



DELTA STEWARDSHIP COUNCIL

# **Delta Conservation Adaptive Management Action Strategy**

APRIL 2019



# Delta Conservation Adaptive Management Action Strategy

*April 2019*

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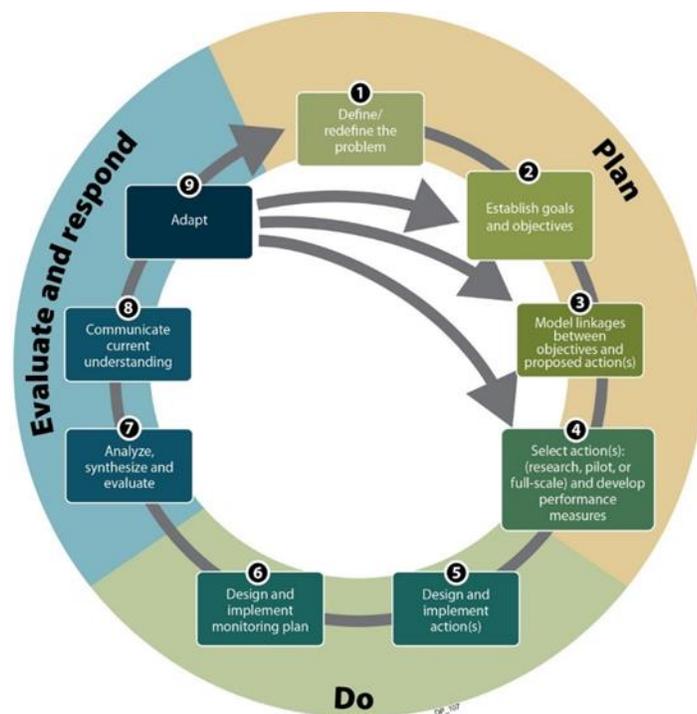
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# Chapter 1: Introduction

## Background

Various efforts are ongoing to restore and enhance ecosystems in the Sacramento-San Joaquin Delta, Yolo Bypass, and Suisun Marsh (hereafter the Delta) that require support for adaptive management. Adaptive management is a science-based, structured approach to environmental decision making under uncertain conditions. Adaptive management emphasizes acquisition and use of new knowledge in natural resource management, leading to continuous iterative improvements in project planning, implementation, monitoring, and follow-up. Adaptive management is required for compliance with multiple regulatory processes, such as consistency with the Delta Plan and the Suisun Marsh Plan, but recent reviews have found that a full adaptive management cycle is rarely completed at either the project- or system-level in the Delta (Delta Independent Science Board 2016; Nagarkar and Raulund-Rasmussen 2016). To address this issue, the Delta Science Program initiated an effort to work with agency and stakeholder partners in the Delta to develop a comprehensive, science-based adaptive management approach to support achievement of Delta conservation goals. Conservation, as defined in the Delta Conservation Framework (Sloop et al. 2018), consists of efforts to protect, restore, and enhance ecosystems in the Delta. The Delta Conservation Adaptive Management Action Strategy is based on the Adaptive Management Framework outlined in the Delta Plan (Figure 1, Delta Stewardship Council 2013).



**Figure 1. The Delta Plan three-phase, nine-step adaptive management cycle (Delta Stewardship Council 2013).**

*The shading represents the three broad phases of adaptive management (Plan, Do, and Evaluate and Respond), and the boxes represent the nine steps within the adaptive management framework. The circular arrow represents the general sequence of steps. The additional arrows indicate possible next steps for adapting (e.g., revising the selected action based on what has been learned).*

## Goals

The Adaptive Management Action Strategy (AM Action Strategy) builds on previous reviews of adaptive management in the Delta and other systems, and decades of experience working in the Delta, to help integrate existing resources and cut across individual agency missions to support adaptive management efforts across the system. The AM Action Strategy presents a series of strategic actions for supporting adaptive management of conservation activities in the Delta. The specific goals of the actions are to 1) improve coordination, 2) provide technical assistance, and 3) fill knowledge gaps. These actions will provide a strong foundation for long-term, system-wide planning and evaluation of current and future conservation efforts. The intended audience for this paper includes conservation project implementers, funders, regulators, and stakeholders.

## Structure

The AM Action Strategy will be implemented by the Delta Science Program in coordination with the Interagency Adaptive Management Integration Team (IAMIT). The IAMIT is convened by the Delta Science Program to strengthen collaborations and to discuss and coordinate strategies for implementing adaptive management for conservation projects in the Delta. Progress updates on implementation of actions herein will be presented to the Delta Plan Interagency Implementation Committee as well as at conferences and other venues.

The **Adaptive Management Liaisons** (AM Liaisons) are staff scientists at the Delta Science Program tasked with advising those engaged in adaptive management. The AM Liaisons consult with project proponents on adaptive management, the use of best available science, and determinations for Delta Plan consistency (Delta Stewardship Council 2013). The AM Liaisons take primary responsibility for implementation of actions in this strategy, in collaboration and coordination with the IAMIT.

The **IAMIT** is made up of scientific and technical staff from local, State, and Federal agencies, and certain key stakeholder groups (Appendix 2). It serves as a technical team that provides input and guidance on adaptive management for current and future Delta conservation efforts, at a high level that crosscuts individual agency missions. The IAMIT supported the development of this action strategy by providing input and review, and will similarly support implementation of the actions herein.

## Chapter 2: Actions for Enhancing Interagency Resources for Adaptive Management

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A number of existing planning, monitoring, analysis, and communication efforts are already available and/or underway to support adaptive management of projects and programs in the Delta, but full implementation of the adaptive process is still a challenge. Existing resources (e.g., tools, staffing, and programs) and gaps for adaptive management vary across ecosystem and project types. The actions in this strategy were developed by evaluating existing resources and current efforts, identifying current gaps and needs, and gathering examples from other systems. The actions integrate existing adaptive management efforts to enhance coordination, integration, synthesis, evaluation, information sharing, and communication. Actions are organized around the following topics: project support, conceptual models, monitoring and research, data management, analysis and synthesis, and communication.

Many important actions to support adaptive management are being covered through existing efforts and are therefore not included here. For example, performance measures are very important for tracking effectiveness of conservation actions, but system-wide performance measures are established in the Delta Plan (Delta



Stewardship Council 2013) so fall outside of the scope of this strategy. Other examples of existing efforts and products include the 2017 Tidal Wetland Monitoring Framework based on updated conceptual models (Interagency Ecological Program Tidal Wetlands Monitoring Project Work Team 2017, Sherman et al. 2017), and the Integrated Modeling Steering Committee which is focused on supporting improved development and integration of quantitative models. The Delta Conservation Framework (Sloop et al. 2018) identifies approaches for coordinating regulatory requirements that affect adaptive management implementation.

The AM Action Strategy is designed to avoid duplication of existing efforts, to collect and share information to facilitate planning of new efforts, and to coordinate project-level adaptive management activities (e.g. data management, monitoring). The multi-agency structure of the IAMIT helps promote information sharing, collaboration, and coordination.

## Project Support (PS)

The actions in this section support conservation projects working on adaptive management planning and implementation. Helping projects use robust, science-based adaptive management should increase the likelihood that projects meet their goals and objectives and maintain restored or constructed ecological function over time.

### **PS1. Provide a venue for support and technical guidance to projects and programs**

The Delta Science Program will convene a technical advisory body to assist project proponents who voluntarily choose to receive technical and regulatory advice on adaptive management. This forum for informal joint consultation with regulatory agencies will be modeled after the Suisun Marsh Plan Adaptive Management Advisory Team (SMP AMAT). The SMP AMAT provides a single venue for project review and advice to facilitate meeting regulatory and adaptive management needs. Restoration projects being undertaken under the Fish Restoration Program Agreement (FRPA) undergo technical review by the Fishery Agency Strategy Team (FAST), a single venue with multiple regulatory agencies present (Department of Water Resources et al. 2011). However, many projects outside of the Suisun Marsh Plan or the FRPA, such as carbon sequestration wetlands, habitat improvements along levees, and conservation projects funded through water bonds, do not have opportunities for coordinated technical and regulatory adaptive management support. The new technical advisory body will be developed by the Delta Science Program with advice and input from the IAMIT.

*Goal:* Conservation project proponents have a regularly available venue to get input on adaptive management planning from an interagency regional and technical perspective. Proponents will receive benefits by capitalizing on existing interagency resources that can be accessed or networked through the technical advisory body.

*Activities:* Offer support and technical guidance on an as-requested basis to project proponents with inquiries related to adaptive management planning or implementation. Provide project proponents with either direct input from the group or advice on where to go for additional support. Connect on-the-ground proponents to relevant academic researchers to facilitate the development of conservation-related research. Invite proponents to return post-implementation to provide lessons learned, guidance, and other relevant information to other projects proponents.

### **PS2. Develop resources to aid in the writing of adaptive management plans**

Adaptive management plans are required for compliance with multiple regulatory processes (e.g., Delta Plan consistency, FAST requirements, and various US Army Corps of Engineers permits). Sometimes multiple adaptive management plans, monitoring plans, and long-term management plans are developed for individual projects according to requirements for each of these separate regulatory processes. Specific resources and standardized templates that integrate various regulatory and funding

agencies' requirements for adaptive management plans could save projects and regulators time, resources, and confusion, and may help avoid duplication of efforts.

*Goal:* Consistent approaches to developing adaptive management plans to streamline the process for project proponents, regulators, and funders.

*Activities:* Develop specific resources to aid writing project-level adaptive management plans that integrate various regulatory and funding agencies' requirements, where feasible. Compile information on the types of management plans required by different regulators. Assemble a reference library of existing adaptive management plans that can be utilized by projects for guidance. Communicate with projects about how to use guidance documents, example plans, or available templates to aid in their adaptive management planning.

## Conceptual Models (CM)

Models, from simple conceptual models to complex quantitative models, are useful in predicting potential consequences of alternative management actions and weighing trade-offs among decisions. Conceptual models summarize the latest scientific understanding about cause-effect relationships and are helpful for articulating scientific uncertainties within those relationships and potential consequences of alternative management actions. Conceptual models are critically important for linking goals and objectives to project actions, monitoring, data collection, and research using best available science. Currently, numerous models are available, yet some important models are out of date or missing. Existing models should be compiled and curated to better provide resources to projects and identify gaps that future model development can address.

### **CM1. Compile and curate conceptual models, and support development of new models**

While numerous conceptual models of ecological function are available in the Delta (e.g., Suisun Marsh, tidal wetlands), they are not always easy to find or use by those planning conservation projects. Also, models for some important ecosystems, species, and processes are lacking or out of date. A centralized repository for conceptual models would make it easier for project planners to access relevant, up-to-date resources.

*Goals:* (1) Increased awareness, accessibility, and use of existing conceptual models. (2) Updated existing models and new conceptual models for important species, and ecosystem and landscape-scale processes.

*Activities:* Compile information on existing conceptual models that have been developed to describe species, ecosystems, human use, and ecological function in the Delta. Communicate with project proponents about the availability of relevant conceptual models, and advise projects on the use of conceptual models in their project designs and adaptive management plans. Support updates to existing models where necessary and

support the development of additional models for important species, ecosystems, or different regions, building upon existing resource-specific conceptual models.

## **CM2. Compile key management questions and uncertainties associated with conservation**

Identifying system-wide management questions and uncertainties provides the opportunity to address areas where significant gaps in knowledge hinder conservation or management actions (LoSchiavo et al. 2013). In the Delta, key uncertainties associated with tidal marsh restoration for fish benefits were identified in multiple efforts (e.g. Brown 2003; Herbold et al. 2014), key uncertainties for floodplains and riparian zones were published as part of [Delta Regional Ecosystem Restoration Implementation Plan \(DRERIP\) models](http://www.dfg.ca.gov/erp/cm_list.asp) in 2008 ([http://www.dfg.ca.gov/erp/cm\\_list.asp](http://www.dfg.ca.gov/erp/cm_list.asp)), and uncertainties associated with system function in Suisun Marsh were identified from conceptual models in the Suisun Marsh Plan (U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and California Department of Fish and Game 2013). Though management uncertainties for certain conservation projects have been previously highlighted, there is a need to compile management questions and uncertainties for various other regions and project types, and update earlier efforts.

*Goal:* Increased likelihood that key management questions and uncertainties are addressed.

*Activities:* Compile a list of key management questions that have been identified by other agencies and groups as relevant to Delta conservation outcomes. Summarize uncertainties related to these management questions using existing conceptual models. Make information on uncertainties and management questions easily available to Delta scientists and conservation practitioners. Communicate with project proponents directly to provide guidance for how uncertainties could be addressed through project-specific monitoring, active adaptive management experiments, and applied studies in individual projects.

## **Monitoring and Research (MR)**

Monitoring is critical for evaluating progress towards goals, refining conceptual models, and adapting management actions. Standardized monitoring plans allow for coordination across and comparability of projects, and increase the contribution of project data to detecting system-wide responses to restoration. Focused natural and social science research could take advantage of standardized monitoring data to study changes



Photo Courtesy of DWR

and relationships at larger spatial and temporal scales. This would improve coordination between projects and help inform future research aimed at improving conservation outcomes.

### **MR1. Compile existing and support development of new monitoring frameworks**

Employing comparable approaches to monitoring allows for a more integrative assessment of the system-wide effects of restoration. Monitoring frameworks, such as the one developed for tidal wetlands (Interagency Ecological Program Tidal Wetlands Monitoring Project Work Team 2017), provide guidance for project-level monitoring plans to use standardized methods that facilitate comparability across projects for larger-scale analysis, synthesis, and evaluation efforts. Frameworks could also consider options to consolidate certain aspects of monitoring across individual projects. Some common project types that do not have existing monitoring frameworks include riparian and shaded aquatic habitats (such as along levees), and freshwater emergent wetlands (non-tidal, such as subsidence reversal projects).

*Goals:* (1) Guidance for design of project-level monitoring plans that use comparable methods in their planning processes. (2) Monitoring frameworks that include protocols for comparable data collection across projects and programs.

*Activities:* Compile existing monitoring frameworks and communicate with project proponents about the availability of relevant monitoring frameworks and protocols. Advise projects on the use of these frameworks in their adaptive management and monitoring plans. Advocate for, support, and participate in efforts to augment existing and develop new monitoring frameworks for ecosystems or species affected by conservation projects.

### **MR2. Identify opportunities for funding targeted research and active adaptive management experiments**

Each conservation project presents a unique opportunity for experimentation and research, but often the implementing agencies do not have the financial or logistical resources to do research themselves. While changes at the landscape scale resulting from conservation actions can take multiple years to detect, the duration of project-level monitoring may be limited by short grant terms or limited regulatory requirements (Delta Independent Science Board 2016). There can be great added value in revisiting past project sites for further study. Research grants and partnerships with agency or academic researchers can provide projects with opportunities to generate science that they otherwise may not have been able to fund with their own resources.

*Goal:* Funding and technical support for targeted research, active adaptive management experiments, or design features that test key uncertainties relevant to project- or system-wide objectives.

*Activities:* Identify opportunities for funding targeted research and communicate those to project proponents and researchers. Provide advice to project proponents on available

funding and on potential collaborations with existing monitoring or research programs. Help inform future grant solicitations on conservation adaptive management priorities.

### **MR3. Assist with mobilizing resources for studying responses to major events**

Unplanned events (such as extreme droughts, floods, earthquakes, and levee breaks) and planned large-scale management actions (such as construction of salinity barriers, and cold-water releases from dams) have system-wide effects and may provide unique opportunities to learn and test hypotheses about the functioning of natural and restored ecosystems. Having quick-to-mobilize funding, staff, and contracting support for additional research, monitoring protocols, regulatory support, and modeling capability in place will allow Delta science efforts to capitalize on these opportunities (Delta Independent Science Board 2016).

*Goal:* Quick-to-mobilize funding, staff, and contracting support for learning and for testing hypotheses in response to unplanned events or large-scale management actions.

*Activities:* Develop a needs assessment for research opportunities related to conservation adaptive management that could be addressed in response to major events. Solicit “bookshelf project” pre-proposals from researchers working in the system to aid in expedited funding opportunities. Help researchers and project proponents match studies with funding sources when major environmental events or management actions occur.

## **Data Management (DM)**

Adaptive Management is an information-driven endeavor that relies on accessibility of key datasets in order to inform and adapt. Several state and federal data management systems offer central access to datasets of interest for restoration, but it is not always clear how to relate these data resources to each other, or where to house the data being generated by new projects. Supporting data management at both the project and the system level will help provide the information necessary for implementing adaptive management.

### **DM1. Enhance development and implementation of project-level data management plans**

Many conservation projects and programs require support to effectively manage their data. During the planning phase of a restoration project, it is important to consider what types of data are needed to address key uncertainties and performance measures, and how those data will be managed, stored, and accessed. Incorporating data management plans into adaptive management planning helps to ensure that data management is a part of projects and programs from the very beginning. Creating and updating data management plans as a part of project-level adaptive management addresses both immediate needs and long-term management of data for future uses, ultimately supporting timely analysis, synthesis, and evaluation at the system-wide scale. Data management plans should leverage existing resources, such as the technical guidance

provided by the IEP Data Utilization Workgroup, the California Water Quality Monitoring Council Data Management Workgroup, and by the AB 1755 Technical Working Group regarding data management, web services, and data federation. Adaptive Management Liaisons at the Delta Science Program will work directly to support project proponents in data management plan development.



Photo Courtesy of DWR

*Goals:* (1) Conservation project proponents receive advice on data management plans, which will be included in adaptive management plans. (2) Needs of conservation projects are advocated for in other data management initiatives.

*Activities:* Assist current conservation project proponents with their data management needs across

the entire life cycle of a project, including incorporating data management plans into adaptive management plans, collecting data, and uploading data products. Coordinate with other data management efforts to advocate for specific needs of conservation projects. Help align project-level efforts with needs of regulators and granting agencies. Work with projects to improve compatibility, comparability, quality assurance and quality control, and public accessibility of data (i.e. web-servicing and other data access mechanisms). Help projects share data using common data platforms so that data can be accessed, reviewed, and linked with data from other projects, for example through online data visualization tools such as EcoAtlas, Bay Delta Live, Environmental Data Initiative, or the Estuaries Portal.

## **DM2. Identify environmental data resources that should be regularly updated to support Delta conservation adaptive management**

Certain fundamental environmental datasets that could improve project planning and evaluation across the system are missing, out of date, or not consistently collected across the entire system. These dataset needs must be better defined, and funding allocated to consistently collect and process the data and make it available to all conservation project proponents and analysis staff to aid their planning and evaluation.

*Goal:* Identification of high priority environmental data resource needs, and advocacy to secure funding for data collection and dissemination to ensure availability to Delta conservation projects.

*Activities:* Identify fundamental, system-wide environmental data resources of universal

benefit to project planning and evaluation, which could be updated on an ongoing basis. Assemble information on the current status of these resources, the importance of each for supporting Delta conservation adaptive management, and the necessary frequency of data collection to serve the needs of adaptive management planning and evaluation. Present information on environmental data resource needs in a format suitable for funders to make decisions about resource allocation to meet those needs.

## Analysis and Synthesis (AS)

Information from multiple projects and system-wide monitoring programs inform adaptive management actions at project sites, plans for future projects, system-wide objectives and targets, or updates to the conceptual models that guide conservation in the system. More conservation-relevant synthesis would be of great benefit to project managers and could save agencies time and money, and help ensure that the best available science is used to plan and implement projects.

### AS1. Contribute to system-wide conservation analysis and synthesis

Staff with a range of technical expertise are needed to perform system-wide analyses of the effects of conservation and to generate reports on effectiveness and changes in the state of knowledge, thus informing system-wide performance measures and future restoration actions. Various technical staff with appropriate expertise are currently employed by agencies (e.g., California Department of Fish and Wildlife, Department of Water Resources, Delta Science Program) whose coordinated efforts can be dedicated to synthesis projects specific to conservation. In small working teams, staff from across multiple agencies and organizations could perform analyses using a variety of data sets (e.g., project monitoring, regional monitoring, long-term and continuous monitoring stations, targeted research) to generate presentations, reports, and peer reviewed publications. Projects undertaken would be designed to align with the missions and needs of the participating agencies. Synthesis projects could help:

- inform key uncertainties, hypotheses, and performance measures outside the responsibility of individual projects;
- generate the information needed to update conceptual models;
- lead to meaningful revision of system-wide conservation goals, objectives, and performance measures;
- potentially guide project-specific adaptive management actions; and
- help guide the next generation of conservation projects.

*Goal:* Conservation-relevant synthesis across landscapes, ecosystems, or multiple projects, or for specific species or actions in the context of system-wide monitoring programs and targeted research.

*Activities:* Identify topic areas of need and interest for synthesis to support conservation adaptive management, focusing on addressing uncertainties associated with key

management questions. Present information on the importance of topic for supporting Delta conservation adaptive management to interested partners. Lead or partner in interagency teams to conduct synthesis projects identified by this process or by other groups.

## Communication (C)

An effective communication strategy should facilitate multi-directional information exchange across all audiences (e.g. project proponents, scientists, high-level decision makers, operational managers), sharing lessons learned at the project level and advocating for resources and policies to support adaptive management decision making.

### **C1. Develop and implement a communication strategy**

A communication strategy for the implementation of the Actions listed in this Strategy would help reach the various audiences who could benefit from conservation adaptive management support. Regular Adaptive Management Forums are venues for discussion among the broad community of conservation practitioners and decision-makers.

*Goals:* (1) Outreach to the conservation community about the roles of the Delta Science Program Adaptive Management Liaisons and the IAMIT in supporting adaptive management for conservation projects and system-wide efforts. (2) Web resource products developed in the implementation of Actions in this Strategy. (3) Convene regular Adaptive Management Forums to communicate with a broad community about adaptive management in the Delta.

*Activities:* Develop a communication strategy that details communication goals and objectives, key audiences and stakeholders, and key messages and methods. Include a description of existing venues for information sharing, strategies for ensuring information gets shared in a timely manner, and methods to publicize products to inform stakeholders and to garner support. Develop a webpage that outside entities can access to find out information on the Delta Science Program Adaptive Management Liaisons and the IAMIT, and to share products such as a library of conceptual models (CM1), adaptive management plan templates (PS2), etc. Hold adaptive management forums (described in Delta Science Plan action 4.3, Delta Stewardship Council 2019) to share lessons learned, communicate ideas and information on practicing adaptive management, and provide a networking venue for project implementers, funding programs, regulators, and the broader scientific community. Support the integration of input from Delta residents, landowners, farmers, tribes and nongovernmental organizations into adaptive management processes.

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## Appendix 1. Acronyms and Glossary

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DRERIP	Delta Regional Ecosystem Restoration Implementation Plan
DSP	Delta Science Program
FRP	Fish Restoration Program
FAST	Fishery Agency Strategy Team
IAMIT	Interagency Adaptive Management Integration Team
IEP	Interagency Ecological Program
ISB	(Delta) Independent Science Board
SMP AMAT	Suisun Marsh Plan Adaptive Management Advisory Team

**Adaptive management:** 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 (CA Water Code §85052).

**Active adaptive management:** Actively pursues the reduction of uncertainty through management interventions.

**Conservation:** Protection, restoration, and enhancement of ecosystems.

**Floodplain:** Low to mid elevation lands adjacent to and transitioning between fluvial, or riverine, and tidal areas, that is subject to flooding during periods of high discharge.

**Framework:** A set of ideas, facts, and principles that provide an integrative and coordinated approach.

**Freshwater emergent wetland:** Temporarily or permanently flooded, permanently saturated wetlands dominated by emergent vegetation.

**Project-level:** Refers to individual conservation projects.

**Project proponent:** Refers to the agency or organization that submits or proposes some project for review and acceptance. A person or organization assigned to this role is supposed to create a detailed project description and present it to stakeholders for analysis and review.

**Riparian zone:** Area at the interface between land and rivers, channels, creeks or streams characterized by a woody vegetation community.

**Strategy:** A general method worked out in advance for achieving some objective, especially over a longer time period.

**System-wide:** For this paper, the Delta is defined as the Delta, Yolo Bypass, and Suisun Marsh. System-wide refers to processes, organizations, or initiatives that span the system.

**System-wide monitoring:** Long-term and integrated monitoring across the whole system. In some other programs, this level of organization is referred to as 'regional' (e.g., Delta Regional Monitoring Program).

**Targeted research:** Studies designed to test the understanding of linkages in conceptual models to reduce uncertainty.

**Tidal wetlands:** Wetted by tides, dominated by emergent marsh vegetation, often transitioning into woody vegetation at the marsh uplands, often freshwater in the Delta or brackish in Suisun Marsh.

## Appendix 2. List of IAMIT Members

List of IAMIT participants from 2016-2019, affiliations listed are as of the time that individual participated in the group.

<b>Agency</b>	<b>Representative</b>
California Department of Fish & Wildlife	Sakura Evans
California Department of Fish & Wildlife	Rebecca Fris
California Department of Fish & Wildlife	Brooke Jacobs
California Department of Fish & Wildlife	Alice Low
California Department of Fish & Wildlife	Stacy Sherman
California Department of Fish & Wildlife	Christina Sloop
California Department of Fish & Wildlife	Hildie Spautz
Contra Costa County	Abigail Fateman
Delta Conservancy	Thomas Jabusch
Delta Conservancy	Laura Jensen
Delta Conservancy	Beckye Stanton
Delta Science Program	Annie Adelson
Delta Science Program	Darcy Austin
Delta Science Program	Eva Bush
Delta Science Program	Dylan Chapple
Delta Science Program	Maggie Christman
Delta Science Program	Karen Kayfetz
Delta Science Program	Annika Keeley
Delta Science Program	Tricia Lee
Delta Science Program	Catarina Pien
Delta Science Program	Edmund Yu
Delta Stewardship Council	Megan Brooks
Delta Stewardship Council	Jessica Davenport
Delta Stewardship Council	Lauren Hastings
Delta Stewardship Council	Daniel Huang
Delta Stewardship Council	Martina Koller
Delta Stewardship Council	Ron Melcer
Department of Water Resources	Charlotte Biggs
Department of Water Resources	Louise Conrad
Department of Water Resources	Bonnie Irving
Department of Water Resources	Gardner Jones
Department of Water Resources	Kristopher Jones
Department of Water Resources	Erik Loboschefskey
On behalf of Environmental NGOs	Samuel Luoma
National Oceanographic & Atmospheric Administration	Rachel Johnson
National Marine Fisheries Service	Evan Sawyer
National Marine Fisheries Service	Cathy Marcinkevage
National Marine Fisheries Service	Ryan Wulf

<b>Agency</b>	<b>Representative</b>
Sacramento County	Don Thomas
San Joaquin Council of Governments	Steve Mayo
State and Federal Contractors Water Agency	Kelsey Cowin
State and Federal Contractors Water Agency	Stephanie Fong
Solano County	Roberta Goulart
Solano County	Peter Miljanich
Solano County Water Agency	Chris Lee
On behalf of the State Water Resources Control Board	Valerie Connor
State Water Resources Control Board	Rafael Maestu
University of California Davis	Alejo Kraus-Polk
University of California Davis	Brett Milligan
US Bureau of Reclamation	Josh Israel
US Bureau of Reclamation	Ian Smith
US Fish & Wildlife Service	Heather Swinney
US Fish & Wildlife Service	Kim Turner
US Fish & Wildlife Service	Kim Webb
US Geological Survey	Cathy Ruhl
Yolo County	Petrea Marchand
Yolo County	Tara Morin