

2015 Annual Report



DELTA STEWARDSHIP COUNCIL
A California State Agency

From the Executive Officer ...

Managing water supply, ecosystem improvements and quality-of-life issues in the delta formed by the two largest rivers in California is both complex and contentious, made even more difficult this year by California's ongoing and historic drought.

Planning and science aren't typically topics that enthral, let alone make page-turning annual reports of state agencies. But in an age of climate uncertainty, management of the Delta's many assets, flood risk, declining species, and highly variable water supplies – all provide a backdrop upon which the state is poised to spend billions of dollars on projects that affect the Delta and the state's water supplies – effective, science-based collaborative planning could not be more essential now in order to end up where we intend to go.

Those who work on Delta issues are often frustrated by the incremental pace of progress, understandably so as the politically charged nature of water and land use matters increases the time needed for planning and permitting, and draws scrutiny and interest from a wide range of interests even on proposals that appear routine or insignificant. However, 2015 offered a lot of reason for hope. Coming on the heels of strong voter support for a multi-billion-dollar water bond, significant time and monetary investments were redoubled by scientists and managers to do the necessary planning and to advance the science to create a foundation upon which more effective flood, ecosystem, and water projects in the state can be built. Overall this approach will increase the efficacy of the state's investments, and improve the long-term outcomes for water users, Delta residents, and fish and wildlife.

The Delta Stewardship Council was created to further the State's coequal goals of statewide water supply reliability and an improved Delta ecosystem in a manner that protects the unique values of the Delta and is founded on best available science. The Council's Delta Plan lays out a strategy of coordinated and integrated

actions to further the coequal goals, backed by regulatory authority and a commitment to transparency and accountability that will result in better management of the Delta and stewardship of its multiple resources.



Jessica Pearson, Executive Officer

This year, despite a focus on the drought's punishing effects, behind the scenes agencies were setting the stage for significant progress in the years ahead, guided by the Council's Delta Plan and Governor Brown's California Water Action Plan.

In the following pages you will learn about the year's accomplishments:

- How the Council is helping to better integrate science into daily decision-making*
- How the Delta Plan's goal of a more reliable water supply is being advanced by the State Water Resources Control Board and other agencies as they help Californians conserve water and diversify local water supplies*
- How fish and wildlife agencies, with the assistance of the Delta Science Program, are working to protect and restore the Delta ecosystem as they try to sustain fish species through careful management of the very limited water supplies available in the system.*
- How the Council's development of the Delta Levees Investment Strategy will better prioritize state spending (\$700 million allocated since the 1970s) to reduce flood risks and better integrate Delta levees with other Delta actions and the statewide system of flood control.*



Delta Stewardship Council: Setting the course

- *Implementation committee spurs science investigations, ecosystem restoration*
- *Council adopts principles to integrate conveyance, storage and operations*
- *Early consultations on projects help ensure conformity with Delta Plan*
- *Performance measures track progress and provide accountability*

The continuing drought touched the lives of all Californians in 2015, providing special emphasis for key policies and recommendations in the Council's long-term plan to achieve the State's coequal goals of improving water supply reliability and restoring and enhancing the Delta's ecosystem, while protecting the Delta's unique sense of place.

While many agencies work on Delta-related projects, planning, and activity, before this decade no single entity was charged with overall long-term planning to achieve the State's goals for the Delta. The Council was established in 2010 to advance the coequal goals and does so through implementation of a comprehensive management plan that includes 14 regulations and 73 recommendations. This Delta Plan guides the activities of more than 225 state, local, regional and federal agencies that have responsibility for some aspect of the Delta, providing a cohesive strategy – and where necessary the regulatory framework – that coordinates their actions to further the coequal goals.

Implementing the Delta Plan occurs through the Council's leadership of the Delta Plan Interagency Implementation Committee (DPIIC), ongoing focused staff-to-staff agency coordination, development of science to support the Delta Plan, and use of the Council's statutory authority over "covered actions" through which plans, programs and/or projects must demonstrate consistency with the Delta Plan. The latter includes staff-level discussions with project proponents – "early consultations" – that assist them in determining their required consistency with the Delta Plan's 14 regulatory policies.

Improving scientific and operational decision-making

Meeting through staff-level workgroups and reporting out at semi-annual DPIIC meetings, the leaders of 17 federal and State agencies worked with the Council to identify several priority science investigations to be implemented over the next two years. This unique and critically important accomplishment has generated greater momentum for the collective prioritization of science needs and

The Council's role is to provide the framework, coordinate where necessary, and connect the dots in a cohesive strategy for the future

underscores the importance of the Delta Science Program as an objective facilitator of collaborative activity in the region. The investigations include:

- Assessing drought-related impacts on the Delta
- Evaluating the effectiveness and implications of habitat restoration actions
- Enhanced management of estuarine and migratory species

The outcomes of these investigations will reduce scientific disagreement, provide new data and information to support effective adaptive management, inform ecosystem restoration projects, and improve the way water is moved across the Delta.

“To the extent that we can invest in science and learn how better to use water efficiently for the benefit of fish, and still improve our water supply reliability, that’s my big hope here”

*Mark Cowin, Director,
California Department of
Water Resources*

To further advance the collaborative science activity in the Delta envisioned by the Delta Science Plan and its “One Delta, One Science” initiative, the Council is investing \$1.5 million in research through fellowships jointly sponsored with the California Sea Grant Program and administered by Scripps Institution of Oceanography at the University of California, San Diego. In addition, DPIIC’s habitat-related high-impact science priorities were incorporated into a \$7 million grant solicitation from the Department of Fish & Wildlife (DFW) for implementation beginning in 2016.

Providing these missing links of scientific understanding is a primary function of the Delta Science Program and will ensure that projects such as large-scale ecosystem restoration are based on state-of-the-art science and provide the critical support that agencies require during the decision-making process – all with the intention of improving the effectiveness of projects, and accordingly, improving outcomes for the Delta ecosystem.

Council focuses on issues and actions through hearings and reports

The Council uses its own monthly meetings to explore critical issues in relation to the Delta Plan, focusing attention on areas that need additional work, highlighting areas of progress, and making recommendations for future actions, all guided by the best available science. Highlights this year include:

- **Integrating conveyance, storage and operations**

One of the Council’s primary focuses this year was on integrating several major long-term water supply reliability projects. Ongoing discussions since 2006 had proposed linking improvements in the way the State and federal water projects move water across the Delta with enhancements to the ecosystem through a Natural Community Conservation Plan (NCCP). In the face of scientific uncertainties including a changing climate, however, what was known as the Bay-Delta Conservation Plan (BDCP) was modified in the spring into two separate proposals – one for conveyance and another for ecosystem restoration.

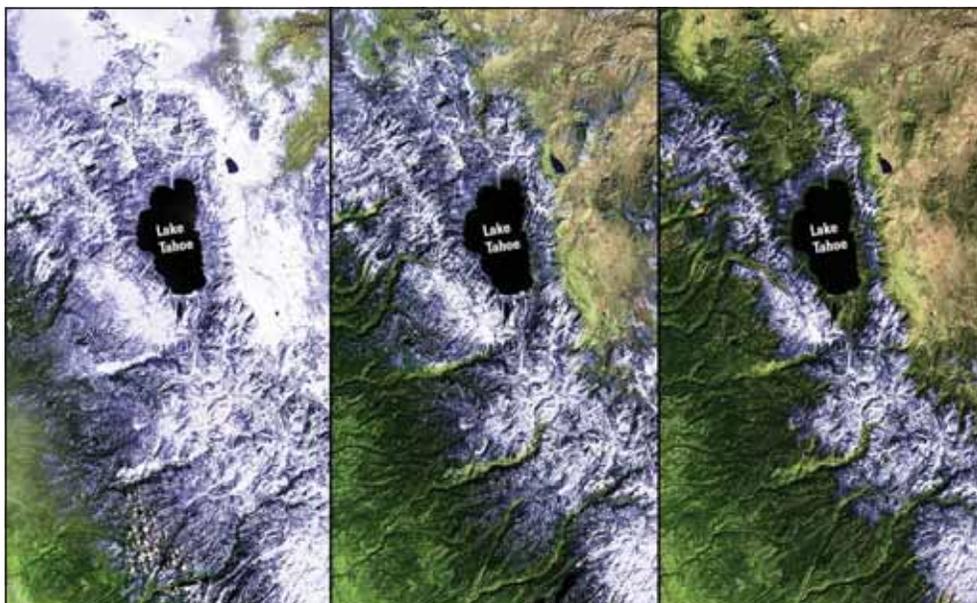
The Delta Independent Science Board (Delta ISB) and the Council both reviewed and provided valuable feedback to improve environmental documentation for the conveyance facilities in the revised BDCP. The Council noted that:

- Key operational components were not yet incorporated into the project description
- Measures proposed to mitigate water quality impacts on other Delta users needed to be less cumbersome
- Cumulative impacts on the Delta were not fully evaluated
- Proposed mitigation needed to be consistent with the Delta Plan and offer additional protections for Delta communities

Council staff also worked closely with the California Water Commission as it developed guidelines for grants to increase water storage with \$2.7 billion in funding from Proposition 1, the water bond approved by voters in 2014. To align with the Delta Plan, the guidelines include ways to define and quantify ecosystem benefits, and a requirement that applicants provide assurance of funding sources and financial commitment to implement monitoring and report on how well the projects meet performance objectives consistent with recommendations in the Delta Plan.



Council meetings are webcast to a live audience of an average 300 viewers across California. Archived webcasts are available on the Council's website and on YouTube.



(NASA photos)

These satellite photos taken in February of drought years 2012, 2013 and 2014, show the dramatic reduction in Sierra snowpack that scientists say will occur more frequently as a result of climate change, permanently reducing the state's natural storage reservoir.

The change in approach to the BDCP means it no longer meets the Delta Reform Act requirements for automatic inclusion in the Council's Delta Plan. As a result, the Council held a series of discussions over the summer and fall on new principles that address how improvements to conveyance and increases in storage capacity should be considered as interdependent parts of a system and be operated in a way that maximizes benefits for each of the coequal goals.

Adopted in November, those principles provide a starting place for prospective amendment of the Delta Plan to guide the nearly \$20 billion proposed to be invested over the next decade in conveyance and/or storage projects affecting the Delta.

*Delta Plan principles
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ecosystem*

- **Facilitating and improving the transparency of water transfers**

In developing the Delta Plan, the Council recognized the contribution of water transfers to a reliable water supply and the need to make the regulatory process for transfers thorough but less protracted. Responsive to recommendations in the Delta Plan, the two State agencies most involved in water transfers – the State Water Resources Control Board (SWRCB) and the Department of Water Resources (DWR) – put into place an improved and more efficient review process that allows the public to clearly understand how much water is being proposed to move from where to whom and when.

After receiving reports about the agencies' improved oversight of transfers and reviewing the best available science related to the ecological effects of transfers, the Council recommended updating the Plan to make permanent the temporary exclusion of single-year transfers from its regulatory process. The Council concluded that, under the current operational rules of the state and federal water projects and under existing regulatory oversight, single-year water transfers that are conveyed through the Delta do not have a significant impact on the coequal goals, and should not be regulated as covered actions under the Delta Reform Act.

Making inter-governmental planning and coordination a priority

Because plans, projects and/or programs that are in, or partly in the Delta must be consistent with the Delta Plan's 14 regulations, much of the work implementing the Delta Plan is done by engaging in "early consultations". In these consultations for projects that occur in, or affect, the Delta, Council staff advises project proponents on aspects such as using best available science, developing an adaptive management plan, and reducing potential conflict with existing land uses.

These activities improve the projects and help ensure – whether they are covered actions or not – that they are consistent with the Delta Plan and thereby further the achievement of the coequal goals, as the Delta Reform Act requires.

Council staff engaged in more than 15 early consultations over the past year and formally commented on 29 projects.

Measuring performance, providing accountability

Performance measures allow the Council and others to track how effectively the goals and strategies in the Delta Plan are being achieved and how conditions in the Delta are changing through its implementation. Further, performance measures enable the Council to adaptively manage the Delta Plan by identifying those policies or recommendations that require attention or revisions to be more effective and timely. The measures provide an unprecedented assessment of real-time progress in the Delta, and give the Delta Plan a unique level of accountability.

The Council’s Delta Plan includes 160 performance measures in three categories: Administrative performance measures (118) are used to track various actions recommended by the Delta Plan. Output performance measures (21) are used to track results of administrative action (what happened as a result of the project or program?). Finally, outcome measures (21) are included for tracking the impacts of those actions (did the project or program achieve the desired results?).

Staff monitors the progress of the 118 actions tracked by the Delta Plan’s administrative measures. Of these, 100 have either been completed or are in the process of being completed. Over the past year, considerable time and effort has gone into assessing the Plan’s 21 “output” and 21 “outcome” measures, reviewing each one individually with technical experts and stakeholders to assess whether the metrics accurately address the recommendations they were designed to measure and whether data exist – or could exist – to be measureable. This process, with a review of the methodology by the Delta ISB, is expected to be completed by Spring 2016. Throughout this report, these performance measures are used to supplement our report on Delta activities and conditions.



This chart provides a snapshot of progress to date for each Delta Plan goal. As shown, there has been some progress toward achieving water supply reliability, ecosystem restoration and water quality goals. Progress is stronger in the areas of risk reduction and protecting/enhancing the Delta as an evolving place.

Specific snapshots and further details are included in each section of this report.



(DWR photo)

Lake Oroville, October 2015

Over the past year, the Water Commission worked with the Council and other agencies and stakeholders to establish guidelines for the \$2.7 billion Water Storage Investment Program, which will fund the public benefits of future storage projects

Drought focuses attention on conservation and supply diversity

- *Groundwork completed for decisions on additional storage and Delta conveyance*
- *Californians respond to conservation—will habits stick?*
- *Local and regional agencies diversify supplies*

Historically, the Sierra Nevada acts as a natural storage reservoir, with the winter snowfall slowly melting in the spring and summer to provide cold water runoff for fish, power for the state’s hydroelectric system, and replenishment for the state’s reservoirs. This year, the Sierra snowpack’s water content measured just five percent of normal, obliterating the previous record low of 25 percent.

The year also saw the highest average temperature in 120 years of record-keeping. According to the California Climate Tracker, the state’s average temperature was 58.4 degrees — more than three degrees warmer than average and almost a full degree warmer than the previous high in 1995-96.

Anticipating the effects of climate change, as well as the realities of an increasingly variable precipitation pattern, the Delta Plan lays out four core strategies for providing a more reliable statewide water supply for California:

- Improve conveyance and expand storage
- Increase water conservation and expand local and regional supplies
- Improve water management information
- Improve groundwater management

Many of the projects that implement the Delta Plan and further the State’s coequal goals are carried out by a number of agencies, with the Council serving in a coordinating and oversight capacity. Examples of successful 2015 efforts at the State, regional, and local levels are described below.

New plan to improve the way water moves across the Delta

As noted in the previous chapter, proponents of the multi-species conservation and water conveyance proposal known as the BDCP decided to no

longer pursue a 50-year NCCP for the Delta. Instead, they separated a conveyance facility proposal from habitat restoration measures into two distinct initiatives, now known as California WaterFix and California EcoRestore.

WaterFix would significantly modify the State Water Project’s (SWP) Delta water conveyance system by adding three new Sacramento River intakes near Hood and Clarksburg and two gravity-fed, 40-foot diameter tunnels to convey the diverted water 30 miles to the existing SWP pumping plants at Clifton Court.

WaterFix was embodied as an alternative in the BDCP’s Recirculated Draft EIR/Supplemental Draft EIS released for public review in July 2015. The Council and the Delta ISB, along with many other agencies and thousands of individuals, analyzed the documents in-depth and provided comments on the new proposal.

In those comments, the Council and the Delta ISB recognized the need for improved conveyance but urged improvements to ensure the project maintained a more natural hydrologic flow through the Delta, included adaptive management planning to ensure that both water supply and environmental objectives were met, adequately incorporated structural and operations flexibility to deal with climate change, and better protected the Delta’s economy, recreation, and communities during construction and beyond.

As noted in the Delta Plan, conveyance improvements in general should enhance operational flexibility of the Delta system to divert and move water at times and to locations that are responsive to water supply and protective of ecosystem needs.

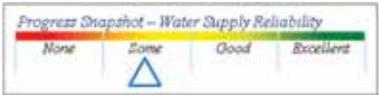
In August, DWR and the federal Bureau of Reclamation (Reclamation) effectively kicked off a much anticipated and likely lengthy and contentious permitting process. They jointly petitioned the SWRCB for a change to their water rights to allow for the new diversion points. Hearings are scheduled to begin in spring 2016.

The WaterFix falls under the Council’s covered action authority and its proponents must certify consistency with the Delta Plan, subject to appeal before the Council.

Progress on expanding water storage

In November 2014, California voters overwhelmingly passed Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014, a \$7.5 billion water bond that will make needed investments in the state’s water management systems.

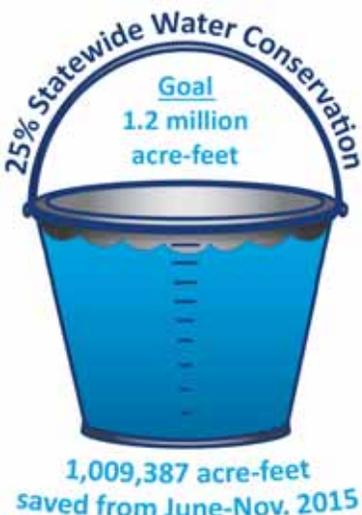
Performance snapshot



Urban water conservation efforts during the drought have exceeded long-term goals and demonstrate what is possible when rapid demand reduction is necessary. Further refinements await details that will be included in urban and agricultural management plans that will be completed in 2016.

Of the Delta Plan’s 24 administrative measures for water supply reliability, four are completed, seven have yet to start, and the rest are in varying stages of completion.

The bond dedicated \$2.7 billion for investments in water storage projects and designated the California Water Commission as the agency responsible for appropriately allocating these funds. Over the past year, the Commission worked with the Council and other agencies and stakeholders to establish the guidelines for the Water Storage Investment Program, which will fund the public benefits of these projects. Notably, eligible storage projects must provide measurable benefits to the Delta ecosystem or its tributaries.



Californians responded with increased conservation

Standing in a barren mountain meadow that instead should have been covered by several feet of snow, Governor Brown on April 1 ordered cities and towns across the state to cut their water use by an average of 25 percent. Agricultural contractors with the federal Central Valley Project had already been told they would get no project water this year; agricultural and urban contractors with the State Water Project (SWP) would get 20 percent of their usual allotments. Gov. Brown extended his order in November, calling for an extension of restrictions to urban potable water use until the end of October 2016, should drought conditions persist through January 2016.

Although slow to start, conservation across the state picked up quickly with the help of the statewide ‘Save Our Water’ campaign and several local programs

In June, the SWRCB approved regulations to achieve an overall 25 percent cut while recognizing that residents of denser and cooler coastal areas already used less water than those in hotter, larger inland areas. Required coastal cuts came in as low as nine percent; inland areas as high as 36 percent. As the drought deepened over the summer, the SWRCB curtailed even the most senior water rights holders and prevailed in early rounds of lawsuits challenging its ability to enforce reductions.



Although slow to start, conservation across the state picked up quickly as the State, in partnership with the Association of California Water Agencies, ramped up awareness through the statewide “Save Our Water” campaign and other local programs. Californians responded by letting lawns go brown – or replacing them with drought-tolerant native plants – and becoming much more efficient in their indoor use.

For June through November, the cumulative statewide savings rate was 26.3 percent, which equates to just over 1 million acre-feet or 365 billion gallons. This is 83 percent of the overall goal of saving 1.2 million acre-feet by February 2016, and equivalent to the amount of water used by more than 5 million Californians annually.

Much of that reduction came at a cost to local water agencies, which lost revenue through reduced water sales, generating discussion around water pricing and sustainable rate structures. Much less impacted were those that had already adopted a conservation-based rate structure, as called for in the Delta Plan.

Ability to measure water use improved

Although the California Water Commission had established a complex set of guidelines for calculating per capita urban water use in response to the 2009 legislative requirement for a 20 percent reduction by 2020, the Governor's call for an immediate 25 percent cut resulted in a new set of guidelines from the SWRCB that more accurately reflect urban residential water use as recommended in the Council's Delta Plan.

In addition, Governor Brown, in a 2015 Executive Order, outlined measures to improve monitoring and oversight of water use for certain users. For instance, agricultural users will have to report to the SWRCB on their water use data, and water agencies located in high- or medium- priority groundwater basins must adhere to new groundwater basin elevation monitoring standards enforced by DWR.

Agencies across state increase local supplies, reduce Delta reliance

As the worst drought in California history threatens to enter a fifth straight year, officials are advocating a variety of desalination and water reuse projects intended to meet the Delta Reform Act mandate and Delta Plan's objective of reduced reliance on the Delta for imported water.

- After 12 years of planning and more than six years in the State's permitting process, Poseidon Resources' Carlsbad Desalination Project became operational in December and is expected to deliver 50 million gallons per day for use in Carlsbad and surrounding communities. The 50,000 acre-feet expected annually from the desalination plant represent about nine percent of the countywide supply.
- About 60 miles up the coast in Huntington Beach, Poseidon is proposing a second 50-million-gallon-per-day desalination plant. Still in the permitting process, the plant is expected to be operational in 2018, providing about eight percent of the county's water supply through an agreement with the Orange County Water District.
- The Water Replenishment District of Southern California (WRD) is planning for a \$95-million water purification plant that would generate enough recycled water to replace the need to buy imported water. The WRD manages two enormous aquifers – the Central and West Coast Groundwater Basins – that provide water to roughly 40 percent of the population of southern Los Angeles County.



“New scientific reports now make it crystal clear that climate change is already affecting California and the Southwest in the form of higher temperatures and a more devastating drought”

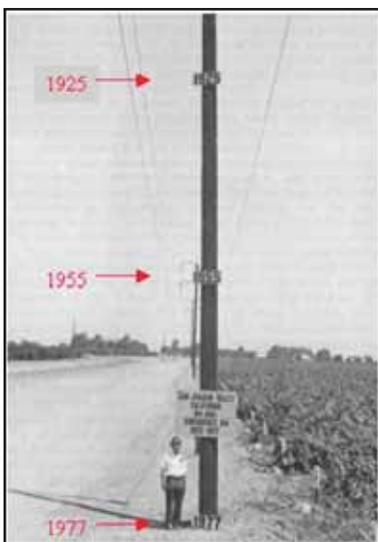
— Gov. Jerry Brown

- In addition, the Sanitation Districts of Los Angeles County and the Metropolitan Water District of Southern California are teaming up to take 150,000 acre-feet per year from the Joint Water Pollution Control Plant in Carson and add it to the groundwater in the Raymond Basin beneath Pasadena, Arcadia and Sierra Madre, as well as the basins fed by the WRD and the Main San Gabriel Basin. That project will add 48 billion gallons to the local water supply.



(USGS photos)

A USGS hydrologist holds a sign (above) indicating how far ground in the San Joaquin Valley has settled over the past 25 years. Photo below illustrates settling over a longer period.



Improving groundwater management

In the midst of some recent rain, the question turns to: When is the drought over? Analysis of satellite data reveals that California needs 34 million acre-feet, as of December 2014, to end its ongoing drought. California has also accumulated a precipitation deficit of 20 inches during the current drought (2012 - 2015), which is equivalent to the long-term average amount to fall in the state in a single year.

As the drought reduced surface stream flows and exports from the Delta were reduced, Californians increasingly turned to groundwater to make up the difference. New wells were drilled at a record pace, older wells pumped continuously and – particularly in the agricultural areas of the San Joaquin Valley – the consequences of overuse became increasingly acute and evident.

In some places, water tables have dropped 50 feet or more in just a few years. With less underground water to buoy it, the land surface is sinking as much as a foot a year in spots, causing roads to buckle, bridges to crack, and even damage to the SWP aqueduct and Delta-Mendota Canal. In addition, shallow wells have run dry, depriving several smaller communities of water.

The Delta Plan recognized these problems, noting that “groundwater overdraft is an impediment to the coequal goals,” and included specific recommendations intended to lead to sustainable groundwater management. In 2014, the State Legislature passed landmark legislation known as the Sustainable Groundwater Management Act, whose aim is to ensure basin resiliency for present and future Californians.

In 2015, through the California Water Commission, DWR adopted basin boundaries as an essential first step before forming agencies to manage groundwater. As required by the Act, by 2017 all high- and medium-priority basins must have formed Groundwater Sustainability Agencies. By 2022, the newly formed Agencies must have assessed local groundwater conditions and developed Groundwater Sustainability Plans. While it will take time before the full benefits of the new mandates are attained, adoption of this approach was a significant long-term win for California’s water supply reliability.

Ecosystem Restoration: Picking up the pace

- *EcoRestore initiative accelerates Delta Plan's priority restoration projects*
- *Science Board recommends ways to adaptively manage flows and fishes*
- *Increased focus on managing non-native species*

California's record-setting drought also severely threatened the State's other coequal goal: protecting, restoring and enhancing the Delta ecosystem. Despite unprecedented efforts by water managers to leverage low reservoir levels by severely cutting back on diversions across all water-rights holders and managing the timing and temperature of releases to try to benefit fish passage and spawning, the drought's impact still fell hardest on fish and wildlife.

Low flows in the spring made the juvenile salmon migration to the ocean so perilous that, as they did in 2014, wildlife managers trucked more than 30 million young fish from upstream hatcheries in the Central Valley to release at locations in Rio Vista and the San Francisco Bay. While this extraordinary approach hinders the ability of salmon to return to their home waters to spawn, it was deemed the best option to ensure that a reasonable number of young fish survived the trip to the ocean.

Despite sharply curtailing flows of water coming out of Lake Shasta this spring, delaying deliveries of irrigation water to hundreds of Central Valley farmers, federal officials were unable to hold enough cold water in the system to keep most juvenile salmonids alive in the fall. Preliminary figures indicate that this year will be the second in a row that nearly all of the juvenile winter-run Chinook died because temperatures in the Sacramento River got too warm. Officials estimate that last year, only five percent of these fish survived long enough to migrate out to sea.

In a related effort, in late November, an independent science panel convened by the Council reviewed the annual operations of the SWP and CVP, ultimately culminating in recommendations to modernize and improve Shasta Reservoir and Sacramento River temperature monitoring, modeling and management, and calling for additional modeling and analysis to better understand the relationship of water operations and the severely declining delta smelt population.



David Okita, special consultant for California EcoRestore, briefs the Delta Plan Interagency Implementation Committee about his plans to speed restoration efforts in the Delta

Performance snapshot



Progress toward habitat restoration in the Delta is evident, if slow. Overall, in 2015 an additional 800 acres were restored. Although the drought added additional challenges for native species, important groundwork has been set for future restoration.

Of the Delta Plan's 26 administrative measures for ecosystem restoration, one is complete, six have yet to start, and the rest are in varying stages of completion.

On the longer view, the Council's Delta Plan contains policies and recommendations for restoring the Delta ecosystem organized into five core strategies:

- Create more natural functional flows
- Improve water quality to protect the ecosystem
- Restore habitat
- Prevent introduction of and manage non-native species impacts
- Improve hatcheries and harvest management

The following highlights the Council's work on these issues - all part of implementing the Delta Plan.

Create more natural functional flows

The Delta Reform Act requires the Delta ISB to regularly review Delta scientific programs in support of adaptive management. This takes the form of a multi-year series of programmatic reviews with 2015 focusing on how freshwater flows affect Delta fish populations. The report is based on a review of scientific literature and interviews with a wide range of interested and involved parties including scientists in State and federal agencies, consulting firms, interest groups, and academia. The Delta ISB concluded that understanding the relationship between flows and fish is paramount to achieving the coequal goals. In order to advance this understanding, the Delta ISB set forth nine specific recommendations including "moving from inferences based on correlations with flows to direct studies of the mechanisms linking flows and fishes."

The Delta ISB's report will help agencies better understand the effects of flows in day-to-day management of Delta water operations, and also provide background for the SWRCB's update of its 2006 Bay Delta Water Quality Control Plan and its upcoming review of WaterFix.

Restore Delta Habitat

The Delta Plan identifies the restoration of key habitats lost when Delta marshes were converted to agricultural uses as a critically important action needed to recover fish and wildlife. As with other elements of the Delta Plan, the Council relies on many other agencies with their own statutory mandates to undertake the projects and programs that meet the Delta Plan's objectives.

A 2013 review of habitat restoration in the Delta and Suisun Marsh by the Delta ISB resulted in a 2014 Council issue paper entitled *Restoring Habitat with*

Science and Society in Mind. This paper serves as a guide for the Council and other agencies to focus their work on implementing the habitat restoration portions of the Delta Plan over a two-year period. An implementation update presented to the Council this fall concluded that considerable progress was now being made on the 10 focus areas identified in the Issue Paper, including:

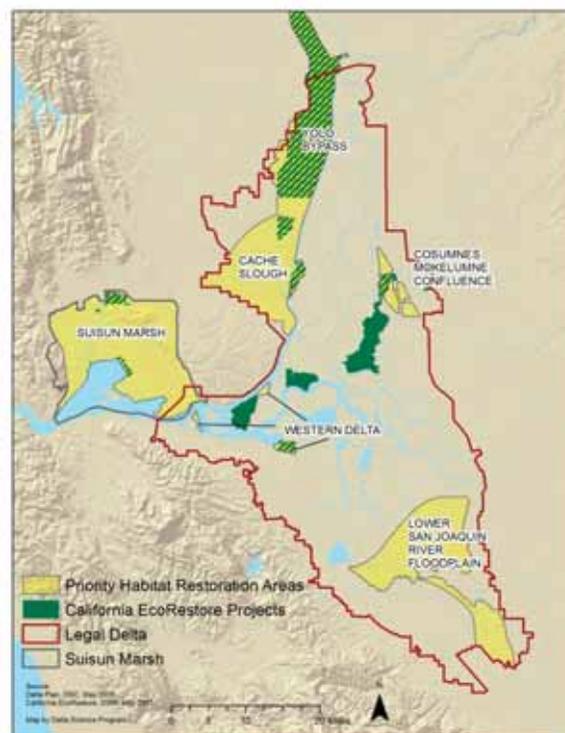
- Early consultation on six restoration projects and refinements to habitat restoration performance measures in the Delta Plan to better gauge the success of projects.
- Progress by DWR in resolving land acquisition challenges, as demonstrated by the acquisition of land on Prospect Island and Decker Island in 2015.
- The identification of specific agricultural enhancements in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project by DWR, Reclamation, and local interests to achieve better beneficial outcomes for agriculture in the project.

As noted earlier, the Brown Administration in April announced a new ecosystem restoration initiative called California EcoRestore to accelerate implementation of a suite of habitat restoration actions in the Delta.

With the Governor’s support, EcoRestore has been advancing restoration on three tracks, focusing in particular on areas protected for restoration in the Delta Plan:

- Accelerating, over the next four years, a set of restoration projects totaling 30,000 acres and improving critical fish passage. EcoRestore’s first major accomplishment was to accelerate funding and permitting for the Knights Landing Outfall Gate project, described below.
- Seeking funding and institutional changes to improve the feasibility of long-term adaptive management of habitat restoration projects and programs in order to improve outcomes for fish and wildlife.
- Supporting landscape-scale planning, as called for in the Delta Plan, by the Delta Conservancy, beginning with pilot projects in the Northeast Delta and Cache Slough Complex.

Over the past year, three EcoRestore projects have broken ground and two restoration projects have been certified for consistency with the Council’s Delta Plan as covered actions.



Delta Stewardship Council map

The Council’s Delta Plan identified and protected six high-priority restoration areas. Most EcoRestore projects are aligned with these priority areas.



(DWR photo)

A gate is put in place at the Knight's Landing Outfall Gates Fish Barrier Project to improve spawning opportunities by keeping Sacramento River salmon from entering the Colusa Drain.

- Lindsey Slough Restoration Project – Located in the California Department of Fish and Wildlife's 965-acre Calhoun Cut Ecological Reserve in Solano County, this project was initiated and completed in October 2014, reestablishing tidal connection with the historic marsh and channel system and enhancing the existing marsh habitat. The reserve is located within the Cache Slough Complex, one of the Delta Plan's priority habitat restoration areas.
- Knights Landing Outfall Gate Fish Barrier Project – Located north of the Delta on the Sacramento River, upstream of the Fremont Weir, this project will prevent adult salmon from entering the Colusa Basin Drain, where they have no way to return to the Sacramento River to complete their lifecycle by spawning in appropriate upstream habitat. The project broke ground in August.
- Sherman Island Whale's Mouth Wetland Restoration Project – This project created approximately 600 acres of freshwater emergent wetlands within an 877-acre site on Sherman Island. In addition to its habitat benefits, the project is designed to increase stability and reduce seepage on a threatened section of levee and to enhance carbon sequestration rates and amounts. The project was completed in October.

Two restoration projects have been certified as consistent with the Delta Plan: the Sherman Island Whale's Mouth Project, described above, and the Dutch Slough Restoration Project, described below, which is awaiting final permits. Both are within the Delta Plan's high-priority restoration areas. The Lindsey Slough project was exempt from Council regulation and the Knights Landing Outfall Gate project was not a covered action because it is located outside the Delta.

- Decker Island Tidal Habitat Restoration– DWR acquired the eastern parcel of the island, approximately 140 acres, from the Port of West Sacramento in August. DWR plans to restore this property to tidal habitat in part to meet endangered species habitat restoration requirements.
- Dutch Slough – Located in the City of Oakley in the western Delta, this project will provide wetland and floodplain habitats and open space in the urbanizing area of eastern Contra Costa County. This project, which is awaiting final permits, will create a large area of tidal marsh and complex intertidal channels—1,178 acres of critically needed habitat for fish and wildlife in the Delta. Shaded channels, native grasslands, and riparian forests will be restored in the upland portions of the site, like those that historically dominated the Delta. This project will also provide outdoor recreation for the residents of the Delta and Bay Area.

Prevent introduction of, and manage, non-native species

The California Delta and San Francisco Bay are often described as the most invaded estuary in the world. While the Stockton and Sacramento Deep Water Ship Channels opened the Central Valley to commerce throughout the world, ballast water discharge from seagoing vessels in some cases brought the world to the Delta. The Asian overbite clam (*Potamocorbula amurensis*) is an example of a non-native, invasive species presumed to have been introduced to the Bay-Delta ecosystem via ballast water. The clam has had profound effects on the food web in the western portions of the Delta and Suisun Bay.

The California State Lands Commission is charged with preventing or minimizing the introduction of nonindigenous species by requiring that vessels either retain all ballast water or treat it to standards set by the Commission before discharging into State waters. So far, however, on-board treatment systems have been unable to meet the Commission's stringent interim performance standards. The shipping industry as well as environmental advocacy groups have pointed out that, although the use of shore-based reception facilities is an approved method for compliance, there are currently no operational ballast water reception facilities in California.

As a result, the Commission asked the Council's Delta Science Program to manage the preparation and independent review of a feasibility study of the potential use of shore-based ballast water reception and treatment facilities. That process launched in 2015 with the first of three planned scientific workshops and will result in recommendations in 2016 that may lead to a broader and more effective range of treatment options.

Improve hatcheries and harvest management

When dams on many rivers cut off spawning grounds for salmon and steelhead trout, hatcheries were built to compensate for this habitat loss. Now there is worry that hatchery-raised salmon, less genetically diverse than their wild cousins, may mix with and reduce the fitness of the wild strains. To address this concern, the California Department of Fish and Wildlife (CDFW) has been developing (and has completed several) Hatchery and Genetic Management Plans, as called for in the Delta Plan. The Delta Plan also calls for the CDFW, in cooperation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, to implement its program for marking and tagging hatchery salmon and steelhead to improve management of hatchery and wild stocks. This program requires funding from several agencies, however, and that funding has been declining.



(DFW photo)

The Lindsey Slough Restoration Project in Solano County included excavation and placement of fill at the historic Lindsey Slough to reestablish tidal connection to the historic marsh and channel system and enhance existing marsh habitat and associated vernal pools and grassland.



(DWR photo)

A temporary rock barrier was constructed at West False River in the Delta. The 750-foot wide barrier was intended to help keep salinity out of the Delta and preserve water in upstream reservoirs that otherwise would have been used to push salt water back.

Drought meant extraordinary efforts to maintain Delta water quality

- *Temporary barrier keeps salinity at bay; scientists study short-term effects and long-term implications*
- *Improved monitoring at Delta water intakes*
- *Increased focus on managing invasive weeds*

The sometimes tenuous balance of the coequal goals is clearly evident in maintaining Delta water quality. Drinking and irrigation water should have little salt and limited dissolved organic material; water for fish, however, might require variable salinity and both dissolved and particulate matter.

Protecting and improving water quality is central to the Delta Plan, which sets forth priority Delta-specific recommendations for agencies such as the SWRCB and its related regional boards that focus on four core strategies:

- Require Delta-specific water quality protection
- Protect beneficial uses by managing salinity
- Improve drinking water quality
- Improve environmental water quality

Require Delta-specific water quality protection

Among the many problems plaguing the Delta are upstream wastewater discharges, particularly those coming from the rapidly expanding Sacramento metropolitan area. The wastewater treatment plant serving the Sacramento region was constructed in 1982, currently serves a population of more than 1.3 million people, and discharges secondarily treated disinfected wastewater into the Sacramento River downstream from the city and upstream from most of the Delta.

Scientists had flagged those discharges as a potential contributor to the Delta’s problems, mostly due to ammonia remaining in the effluent after treatment. In 2010, citing the State’s coequal goals, the Central Valley Regional Water Quality Control Board required the Sacramento Regional County Sanitation District to upgrade its facility to full tertiary treatment including nitrogen removal and tertiary filtration. The requirement was upheld on appeal to the SWRCB in 2011.

This year, the Regional Sanitation District began construction of its EchoWater Project – the major upgrades to the wastewater treatment plant called for in the 2010 order— and increased the amount of recycled water produced by the plant for landscape irrigation, in keeping with a recommendation of the Delta Plan, and helping to replenish groundwater in southern Sacramento County.

The EchoWater Project is the largest public works project in Sacramento’s history, with a dozen separate construction projects and numerous construction contractors on site through 2023. When completed, it is projected to improve water quality by a nearly 95 percent reduction in ammonia discharged to the Delta.

Protect beneficial uses by managing salinity

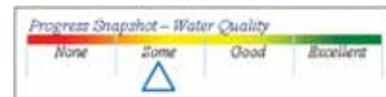
The combination of extremely limited runoff and diminished reservoir storage convinced federal and State wildlife and water agency managers that installation of an emergency drought barrier on West False River in the Delta was needed to repel salinity that could threaten the Delta as a source of water.

Installation of a single emergency rock salinity barrier across West False River was completed in early June; removal began in September and was completed by mid-November. The barrier helped limit the tidal push of saltwater from San Francisco Bay into the central Delta and reduced the amount of fresh water that had to be released from upstream reservoirs to repel saltwater.

Upon learning of the proposed barrier, the Council’s Delta Science Program led discussions among Delta agencies regarding how more comprehensive and strategic monitoring of the barrier’s environmental water quality effects provided a unique opportunity to improve understanding of the Delta ecosystem. Those discussions resulted in a multiagency monitoring program that will provide valuable insight into the drought’s impact on the Delta, as well as inform future drought response measures in the region.

Additionally, the Council’s science program awarded science investigation funds to strategically research impacts of the barrier on water supply and ecosystem

Performance snapshot



Measurements over 2014 and 2015 indicate that meeting salinity standards for the Delta is becoming increasingly difficult. Drought conditions and low reservoir levels led regulators to temporarily relax those standards in 2015. Progress has been made, however, in some key areas, such as improved monitoring for specific constituents of concern (e.g. mercury, selenium, diazinon, and chlorpyrifos).

Of the Delta Plan’s 17 administrative measures for water quality, all have been started, seven are complete, and the rest are in varying stages of completion.

variables. Specifically, the research focuses on the barrier's impact on aquatic habitats, food-webs (the natural interconnection of food chains), hydrological conditions, and invasive species. The results from this research will help guide future management of Delta flows and habitat restoration design, including EcoRestore projects.

Improve drinking water quality

The Delta Regional Monitoring Program (RMP) is a stakeholder-directed project formed to develop water quality data necessary for improving our understanding of Delta water quality issues.

The goal of this effort is to better coordinate and design current and future monitoring activities in and around the Delta to create a cost-effective approach for critically needed water quality information to better inform decisions of the Central Valley Regional Water Quality Control Board and other agencies. As part of this program, monitoring for a Pathogen Study began in April 2015 at drinking water intakes and other locations throughout the Delta as part of the Delta RMP. Additional monitoring elements will be added in the future as funding partnerships are strengthened.

In other actions, the SWRCB released funding guidelines in August for the \$680 million in grants it will make for drinking water infrastructure improvements under Proposition 1. Separately but notably, the SWRCB was given authority by the legislature to consolidate water systems serving disadvantaged communities if the system failed to provide quality drinking water, a significant new management tool for protecting drinking water supplies for rural residents.

Improve environmental water quality

An ongoing problem for the Delta is the prevalence – especially in the summer and fall – of invasive aquatic weeds that not only displace native plants, block light needed for algal photosynthesis, reduce the amount of dissolved oxygen in the water, and deposit silt and organic matter at several times the normal rate, but also choke waterways and cause problems for recreational boaters, operators of in-Delta water diversion facilities, fishermen, and the commerce that depends on clean water and clear waterways.

The effort to control the weeds is led by California State Parks' Division of Boating and Waterways (DBW), which this year dramatically increased the acreage



(DWR photo)

The Delta Stewardship Council and other agencies stepped up science efforts to better understand how to manage invasive weeds such as water hyacinth which clog waterways and reduce the amount of oxygen in water.

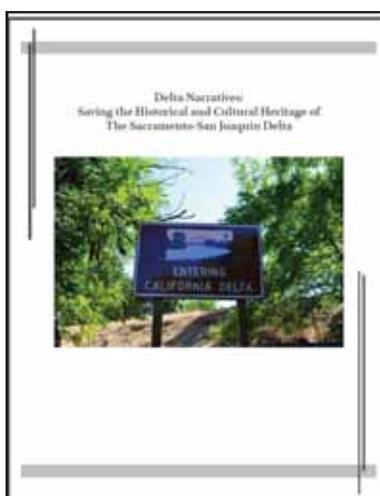
it treated for water hyacinth and spongeplant to 3,813 acres compared with 2,617 acres in 2014. The DBW treated an additional 1,530 acres to control another invasive species, Brazilian waterweed. While generally successful in keeping weeds under control in more areas of the Delta for most of the year, once again the weeds returned to Stockton in October, carpeting downtown McLeod Lake, forcing the city to close its largest marina at Buckley Cove, and, for the second straight year, keeping the city's annual holiday lighted boat parade off the water, further evidence of the resiliency of invasive aquatic weeds and the severe management challenge they present.

Scientists agree the problem is exacerbated by drought that leads to a warmer, clearer, nutrient-rich water that stays longer in the Delta. In September, the Council's Delta Science Program, in concert with several other agencies, hosted an aquatic weed symposium to further understanding and develop better management options for aquatic weed management. At the symposium, local and national experts discussed 1) new developments in surveillance and monitoring of aquatic vegetation to facilitate management and control, 2) advances in knowledge that could lead to better management and control practices, and 3) advances in risk assessment and reduction. A summary paper with specific recommendations is forthcoming in 2016.

The effort to control aquatic weeds is led by California State Parks' Division of Boating and Waterways, which this year dramatically increased the acreage it treated for water hyacinth and spongeplant

Protecting and enhancing the Delta's unique and evolving sense of place

- *Delta Narratives project creates wider understanding*
- *Economic development promoted, farmland protected*
- *Carbon sequestration projects show promise*



The Delta Narratives project documented ways the history of the Delta has influenced trends in land management and reclamation, technological shifts in transportation and agriculture, the impact of ethnicity and labor specialization.

The Sacramento-San Joaquin Delta has changed dramatically over the past 150 years. It is the product of policies that encouraged settlers to build levees, drain swampland and turn vast acreages of tule marsh into productive agricultural fields; of the residual effects of hydraulic mining that clogged streams and channels with mercury-laden silt; of efforts to improve flood management and transportation corridors by dredging straighter and deeper channels; of the runoff from upstream farms and expanding urban centers; and from the competing demands of those who use it as a transfer point for water supplies, energy, and freight.

Today's Delta is the heart of California—a unique blend of agriculture, recreation, tourism, commerce, infrastructure, history, and natural beauty. The Delta Reform Act requires that *the coequal goals be achieved "in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place."*

The Delta Plan contains five core strategies for protecting and enhancing the Delta:

- Designate the Delta as a special place worthy of national and state attention
- Plan to protect the Delta's lands and communities
- Maintain Delta agriculture as a primary land use, food source, key economic sector, and a way of life
- Encourage recreation and tourism that allow visitors to enjoy and appreciate the Delta, and that contribute to its economy
- Sustain a vital Delta economy that includes a mix of agriculture, tourism, recreation, commercial and other industries, and vital components of state and regional infrastructure

In its ongoing efforts to preserve, protect and enhance the Delta during the past year the Council and implementing agencies accomplished the following:

National Heritage Area Designation

In 2015, as in 2013, bills that would establish a Sacramento-San Joaquin Delta National Heritage Area, as recommended in the Delta Plan, were introduced in both the U.S. Senate and House of Representatives. The Council was among many local governments, businesses, and citizen groups who formally support the legislation; however, perhaps caught in the tide of broader water politics, neither bill advanced.

Delta Narratives – Funded by the Delta Protection Commission (DPC), a series of essays collectively called the Delta Narratives, documented ways the history of the Delta has influenced trends in land management and reclamation, technological shifts in transportation and agriculture, the impact of ethnicity and labor specialization on community building, and finally, the shifting vision of America's promise by artists and writers in response to the intense cultivation of the Delta and the conditions that workers there endured.

To promote the collection, the project includes a directory of museums, historical societies, nature centers and other institutions committed to promoting Delta stories and two workshops at which the scholars and archivists shared insights and invited commentary and conversation.

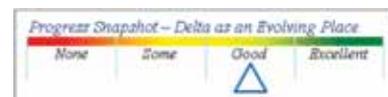
The final report recommended developing a Delta-wide organization focused on the preservation and dissemination of Delta history through a variety of potential means including a website, education curriculum, and Delta historical events.

Maintain Delta agriculture as a primary land use – carbon sequestration

The Delta's deep organic peat soil that is cherished for agriculture is also highly susceptible to subsidence, which eventually results in the sinking of island interiors and may increase water seepage and the consequences of flooding on the island.

Research conducted by DWR, United States Geological Survey (USGS), and the University of California has shown that conversion to wetlands that are flooded year 'round or growing rice helps reverse subsidence.

Performance snapshot



Efforts to protect and enhance the Delta as an evolving place are moving forward. The DPC is leading work toward designation of the Delta and Suisun Marsh as a National Heritage Area. Other efforts such as DWR's subsidence reversal and carbon sequestration projects, totaling 2,325 acres, are creating managed wetlands while addressing subsidence issues. Also, the Council is working with the Department of Conservation to track Delta farmland loss, and the Delta Conservancy/DPC's Delta Branding and Marketing Project continues to promote agritourism.

Of the Delta Plan's 23 administrative measures for protecting the Delta as an evolving place, two have yet to start, three have been completed, and the rest are in varying stages of completion.



(CA Pear Board photo)

The Pear Fair is a celebration of the annual Bartlett pear harvest in Delta river town of Courtland. Organized and run by a committee of local volunteers, it has become a long-standing summer tradition that reflects the character and lifestyle of rural life

In 2008, DWR constructed a 300-acre research project on Twitchell Island to study the effect of growing rice. The initial research data from the first rice crops in 2009 and 2010 showed that rice production stopped subsidence, achieved small amounts of accretion, sequestered carbon, and acted as a sink for pesticides and herbicides.

Research funded by the Council's Delta Science Program is helping to determine how much carbon can be taken up by Delta-area plants – knowledge that offers the region the possibility of becoming financially self-sustaining through the emerging carbon crediting market. In fact, the Air Resources Board is currently developing a method for quantifying carbon emission reductions resulting from carbon capture and sequestration for its Cap and Trade and Low Carbon Fuel Standard programs.

By 2017, approximately 3,100 acres of wetlands on Sherman Island and 1,000 acres of wetland and tidal marsh on Twitchell Island will be completed to provide a full-scale test for carbon farming. These large-scale projects are leading the way for new and innovative agricultural practices and providing information that can be used by the private sector to enter the carbon market.

Encourage recreation and tourism and a vital Delta economy

The Sacramento-San Joaquin Delta Conservancy and the DPC continue to partner on the development of a Delta gateway website and five-year marketing plan.

The Conservancy has contracted with a marketing firm to develop and implement a marketing campaign for the Delta. The purpose of the campaign is to raise awareness of the Delta and increase its use as a tourism destination. This multi-year campaign will work closely with Delta business owners and community members to develop a Delta-wide marketing strategy and utilize the internet and social media as well as marketing opportunities with Visit California.

Delta as Place Interagency Working Group

DPC staff convened the first meeting of the Delta as Place Interagency Working Group in November. The working group is comprised of staff from State agencies and local governments and is focused on facilitating Delta as Place projects, including those involving cultural and historic preservation, economic development, infrastructure, quality of life, and recreation. The working group will report to the DPC, Delta Stewardship Council and DPIIC.

Reducing risk in a flood-prone Delta

- *Delta Levees Investment Strategy will maximize State resources to reduce flood risk in the Delta*
- *Strategy to link with Central Valley Flood Protection Plan*
- *Grants fund Delta levee improvements and maintenance*

Situated at the outlet of two major river systems and with much of its land near or below sea level, the Delta is inherently flood-prone. Delta settlers wrestled these lands from marshes and channels, constructing 1,100 miles of levees with some of the 19th century's best engineering. Constant vigilance and effort is still required today to reduce the risk of floods that imperil 260,000 residents of the region's floodplains and the nearly \$36 billion in assets that include farms, businesses, and infrastructure.

Scientists warn that climate change will increase the potential for flooding. Thus, even as Californians cope with drought, they must prepare for the eventuality of floods, putting lives and property at risk.

The Delta Reform Act states "The Delta Plan shall attempt to reduce risks to people, property, and State interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments." As such, the Delta Plan contains the following core strategies:

- Improve emergency preparedness and response
- Finance and implement flood management activities
- Prioritize flood management investment
- Improve residential flood protection
- Protect and expand floodways, floodplains, and bypasses
- Integrate Delta levees and ecosystem function, and limit liability

Delta Levees Investment Strategy incorporates several core strategies

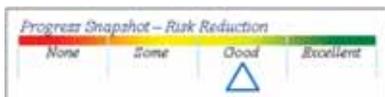
The Delta Reform Act called on the Council to lead a multi-agency effort, in consultation with the Central Valley Flood Protection Board (CVFPB) to establish and adopt, as a part of the Delta Plan, priorities for State investments in levee operation, maintenance, and improvement for both project and non-project levees



(DWR photo)

Members of the California Conservation Corps assist with levee maintenance and repairs.

Performance snapshot



Emergency preparedness has been improved through implementation of the Delta Multi-Hazard Coordination Task Force recommendations. Prioritization of state investment in flood management is well underway with the Council leading the Delta Levees Investment Strategy project. With the approval of the Central Valley Flood Protection Board, DWR continues to provide funding for levee improvements through existing programs. The Delta Protection Commission has begun the feasibility study for a Delta Flood Risk Management Assessment District.

Of the Delta Plan's 19 administrative measures for risk reduction, seven have yet to start, three have been completed, and the rest are in varying stages of completion

in the Delta. Currently, the Delta Plan includes interim priorities for State investment in Delta levees, and the Council now is updating those priorities by developing the Delta Levees Investment Strategy (DLIS).

The strategy will help focus State funding on levee improvements and other actions that will achieve the greatest reduction in threats to lives and property (including important infrastructure) and the most benefit to safeguard water supply and restore the Delta ecosystem, while fully considering the unique values of the Delta's farms and communities.

The Council has developed a sophisticated database of the key resources—levee conditions, lives and property, water supply, habitat, and other assets—to identify areas where levee improvements are crucial. The Council also has developed a computer-based, interactive planning tool to help summarize and visualize current risks without additional levee investments, as well as the risk reduction achieved by potential future levee projects. Using this risk-informed analysis, the Council will develop and recommend a portfolio of actions that can reduce the flood risks in the Delta and Suisun Marsh.

As part of the DLIS, Council staff at the request of the DFW completed a review of levee-related habitat improvement projects in the Delta and their effectiveness for providing habitat for native fish and wildlife as well as the associated costs. The review found that measures were available to enhance aquatic habitats as part of levee improvements, but that furthering the goal of restoring the Delta ecosystem required more focused attention to ecological goals as part of project planning. Specifically, Council staff recommended a more structured assessment of enhancement opportunities, better monitoring of levee-related habitat projects' results, and strategies that focused these projects in high priority locales, such as fish migration corridors, to improve outcomes for fish and wildlife.

Delta levees mostly owned and maintained by local districts

Approximately 65 percent of the levees in the Delta and all levees in the Suisun Marsh are owned or maintained by local agencies or private owners and are not part of the federal-state flood control projects on the Sacramento or San Joaquin rivers. Most of these so-called "non-project" levees are maintained by local reclamation districts created and funded by landowners, initially for the purpose of draining ("reclaiming") Delta islands and tracts. The reclamation districts continue to maintain levees and other water control facilities today.

Efforts to promote effective emergency preparedness and strategic levee investments as required by the Delta Plan include these successful local and regional projects:

- **Improving emergency preparedness and response**

In December, the Council brought together several Delta area flood and emergency management officials to discuss progress and preparation for the coming year. While noting that coordination among so many local entities is always challenging, they discussed efforts now underway to improve coordination and communication.

DWR has made funding available for the Flood Emergency Response Projects grants from Propositions 1E, with \$10 million for statewide projects and Delta communications equipment, and \$5 million for projects such as stockpiling flood fighting materials in the Delta. An additional \$5 million is available for the second round of statewide grants.

Delta Emergency Communications Grant – DWR granted \$5 million in Proposition 84 funds in 2013 to five Delta counties and one local agency to improve emergency communication throughout the Delta and across county lines as recommended in the *2012 Sacramento-San Joaquin Delta Multi-Hazard Coordination Task Force Report*.

Milestones in 2015 for the DWR Delta Emergency Communications Grant include construction of the Twitchell Island Radio Tower and the installation of radio and other communications equipment for all grantees.

Flood Emergency Response Delta Grant – Six awards, totaling \$5 million in Proposition 1E funds, were made by DWR to local governments in the Delta for 2015 improvements in flood emergency response at the local level. These grants help participating agencies to develop flood safety plans, conduct flood emergency response exercises, attend training courses, and purchase flood-fight materials. A second grant solicitation package is anticipated in 2016.

Emergency Response Facility Improvement Project – This project provides DWR with additional physical resources to quickly respond to levee failures in the Delta. DWR is developing three facilities in the Delta for storage of additional flood fight materials and increased stockpiling and deployment of rock, sand, and other materials that are needed to assist in protecting potential breached or failing levees as well as making emergency repairs.

- **Levee Maintenance and Improvements**

The Delta Levees Maintenance Subventions Program is a cost-share program that provides technical and financial assistance to local levee maintenance agencies for project or non-project levees consistent with the Delta Plan's interim priorities for State investment in levees.



(DWR photo)

The Twitchell Island Radio Tower provides emergency radio communications capability to all five Delta County Emergency Operation Centers and DWR.

The allocated funding for FY 2014-15 is \$12 million. Sixty-eight work agreements were put in place with local levee maintaining agencies to support maintenance and rehabilitation activities completed between July 1, 2014 and June 30, 2015. Final claims won't be reconciled until early 2016. Funding for FY 2015-16 also is expected to be \$12 million.

Delta Levees Special Projects Program – This program was established in 1988 to ensure protection of local and State interests in the Delta.

Five projects totaling \$31.3 million were approved in FY 2014-15. These include levee and habitat improvements on Bacon, Bethel, Brannan-Andrus and Twitchell islands, monitoring related to the emergency drought barrier on False River, and proposals for setback levee construction on Bouldin Island and New Hope Tract.

Urban Flood Risk Reduction Program (UFRR) – This DWR program provides Proposition 1E funding for local agencies to repair, rehabilitate, reconstruct, or replace levees, weirs, bypasses, and facilities of the State Plan of Flood Control; and/or improve or add facilities to the State Plan of Flood Control to increase levels of flood protection for urban areas.

In 2015, DWR opened a UFRR solicitation for projects and received nine proposals requesting more than \$566 million. After evaluating the applications, DWR recommends \$246 million in funding for seven proposals, including \$22.3 million to construct the Smith Canal Gate to reduce flood risk to the heavily urbanized area of central Stockton; \$28.7 million for setback levee tie-ins and improvements in the Southport area of West Sacramento; and \$112 million for three projects that improve levees in the area known as the “Pocket” in south Sacramento.



(DPC photo)

Nicole Hinch of Sacramento Search and Rescue and her rescue dogs participated in the 2015 California Flood Awareness Fair.

- **Delta Flood Preparedness Week**

Delta Flood Preparedness Week was held in October and culminated in the second Delta Flood Safety Fair at the Delta Farmers' Market hosted by the DPC. The number of exhibitors doubled from 2014 – the Sacramento County crime prevention and marine patrol teams, Solano County Office of Emergency Services, DWR Delta Levees program, the Dutra Museum, Sacramento County Search and Rescue, the Drowning Accident Rescue Team, River Delta Fire Department, the Federal Emergency Management Administration, a Public Health team from CSU San Jose's School of Health Sciences, and the California Central Valley Flood Control Association all participated.

Integrating science and management

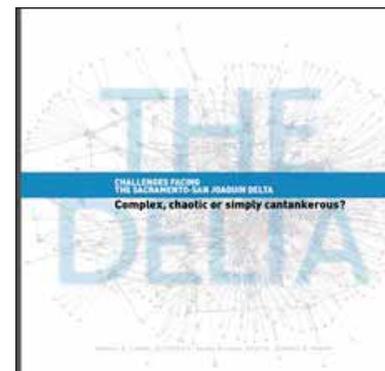
- *Delta Challenges report calls for better integrated science and collaborative management to address Delta issues*
- *Scientists recommend ways to manage environmental data, invasive weeds*
- *Interagency Committee highlights need for reliable, stable science funding*

“**M**anaging the water supply system alone is complicated, but add in the imperative to sustain the ecological and social values of the Delta and every decision becomes unimaginably complex,” according to an in-depth report on the risks and challenges facing the Bay-Delta system prepared this year by four former lead scientists of the CALFED/Delta Science Program.

The Council’s Delta Science Program assembled a panel of the four former lead scientists to respond to a request from the US Department of the Interior and the California Natural Resources Agency to summarize the risks and challenges facing the Bay-Delta system in a single, concise report accessible to a broad audience. Although many reviews, reports and articles describe the stressors and risks facing the contemporary Delta, the information is spread across diverse publications, journal articles, and lengthy technical reports. This diverse information had not previously been presented in a condensed, concise, and readable way.

The resulting report was based in part on a workshop organized by the Council’s Delta Science Program that featured experts from federal, State and local agencies academia, and non-governmental organizations. It details the challenges facing the Bay-Delta system within the context of the physical, water supply, water quality, ecological, and institutional complexity of the Delta – and explaining that this complexity makes it impossible to address challenges individually and that while the Delta’s challenges are not “solvable”, they are manageable.

The report underscores the importance of collaborative science as a means for addressing future uncertainty in the Delta; uncertainty that will only be aggravated by climate change going forward. The report goes on to conclude that continual monitoring in support of adaptive management will reduce this uncertainty and result in substantive gains in knowledge and practical



The Delta Challenges report points to the importance of the Council’s role as integrator and facilitator, bringing the big-picture, long-term view to both scientific investigation and policy implementation.

implementation.

That conclusion – and others – point to the importance of the Council’s role as integrator and facilitator, bringing the big-picture, long-term view to both scientific investigation and policy implementation.



(Anne Holmes, SFSU, photo)

Scientist Anne Slaughter tows a zooplankton net to measure potential impacts from the temporary salinity barrier at False River on food availability for delta smelt.

Integrating best available science into management decisions

The Council’s Delta Science Program was established by the Legislature to provide the best available scientific information and knowledge to help water and environmental policymakers deal with the Delta’s “devilishly wicked” problems. To do this, the Science Program plays a synthesizing and coordinating role, getting the right people working on the right issues and facilitating independent peer review to enhance the transparency of scientific work of different agencies and programs.

The Delta Science Program is advised by a lead scientist appointed by the Council to a two-year term. This year, the Council chose former lead scientist Dr. Cliff Dahm for a return engagement. In addition, the Council appoints the members of, and provides staff support to, the Delta Independent Science Board (Delta ISB) in support of its oversight role for Delta science.

The Delta ISB is a standing board of nationally prominent scientists appointed by the Council with appropriate expertise to evaluate the broad range of scientific programs that support adaptive management of the Delta. The Delta ISB provides oversight of scientific research, monitoring, and assessment programs that support adaptive management of the Delta through periodic reviews of each of those programs.

Structuring these programmatic reviews by themes, this year the Delta ISB completed a review of how freshwater flows affect Delta fish populations. A major challenge in the Delta is determining a flow regime that benefits desirable fishes while also providing enough water for a reliable supply. The Delta ISB’s review broadly examined scientific understanding of the effects of water flow on Delta fish populations and recommended strategic science activities to improve the understanding of underlying processes. This will benefit decision-making and enhance scientific collaboration and communication concerning fish and flows in the context of other stressors.

As noted earlier, the Delta ISB also reviewed the draft recirculated environmental impact report for the BDCP/WaterFix and submitted the review to the Council and DFW. The review recommended improvement of the proposed project’s adaptive management program and clearer communication of the scientific foundation for assessing the environmental impacts of water conveyance alternatives. The review also provided a scientific foundation for Council comments and those by other organizations and agencies, noting that the draft contains a

wealth of information but lacks completeness and clarity in applying science to the kinds of far-reaching policy decisions required by WaterFix and EcoRestore.

Delta Science Program fosters collaborative approach to Delta research

Completed at the end of 2013, the Delta Science Plan lays out a shared vision for science across the Delta science community and has three key components. The first is the Science Plan itself. The second is a Science Action Agenda, which is the work plan for collaborative Delta science investigations that can guide research, monitoring, modeling, and synthesis efforts across the whole Delta science community. The third is the State of Bay-Delta Science, a summary prepared on a four-year cycle of new scientific understanding of the Delta in order to inform the next Science Action Agenda.

A major focus of the Council's Science Program this year was to develop, in coordination with 17 other State and federal agencies on the DPIIC, 15 high-impact science actions that involve multiple agencies and organizations with products intended to affect forthcoming decisions about the Delta-wide system. These critical science actions will fill gaps in science knowledge and collaboratively advance scientific understanding to address decision-makers' needs. The actions focus on four topics:

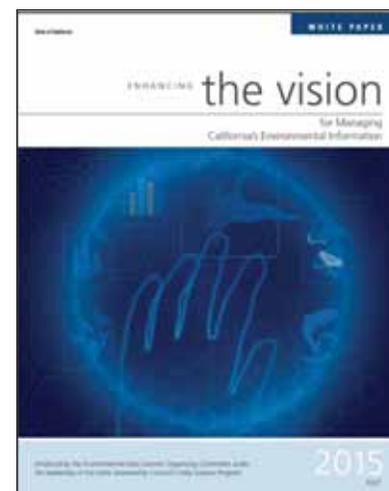
- Assessing drought-related effects on the Delta
- Effectiveness and implications of habitat restoration actions
- Science support for management of estuarine and migratory species
- Science supporting flood risk reduction and the economies of Delta communities

This important endeavor, which is being supported by resources from a number of DPIIC member agencies as well as Proposition 1 funds, advances the Delta Science Plan's call for integrated science through its fundamental "One Delta, One Science" principle, which will ultimately support the achievement of the coequal goals.

Additional major efforts of the Council's science program this year include:

- **Improving Access and Use of Environmental "Big Data"**

Each day immense amounts of environmental data are collected by various academic institutions and State and federal agencies. A white paper released by the Delta Science Program in October and based on a multi-agency "Data Summit" found, however, that information often is inaccessible to others either because of its sheer size, or the incompatibility of competing information systems. This inability



Better and quicker access to the vast amounts of environmental data collected in and around the Delta will help policy makers and others better understand the effects of their decisions.

to retrieve large amounts of digital data from so-called “agency silos” creates inefficiencies for policy-makers who require more timely facts and figures. By focusing on individual data sets, it also inhibits the ability of researchers and the public to understand the system as a whole.

The issue paper concludes in part that California’s policies on data collection lack definition and require a new governance network; that new clear standards will promote compatibility among various database systems; that better business models will improve data management; and that a new system should be developed allowing all environmental data to be accessed by web technology from a single source point.

With the issue paper’s suggestions in place, the authors believe a vast reservoir of data can be tapped and subsequently synthesized in support of adaptive management, allowing policy-makers to reach conclusions more quickly and efficiently. In turn, the public will learn more quickly if investments in projects like ecosystem restoration, water supply reliability enhancements, and protecting and enhancing the unique values of the Delta as an evolving place are in fact paying off. In addition, they can learn what lessons can be applied to improve decisions as remaining uncertainties about risks and benefits are addressed.

The Council’s science program hosts – often with other agencies or academic institutions – day-long or multi-day workshops, seminars and symposia focusing on various aspects of science related to current interrelated Delta issues

Seminars & Symposia focus latest research to key Delta issues

A unique niche the Council’s science program fills is its role in hosting – often with other agencies or academic institutions – day-long or multi-day workshops, seminars and symposia focusing on various aspects of science related to current interrelated Delta issues. Among the highlights this year:

Climate Change and Future Management Strategies in the Delta – Warming temperatures and a diminished snowpack pose problems for the Delta ecosystem. This one-day seminar presented and synthesized ongoing efforts to help develop a broader vision for the Bay-Delta ecosystem under future climate scenarios. Presenters updated the current understanding of climate impacts based on recent projections, and provided information regarding the vulnerability and resilience of both natural and human environments, including the most current approaches for adaptation and mitigation in response to climate related changes. This seminar highlighted recent improvements in modeling various consequences of sea-level rise adaptation strategies, pointing to the benefits of “soft” engineering solutions for shoreline protection.

Science Symposium on Invasive Aquatic Vegetation – The problems caused by invasive aquatic vegetation in the Delta also occur in waterways across the United States and around the world. Sparked by discussions at the Council and DPIIC, this symposium was organized by the Council’s science program in September to explore: 1) new developments in surveillance and monitoring of

aquatic vegetation to facilitate management and control, 2) advances in knowledge that could lead to better management and control practices, and 3) advances in risk assessment and reduction. A summary paper is forthcoming.

California Salmon and Climate Variability Symposium – This September symposium explored recent scientific progress toward understanding how changing and increasingly variable ocean, climate, and hydrologic conditions affect Central Valley salmon and their management. Topics included the interrelationship between climate and river flows on salmon populations, the effects of biodiversity on population stability, and how hatcheries and fisheries affect salmon populations. A summary paper synthesizing the results of the symposium will be provided in 2016 to inform additional management and recovery actions.

Sturgeon in the Sacramento/San Joaquin Watershed: New insights to support conservation and management – There are two species of these huge and ancient fish in the Bay-Delta and its watersheds, green sturgeon and white sturgeon. Reaching more than 10 feet in length and 400 pounds, the white sturgeon is a popular game fish while the slightly smaller and much rarer green sturgeon is a protected species. This seminar presented the latest information about their migration, spawning, and ecology to help guide enhanced management and conservation efforts.

Integrated Modeling for Adaptive Management of Estuarine Systems – A priority action in the Delta Science Plan, this workshop was held in May. It was a joint effort of the Delta Stewardship Council’s Delta Science Program and the Center for Watershed Sciences, with sponsorship from the National Science Foundation. Presenters and participants explored the problems and prospects for improving computer modeling of estuarine systems that would be capable of forecasting how desired environmental and water-supply reliability outcomes can be achieved under various management and climate scenarios. Results will be published in a forthcoming white paper.

Brown Bag Luncheon and other seminars – Brown Bag luncheon seminars are developed by the Council’s Delta Science Program with assistance from the DFW’s Ecosystem Restoration Program and the SWRCB’s Surface Water Ambient Monitoring Program. These seminars convey new research findings that link to current management challenges and advance the understanding of Delta Plan policies and recommendations.

In 2015, Brown Bag seminars were held on:

- A Common Framework for Compliance and Effectiveness Monitoring of Water Quality and Habitat Conservation Plans
- Multifunctional Infrastructure and the Human Use of Restored Delta Landscapes
- Analysis of Water Resiliency in the Context of Hydroclimatic Variability



“Brown Bag’ lunch seminars convey new research findings and synthesis applicable to current management challenges and advance the understanding of Delta Plan policies and recommendations.

- Managing Environmental Degradation Issues: St. Lucie Estuary Story
- Boosting the Use of Science and Data in Support of Management Decisions and Informed Public Policy
- Linking Hydrodynamic Complexity and Salinity to Delta Smelt Distribution in the San Francisco Estuary
- Adaptive Approaches to Wetland Restoration in Southern California
- The Delta as Place: Yesterday and Today (multiple sessions)



The Council partners with the California Sea Grant program to offer fellowships in natural resource management and marine policy.

Peer review panels ensure integration of best available science

The Council's Science Program convenes independent scientific review panels throughout the year to assure the quality of Delta science.

- In May, an Independent Scientific Review Panel (Panel), selected by the Council's Lead Scientist, reviewed the scientific basis of the DLIS prioritization methodology. The methodology will be used to guide the Council's development of a long-term Delta levee investment strategy. The Panel review was convened to ensure a scientifically robust method to quantify and prioritize the assets and risks to State interests associated with each leveed island and tract in the Delta.
- In November, an independent science panel conducted its annual review of the Long Term Operations Biological Opinions (LOBO) actions required by the Endangered Species Act related to salmon, steelhead, green sturgeon, and Delta smelt for operations of the State and federal water projects.

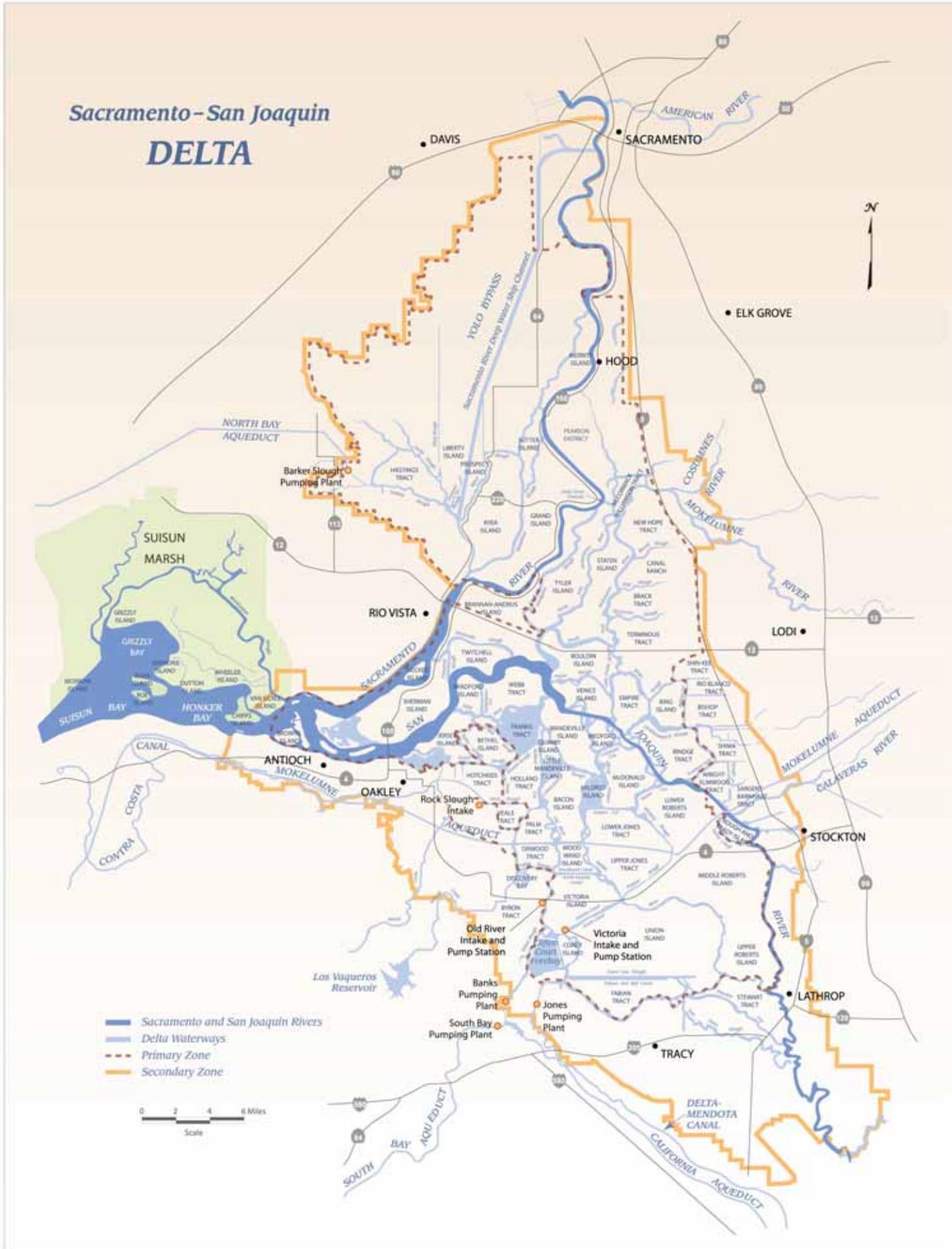
Fellows Program gets younger scientists involved in key Delta issues

An important goal of the Council's Delta Science Fellows Program is to bring junior scientists together with Delta agency scientists and senior research mentors to work collaboratively on data analysis and research projects relevant to Delta policy and management.

The Science Fellows Program works through the California Sea Grant, which itself is a partnership between the National Oceanic and Atmospheric Administration and the University of California. California Sea Grant offers fellowship opportunities in research, natural resource management, and marine policy that allow graduate students, post-graduates, and postdoctoral researchers to explore their interests and broaden their experience.

The Delta Stewardship Council supports both policy and research fellows. Since 2003, the program has funded 68 Science Fellow projects, investing more than \$9 million in research such as new technology and methods for cost-effectively assessing levee vulnerability, and remote sensing of mercury hot spots.

Sacramento-San Joaquin DELTA



- Sacramento and San Joaquin Rivers
- Delta Waterways
- - - Primary Zone
- Secondary Zone



The Delta Stewardship Council was created in legislation to achieve the state mandated coequal goals for the Delta.

"'Coequal goals' means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place."

(CA Water Code §85054)

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A California State Agency



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