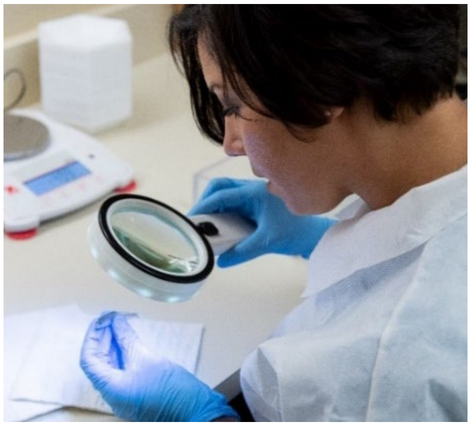
Overview

The SAA is a four- to five-year focused science agenda for the Delta that prioritizes and aligns science actions to inform management decisions, identifies major gaps in knowledge, and promotes collaborative science. It also establishes a foundation for funding critical science investigations. The 2022-2026 SAA is organized around the following six broad Management Needs, which collectively articulate major priorities for advancing science-based management in the Delta. The Management Needs are associated with Management Questions and 25 Top Science Actions, all collaboratively developed with input from the Delta science and management community:



Researcher examining Delta smelt (Photo: California Department of Water Resources)

Management Need 1: Improve coordination and integration of large-scale experiments, data collection, and evaluation across regions and institutions.

A. Establish publicly accessible repositories and interactive platforms for sharing information, products, and tools associated with monitoring and modeling efforts, in support of forecast and scenario development, timely decision-making, and collaborative efforts.
B. Evaluate the individual and institutional factors that enable or present barriers to coordination, learning, trusting, and using scientific information to inform decision-making and resource sharing within and among organizations.
C. Identify and carry out large-scale experiments that can address uncertainties in the outcomes of management actions for water supply, ecosystem function, and socioeconomic conditions in the Delta.

Example: When major management actions occur, such as changes to nutrient loading, coordinated science across multiple groups advances a shared understanding of the impacts and saves time and resources.

Regional San's wastewater treatment plant upgrade aims to produce cleaner water for discharge to the Sacramento River (Photo: Regional San).

Management Need 2: Enhance monitoring and model interoperability, integration, and forecasting.

A. Develop a framework for monitoring, modeling, and information dissemination in support of operational forecasting and near real-time visualization of the extent, toxicity, and health impacts of Harmful Algal Blooms (HABs).

B. Enhance flood risk models through a co-production process with Delta communities to quantify and consider tradeoffs among flood risk management, water supply management, habitat restoration, and climate adaptation.
C. Evaluate and update monitoring programs to ensure their ability to track and inform management of climate change impacts, emerging stressors, and changes in species distributions.
D. Iteratively develop and update forecasts of climatological, hydrological, ecological, and water quality conditions at various spatial and temporal scales that consider climate change scenarios.

Example: Managing HABs, and the negative impacts they wreak on communities and ecosystems, depends on the availability of working models, data, and the integration of monitoring and forecasting frameworks.

Drone view of algal bloom in San Luis Reservoir in 2021 (Photo: California Department of Water Resources).

Management Need 3: Expand multi-benefit approaches to managing the Delta as a social-ecological system.

A. Conduct studies to inform restoration approaches that are resilient to interannual hydrologic variation and climate change impacts.
B. Develop integrated frameworks, data visualization tools, and models of the Delta social-ecological system that evaluate the distribution of environmental benefits and burdens of management actions alongside anticipated climate change impacts.
C. Identify how ecosystem restoration projects benefit and burden human communities, with an emphasis on environmental justice.
D. Synthesize existing knowledge and conduct applied, interdisciplinary research to evaluate the costs and benefits of different strategies for minimizing introduction and spread of invasive species, and to inform early detection and rapid response strategies.
E. Test and monitor the ability of tidal, nontidal, and managed wetlands and inundated floodplains to achieve multiple benefits over a range of spatial scales, including potential management costs, tradeoffs, and unintended consequences.

Example: Multi-benefit approaches to managed floodplains can simultaneously provide for agriculture, carbon sequestration, fish and wildlife habitat, and recreation.

The Franks Tract (pictured) Futures project is exploring options for multi-benefit restoration approaches (Photo: California Department of Fish and Wildlife).

Management Need 4: Build and integrate knowledge on social process and behavior of Delta communities and residents to support effective and equitable management.

A. Collaboratively develop a long-term data collection and monitoring strategy for human communities in the Delta, with the goal of tracking and modeling metrics of resilience, equity, and well-being over time.
B. Measure and evaluate the effects of using co-production or community science approaches (in management and planning processes) on communities' perceptions of governance and decision-making processes.
C. Use multi-method approaches (e.g., surveys, interviews, oral histories, and/or observations) to develop an understanding of how stakeholder values, and cultural, recreational, natural resource, and agricultural uses vary geographically and across demographics.

Example: A dearth of social data and research on how people live, work, and interact with the Delta limits effective and equitable management of the system.

Fishing near Rio Vista Bridge (Photo: California Department of Water Resources).

Management Need 5: Acquire new knowledge and synthesize existing knowledge of interacting stressors to support species recovery and ecosystem health.

A. Identify and test innovative methods for effective control or management of invasive aquatic vegetation in tidal portions of the Delta under current and projected climate conditions.
B. Identify environmental thresholds relevant to managed fish species and location-specific survival probabilities to develop strategies that will support species recovery.
C. Identify the drivers and impacts of HABs severity and persistence.
D. Integrate existing models of hydrodynamics, nutrients, and other food web drivers to allow forecasting the effects of interacting stressors on primary production and listed species.
E. Quantify spatial and temporal "hotspots" of chemical contaminants and evaluate ecosystem effects through monitoring, modeling, and laboratory studies.

Example: With globalization and climate change, new tools are needed to manage and predict invasive aquatic vegetation and the associated environmental stress it inflicts.

Invasive water hyacinth in the Delta (Photo: Delta Science Program).

Management Need 6: Assess and anticipate climate change impacts to support successful adaptation strategies.

A. Evaluate how climate change, sea level rise, and more frequent extremes will impact habitats, water quality and sediment supply changes, the long-term persistence of native and non-native species, productivity, and food web support.
B. Evaluate individual and cumulative impacts and tradeoffs of drought management actions on ecological and human communities over multiple timescales.
C. Evaluate the possible multi-benefits of management actions that promote groundwater recharge for ecological functions and water resilience under multiple dry year scenarios.
D. Identify how human communities connected to the Delta watershed are adapting to climate change, what opportunities and tradeoffs exist for climate adaptation approaches, and how behaviors vary with adaptive capacity.
E. Test and predict how water allocation and ecological flow scenarios under projected climate change will influence habitat conditions, target species' access to critical habitat, and interactions among native and invasive species.

Example: With climate experts predicting more severe and frequent droughts due to climate change, evaluating, and refining our drought management and adaptation toolbox is essential.

Low water levels in Shasta Lake, photographed on October 28, 2021 (Photo: California Department of Water Resources).