives were developed collaboratively by the DRN:

1. **Learning from Success and Failure** – The primary objective of the DRN is to be the structured and regular forum to ensure system wide learning through widespread dissemination of successful restoration efforts and efforts that fail to meet restoration objectives.
2. **Strategic Planning** – The DRN will facilitate in identifying successful restoration planning models and how those can lead to coordinated and integrated restoration. This will include assisting in developing landscape-scale conceptual models, regional hydrodynamic models, species and process conceptual models, criteria, and integrated performance measures. The DRN also will share information on modeling, design and permitting processes to realize efficient and effective design and review of projects. The DRN will provide a platform to share current science developments and ensure their effective incorporation into restoration efforts.
3. **Tracking** – The DRN will convene the appropriate staff and local interests to share information regarding the integration, and if need be further development of existing metrics and measures to allow for effective tracking of progress toward system wide objectives. The group will facilitate the exploration of existing and innovative approaches and tools for centralized tracking of restoration efforts. The group will also explore appropriate platforms that will allow for the synthesis of data at appropriate scales to feed into a coordinated Adaptive Management strategy.
4. **Land Management** – The DRN will convene appropriate staff and local interests to explore and share information regarding coordinated management strategies for agricultural lands and other key habitats, and best management practices for publically owned lands.
5. **Funding** – The DRN will coordinate efforts to identify and highlight funding needs for restoration planning, monitoring, tracking, synthesis and adaptive management, and land management in the near and long term.

**Source:** Delta Conservancy website. Downloaded on August 6, 2014. <http://deltaconservancy.ca.gov/delta-restoration-network-0>

ecosystem restoration actions. A suite of DRERIP conceptual models addressing ecosystem, species, and stressors was completed in 2008, and some of the models were published in the journal *San Francisco Estuary and Watershed Science* in 2012. However, the models need to be updated and more widely applied to restoration project design.

Third, building on its groundbreaking Delta Historical Ecology Study, the San Francisco Estuary Institute (SFEI) is developing landscape visions for the priority habitat restoration areas of the Delta through its Delta Landscapes Project. These landscape visions, when combined with stakeholder input about the



flood protection system and other practical considerations, can contribute to the goal of linking restoration projects together in strategic networks.

Finally, the Delta Conservancy has convened the Delta Restoration Network as a forum for information sharing and coordination among agencies and stakeholders. The Network has drafted a Delta Restoration Framework that provides a list of restoration guidance resources and proposes new approaches to providing scientific support.

**Opportunity.** The Delta Conservancy has worked with members of the Delta Restoration Network to reach consensus on a problem statement related to the need for adaptive management. The group has determined that Delta restoration planning currently lacks:

- A broadly accepted landscape-scale restoration vision for the six recognized restoration opportunity areas supported by conceptual and mechanistic models
- Sufficient early engagement of the Delta community
- Modeling, data inventory, and synthesis tools to support analyses, information sharing, and adaptive management
- A standing expert restoration design team to
  - Support timely property-scale restoration project planning
  - Develop long-term restoration visions for restoration opportunity areas
  - Consider the Delta-wide effects of restoration projects.

The Delta Conservancy is currently seeking funding to establish a Delta Restoration Hub to address these needs. The Hub would incorporate the DRERIP evaluation process and the work of the Delta Landscapes Project, as well as EcoAtlas, described below.

### ✓ **Regular Reporting on Restoration Progress**

**Need.** The ISB (2013) has noted the need for “a comprehensive map and accompanying database to show where habitat restoration activities are being conducted or planned in the Delta, accompanied by essential information on these projects.” The Council also needs such a tracking tool in order to comply with the Delta Reform Act’s requirement to report progress toward Delta Plan implementation based on performance measures, including acres of restored habitat.

#### **Efforts to Build On**

- [Fish Restoration Program Annual Report](#)
- [California Estuaries Portal](#)
- [EcoAtlas](#)

**Progress.** Under the Fish Restoration Program Agreement, DWR, in coordination with DFW, is to prepare an annual report on programs and projects being implemented under the agreement. DWR released its first report, covering 2010-2013, which reported on the acreage associated with four restoration projects that are planned for compliance with the biological opinions.

In 2014, the Council will begin its reporting on progress towards the Delta Plan’s performance measures. Ten pilot performance measures, including one related to habitat, will be reported on by the end of 2014.



Council staff is coordinating reporting of ecological performance measures with the San Francisco Estuary Partnership’s development of ecological indicators for the *State of the Estuary 2015* report in order to provide a consistent message regarding habitat restoration progress to the public and decision-makers. The ecological indicators work will also be coordinated with the new California Estuaries Portal<sup>2</sup>, a website that uses interactive maps and monitoring data to answer the question, “How healthy is the San Francisco Estuary?” The Portal provides overviews for the general public on topics such as water quality, the food web, and habitats, and each overview contains links to websites with more detailed data and analysis.

EcoAtlas, a statewide database managed by SFEI, is an existing tool that is expected to address the ISB’s recommendation to create “a comprehensive map and accompanying database” for habitat restoration projects in the Delta. EcoAtlas provides restoration habitat acreage totals by habitat type, as well as publicly accessible information about the project stage (planning, ongoing, or complete) and contains links to related documents, including monitoring reports. The Delta Conservancy, in partnership with the Central Valley and San Francisco Bay Joint Ventures, received a grant in 2013 to expand the coverage of EcoAtlas to the Delta. They are working with DWR to adopt and improve on an existing restoration projects database. Maintaining EcoAtlas for the Delta will require a source of ongoing financial support.

**Opportunities.** In the future, data collected using the protocols developed by the IEP Tidal Wetland Monitoring Project Work Team, described below, could contribute to tracking the Delta Plan’s performance measure related to trends in occurrence of native species in restored habitats. DWR, DFW, the Delta Science Program and federal agencies could build upon this effort to develop a more comprehensive reporting program that shares results from the monitoring and assessment of the ecosystem restoration actions conducted under FRP and BDCP and other programs, as called for in Action 4.2.2 of the Delta Science Plan. The metrics developed for the Delta Landscapes Project, described above, could become the basis of performance measures in future updates of the Delta Plan.

### ✓ Stakeholder Involvement and Interagency Coordination

**Need.** Restoration plans and projects in the Delta have often faced opposition from local communities because they did not address stakeholder concerns. The ISB has recommended that “considering and assessing probable impacts of restoration and restoration activities on stakeholders should be a component of plans and design of projects. Those who are affected by restoration (e.g., landowners) should be in continuing communication with those who are implementing and overseeing the restoration.” Stakeholders’ capacity for

#### Efforts to Build On

- [Suisun Marsh Habitat Management, Preservation, and Restoration Plan](#)
- [Yolo Bypass Fishery Enhancement Planning Team](#)

<sup>2</sup> The California Estuaries Portal was produced by the California Water Quality Monitoring Council, formed by a cooperative agreement between the California Environmental Protection Agency and the Natural Resources Agency. The portal resulted from the collaboration of 16 state, federal and local agencies and non-governmental organizations, with decisions vetted by the Interagency Ecological Program, development of the website by 34 North, Inc., and funding provided by the State and Federal Contractors Water Agency.



involvement is hampered by the need to participate in many simultaneous planning processes for habitat restoration, flood protection, and economic sustainability in the Delta that are not well coordinated among the agencies developing them.

**Progress.** At the project level, Delta Plan Policy DP P2 requires reducing conflicts with existing and planned land uses where feasible as part of restoration project planning. Council staff advises project proponents on how to apply this policy during early consultation on projects that are covered actions under the Delta Plan. This policy requires consideration of comments from local agencies and the Delta Protection Commission, agencies that often serve as conduits for landowner concerns. Although they were initiated before the Delta Plan was adopted, the Dutch Slough and McCormack Williamson Tract projects provide examples of involving stakeholders in developing habitat restoration plans that meet flood management and recreation objectives. At the program level, the Suisun Marsh Plan provides an example of a plan designed to achieve tidal marsh restoration in the context of meeting other stakeholder needs, including the preservation and enhancement of managed wetlands to support waterfowl hunting.

The Yolo Bypass Fishery Enhancement Planning Team, a BDCP working group, has created an opportunity for agency staff and local stakeholders in the Yolo Bypass to jointly investigate floodplain restoration alternatives in terms of their impacts on agriculture, waterfowl and water quality, as well as their benefits to fisheries and flood protection. The USBR and DWR are also making use of this team to analyze the same issues as part of the Salmonid Habitat Restoration and Fish



*The Yolo Bypass Wildlife Area balances flood control, agriculture, management of diverse wetland ecosystems, and public uses. (Chris Austin photo).*

Passage Project, required by the 2009NMFS biological opinion. The environmental analysis for the project will rely on a set of linked hydrologic, biological, and economic models to examine tradeoffs associated with different project designs. Yolo County took an active role in framing the discussion of tradeoffs by directing the preparation of several studies, including an agricultural and economic impact analysis (Howitt et al. 2013), which was jointly funded by Yolo County, SFCWA, and the Conaway Preservation Group; and a drainage and water infrastructure improvement study (Bowles et al. 2014), which was funded by the Conaway Preservation Group. In addition, Yolo County worked with Ducks Unlimited and the Yolo Basin Foundation on a waterfowl impacts analysis and commissioned a report on a proposed Yolo County Agricultural Economic Development Fund. All of the studies were presented and discussed at Yolo Bypass Fishery Enhancement Planning Team meetings.

**Opportunities.** Two major opportunities for improving stakeholder involvement, as well as interagency coordination, have recently presented themselves. First, based on discussions with representatives of the Central Valley Flood Protection Board, DWR, and the Natural Resources Agency, Council staff has





learned that support is building for convening a Yolo Bypass interagency and stakeholder group to integrate habitat restoration, flood protection, water supply, recreation, and local sustainability objectives from multiple plans and proposals into a single work plan with funding and a timeline for implementation. This initiative would give stakeholders a single plan to focus on instead of dividing their limited time and resources among many uncoordinated plans. The Yolo Bypass effort presents a high profile opportunity for demonstrating effective use of stakeholder input in developing a restoration program that achieves its ecological goals and minimizes adverse economic impacts while maintaining flood protection benefits. If this multi-objective effort proves successful, it may provide a model for developing restoration strategies for the Delta's other restoration areas.

Second, in May and June 2014, the Delta Conservancy convened the Land Management Working Group, which is comprised of various agency representatives. This group discussed issues related to land acquisition, long-term property management, operations and management, and funding. Following these meetings, the Delta Dialogues<sup>3</sup> group also began a discussion regarding long-term management issues. The Delta Dialogues stakeholders expressed interest in continuing to meet to address three issues:

1. An inventory of public lands and lands purchased using public funds for habitat restoration.
2. A map of overlapping habitat areas associated with FRP, BDCP, county habitat conservation plan and natural community conservation plans, levee mitigation and enhancement, and the Central Valley Flood Protection Plan Conservation Strategy.
3. Good neighbor policies, including funding for long-term operations and maintenance of habitat lands to avoid adverse effects on neighbors.

The Conservancy has committed to continuing to facilitate this effort at both the working group and Delta Dialogues levels to address the larger land management issues and stakeholder concerns.

### ✓ **Agricultural and Land Stewardship Strategies**

**Need.** The Delta Plan regulations require siting habitat restoration projects to avoid or reduce conflict with existing uses, such as agriculture, where feasible. Tidal restoration can conflict with agriculture at the project or landscape scale. At the project scale, potential conflicts associated with tidal restoration include loss of prime agricultural land, seepage onto adjacent properties, increased presence of endangered species or pests, and increased flood risk resulting from erosion of levees. At the landscape level, large-scale habitat restoration could result in negative impacts to the agricultural economy and reductions in local

#### **Efforts to Build On**

- [Agricultural and Land Stewardship Workgroup](#)
- [California Roundtable on Agriculture and the Environment](#)
- [Guidelines for Creating Effective Ecosystem Services Incentive Programs and Policy](#)

<sup>3</sup> Delta Dialogues, hosted by the Delta Conservancy since 2012, brings together a representative set of Delta stakeholders to try to listen and understand each other better. Stakeholders in the Delta Dialogues include people representing Delta farmers and residents, recreational interests, Delta reclamation districts, Delta county local governments, water agencies, environmental organizations, and state and federal governments.



government tax revenues and reclamation district assessments. In addition, where agricultural lands currently provide important habitat, such as Swainson’s hawk habitat, significant conversion of farmland to tidal marsh could adversely affect the species dependent on the habitat type that is lost, particularly if that habitat type is limited. There is a need for strategies to address the impacts of habitat restoration on farmland at multiple scales.

**Progress.** Since 2012, DWR has been convening an interagency Agricultural and Land Stewardship Workgroup and consulting with agricultural and local interests to develop a set of strategies for use in effectively addressing the impacts of habitat restoration on farmland. Council staff has been participating in the group to ensure that the strategies developed are consistent with Delta Plan. Many of these strategies are reported in Appendix 14B (Delta Agricultural Stewardship Strategies) of the draft BDCP EIR/EIS, where they are proposed as an optional alternative to the conventional strategy for mitigating environmental effects on agricultural resources.

**Opportunity.** DWR, the Delta Protection Commission and the Delta Conservancy could draft a list of voluntary approaches to avoiding, minimizing and mitigating impacts of restoration on farmland, building upon the work of the Agricultural and Land Stewardship Workgroup. The list could be vetted with agricultural and resource agencies and stakeholders, including Delta local governments and community representatives. Elements related to restoration project implementation, such as good neighbor policies, compensation for crop losses, payments for ecosystem services, and offers to involve landowners in transitioning their land from agriculture to tidal or floodplain habitat could then be compiled and distributed to agencies and other organizations engaged in habitat restoration for their consideration.

#### ✓ **Best Practices: Land Acquisition and Meeting Habitat Regulatory Requirements**

**Need.** State agency staff has expressed concern about the difficulty of acquiring land to meet the current restoration acreage targets, as well as future targets related to the BDCP. The FRP agencies are committed to acquiring restoration lands from willing sellers to the greatest extent possible. State acquisition guidelines require offers to be based on fair market value appraisals. Current appraisal practices do not recognize habitat restoration as the highest and best use of land because there is no established market for it, i.e., there are very few comparable sales. Moreover, the Legislative Analyst’s Office has warned that the cost of the BDCP’s restoration plans could increase significantly due to rising land prices sparked by the BDCP’s demand for restoration sites. The rejection of recent state offers to purchase land at its appraised value has revealed a need for either developing alternative approaches to land acquisition or meeting habitat regulatory requirements in other ways.

##### Efforts to Build On

- [Wildlife Conservation Board Land Acquisition Program](#)
- [State Coastal Conservancy Wetland Restoration Progress](#)
- [California Council of Land Trusts](#)

**Progress.** The state has a range of options for meeting habitat regulatory requirements, from purchasing land and restoring habitat on that land, to purchasing credits for restored habitat from a mitigation bank. In between these two extremes are other options, including buying land and contracting with a nonprofit



organization, resource conservation district, or private company to implement restoration and/or manage the land. FESSRO has developed an innovative approach to paying for levee repair mitigation requirements through the purchase of bulk habitat mitigation credits using a request for proposals process. This allows FESSRO to purchase mitigation credits through the state contracting process instead of acquiring land for habitat restoration. This example shows the state's ability to purchase restored habitat from a commercial provider, although it is costly.

**Opportunities.** The staffs of various agencies, special districts, and nonprofit organizations in California have developed expertise in acquiring land and easements for habitat protection and restoration. They have specialized skills in evaluating the habitat value of large areas and specific properties, building relationships with landowners, conducting appraisals, negotiating transactions, and assembling funding from multiple sources when necessary. Some have specialized skills in acquiring land for wetland restoration projects. For example, DFW develops Conceptual Area Protection Plans that evaluate the biological values within an area so that acquisitions by the Wildlife Conservation Board, which serves as the DFW's land agent, need not undergo biological assessments on a property-by-property basis. The state could tap into this established expertise to identify and apply best practices in habitat land acquisition.

#### ✓ **Permit Coordination to Achieve Science-Based Monitoring and Adaptive Management**

**Need.** Habitat restoration projects require permits from multiple regulatory agencies, each of which may impose its own permit conditions, including monitoring requirements. There is need for coordination among regulatory agency staff and restoration program managers to develop monitoring requirements and adaptive management plans, as well as project designs, based on a shared understanding of the scientific questions associated with restoration project goals. To address this need, the Delta Science Plan's Action 4.2.2 calls for developing "a comprehensive Delta monitoring strategy for an integrated program" and Action 4.5.1 calls for "foster[ing] integrative synthetic throughout the Delta science and management communities."

**Progress.** Coordination of regulatory and scientific input on project design, monitoring and adaptive management plans is moving forward on two main fronts. First, an Adaptive Management Advisory Team (AMAT) for the Suisun Marsh was formed in 2013 and began meeting in 2014. The AMAT's mission is to support state and federal agencies in using adaptive management, including use of best available science, to achieve the objectives of the *Suisun Marsh Habitat Management, Preservation, and Restoration Plan* (Suisun Marsh Plan), which was adopted in May 2014. The AMAT's primary role is to provide restoration project design review and advise project proponents in the development of their monitoring and adaptive management plans. The AMAT also provides a venue for agency staff to provide input on regulatory compliance issues, including incorporation of the best management practices in the Suisun Marsh Plan's environmental impact statement/report and associated biological opinions. The AMAT review process is intended to lead to science-based monitoring requirements in permit conditions, as well as improved project design.

#### **Effort to Build On**

- [Wetlands and Riparian Area Protection Policy](#)





*The Blacklock Tidal Habitat Restoration is a passive restoration project that created 70 acres of tidal wetlands in Suisun Marsh by beaching a levee along Little Honker Bay in 2006. This project has been completed and a 10-year monitoring program is ongoing. (DWR photo).*

Second, DFW launched a Tidal Wetland Monitoring Project Work Team under the Interagency Ecology Program (IEP) in June 2014. The work team intends to refine conceptual models for ecological function of tidal wetlands and develop protocols for monitoring fish and the plants and animals that form the food web for fish. These monitoring protocols will be used by restoration project managers in their adaptive management plans. Data collected using the protocols would contribute to tracking trends in occurrence of native species in restored habitats, an important indicator of project effectiveness.

**Opportunities.** Joint work by DFW and State Water Resources Control Board to develop a Wetland and Riparian Area Protection Policy is laying the groundwork for coordinated permit conditions, but it will take time to bear fruit. In the interim, the Delta Science Plan, in Action 4.2.2 calls for working toward an integrated Delta monitoring program with a shared purpose to systematically inform adaptive management. The Delta Science Plan's Action 4.5.1, calls for the Delta Science Program to "provide forums and collaborative initiatives...and focuses science synthesis as training and information exchange opportunities for science and engineering staff within regulatory and management agencies." It is expected that these opportunities will allow staff to become accustomed to considering the larger context beyond the statutory boundaries of their respective agencies, enabling them to develop permit conditions based on a shared understanding of project-level and landscape scale restoration goals.

## Areas of Focus for the Next Two Years

Based on the Delta Plan, the ISB review, the Delta Science Plan, and input from agencies and stakeholders, Council staff proposes the following areas of focus for the next two years.

### **Council Staff Actions**

1. Continue to provide early consultation on habitat restoration projects that are covered actions under the Delta Plan in order to advise project proponents on using best available science and adaptive management and avoiding or reducing conflicts with existing uses, where feasible.
2. Report on habitat performance measures by December 2014 and again in December 2015.
3. Work with others to complete at least one of the landscape-scale conceptual models and associated landscape habitat metrics for the priority habitat restoration areas.
4. Convene scientific experts to provide independent review of restoration project designs and adaptive management plans within a landscape context.
5. Provide science support to the Fishery Agency Strategy Team and Suisun Marsh Plan's Adaptive Management Advisory Team in coordinating regulatory and scientific input on project design and adaptive management plans.
6. Engage Delta Plan Interagency Implementation Committee members in discussions of challenges and potential solutions related to land acquisition and permit coordination.

### **Actions of Other Agencies and Stakeholders**

1. Complete the expansion of EcoAtlas to the Delta. (SFEI in partnership with the Delta Conservancy, Central Valley Joint Venture and San Francisco Bay Joint Venture)
2. Complete the IEP Tidal Wetland Monitoring Protocols and include them in the adaptive management plans for FRP projects. (IEP Tidal Wetland Monitoring Project Work Team)
3. Apply Agricultural and Land Stewardship Strategies, as appropriate, to habitat restoration projects. (DWR)
4. Address top three Delta community stakeholder concerns regarding land acquisition and management, as discussed above. (Land Management Working Group and Delta stakeholders facilitated by the Delta Conservancy)

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