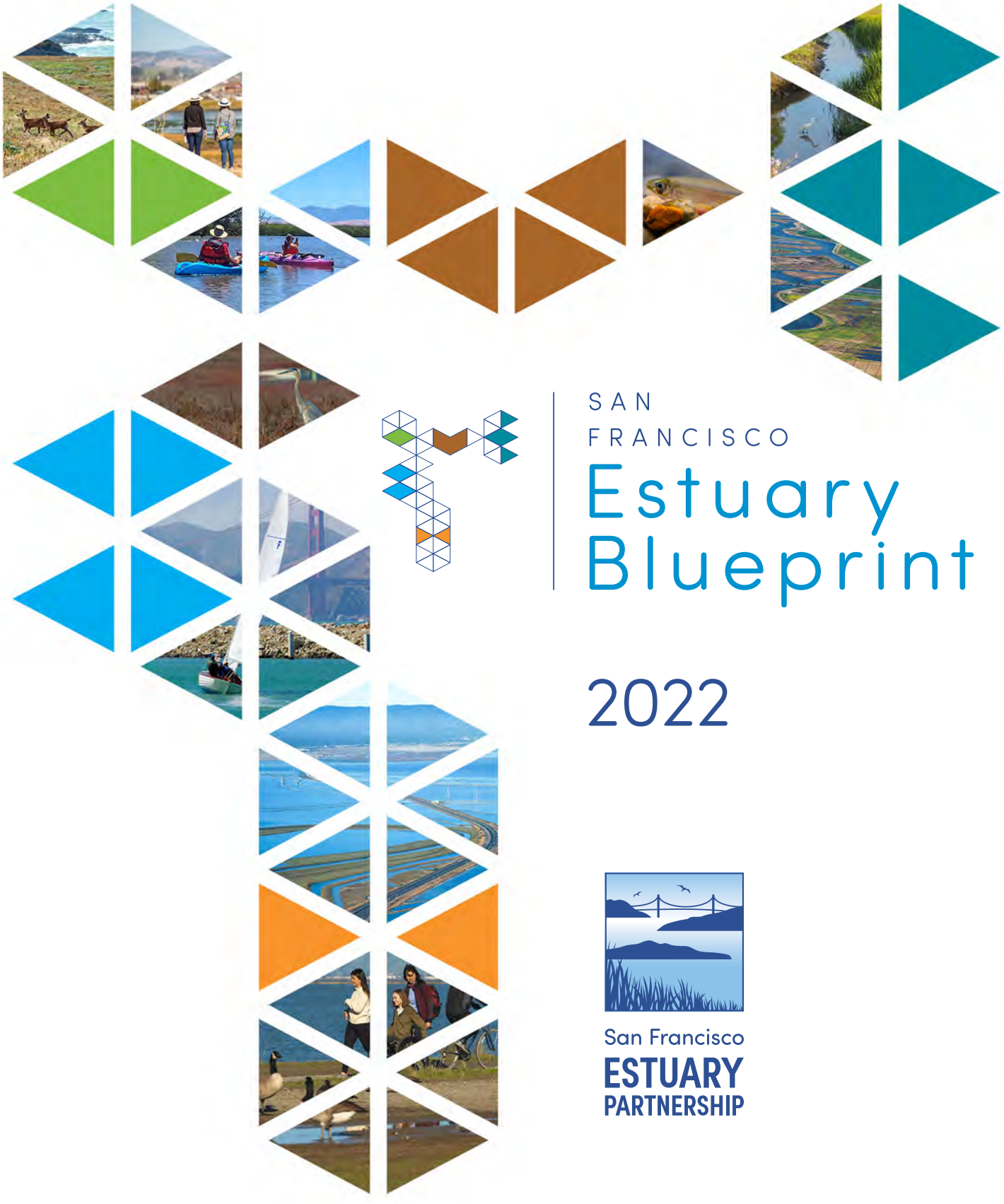

SAN
FRANCISCO

Estuary Blueprint

2022

San Francisco
ESTUARY
PARTNERSHIP

San Francisco
ESTUARY
PARTNERSHIP

San Francisco Estuary Partnership

Bay Area Metro Center
375 Beale Street, Suite 700,
San Francisco, CA 94105

sfestuary.org

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English

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Chinese

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Spanish

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For more information on the Estuary Blueprint, including current progress, visit sfestuary.org/estuary-blueprint/ or scan the code.

SCAN HERE

LAND ACKNOWLEDGMENT AND RACIAL EQUITY STATEMENT

Land Acknowledgment

The work of the San Francisco Estuary Partnership and our environmental partners is critical to the health and future sustainability of our Estuary. However, the Estuary's shoreline, baylands, and uplands have been vital to the health and sustainability of Indigenous people for thousands of years, far predating current efforts to respond to development, fill, population growth, and rising seas.

We honor and acknowledge all Tribal ancestral lands regardless of state or federal recognition. Tribes, Tribal communities, and their families have been stewards of the lands on which we reside since time immemorial. These Tribes, who are the rightful stewards of the land, include the Buena Vista Rancheria of Me-Wuk Indians of California, Shingle Springs Band of Miwok Indians, Potter Valley Tribe, United Auburn Indian Community, Southern Pomo, Wappo, Patwin, Wintun, Nisenan, Maidu, Yokuts, Coast Miwok, Bay Miwok, Plains Miwok, Him-r^n Ohlone, Jalquin, Saclan Tribe, Confederated Villages of Lisjan, Karkin and Chochenyo Ohlone speaking people, Muwékma Ohlone of the San Francisco Bay Area, Tamien Nation, Association of Ramaytush Ohlone, and the Amah Mutsun Tribal Band. We would also like to acknowledge those Tribes and villages that are not on this list and their inherent right to speak for these lands. Our work to protect and restore the Estuary and its watershed should acknowledge and be informed by the history of injustices, by the fact that we are working on the land of Native people who have been displaced through violent means, and by the fact that our work is often adjacent to or even on top of sacred cultural sites. Recognizing the intersections between ecosystem restoration, human recreation, and vital sacred sites can facilitate opportunities throughout our Estuary to restore, create, and protect for multiple purposes. We do this work in good faith, knowing it is centrally important that we work toward reconciliation and reparations wherever possible.

Prior to colonization, over 10,000 people lived in the coastal area between Point Sur and the San Francisco Bay, belonging to about 58 distinct Tribal communities, and roughly half of the entire Indigenous population of California lived in the Sacramento and San Joaquin Valleys. Today, due to displacement, Tribal groups rarely own or have access to their ancestral territory and sacred sites.

We are working to mend relationships with all Tribal communities so we can be better stewards and allies to the original peoples and disenfranchised communities across the Estuary. We commit to improve our cultural competency and strive to build meaningful relationships with the Tribes, Tribal organizations, and Indigenous peoples of the San Francisco Estuary. We invite Indigenous people from anywhere in the Estuary to reach out to us to collaborate and identify opportunities for partnership.

Racial Equity Statement

The San Francisco Estuary Partnership understands that without meaningful effort to eliminate racial inequity in our work, our mission to protect, restore, and enhance the Estuary can result in perpetuating or exacerbating disproportionate impacts to frontline communities, socially vulnerable and underserved populations, Tribal groups and Indigenous people, and people of color. We seek to listen, understand, and work with these communities towards a healthier, more resilient Estuary that benefits all equally.

We have a long way to go, but we are committed to becoming better allies to frontline communities and Black, Indigenous, and people of color throughout the Estuary and beyond.

Photo: Florence Low

TABLE OF CONTENTS

Photo: Rick Lewis

ESTUARY BLUEPRINT CONTRIBUTORS

Photo: Noah Berger

The 2022 Estuary Blueprint contributors include Blueprint Steering Committee members, Estuary Partnership staff, Estuary Partnership Implementation Committee members, and many individuals from myriad organizations who contributed to the Blueprint through Working Group meetings and individual consultations.

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Pat Eklund, Association of Bay Area Governments

Arthur Feinstein, Citizens Committee to Complete the Refuge

Lisa McCann, San Francisco Bay Regional Water Quality Control Board

Thomas Mumley, San Francisco Bay Regional Water Quality Control Board (IC Chair)

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Sandra Scoggin, San Francisco Bay Joint Venture

Luisa Valiela, U.S. Environmental Protection Agency

Estuary Partnership Implementation Committee

Association of Bay Area Governments

Audubon California

Bay Area Clean Water Agencies Association

Bay Area Council

Bay Area Flood Protection Agencies Association

Bay Area Municipal Stormwater Collaborative

Bay Planning Coalition

California State Coastal Conservancy

California State Department of Fish and Wildlife

California State Department of Water Resources

California State Natural Resources Agency

Central Valley Regional Water Quality Control Board

Citizens Committee to Complete the Refuge

Delta Conservancy

Delta Stewardship Council

East Bay Regional Park District

Friends of the San Francisco Estuary

Local governments

Marin Audubon Society

Metropolitan Transportation Commission

Natural Resources Conservation Service

Natural Resources Defense Council

National Oceanic and Atmospheric Administration - Fisheries

NOAA Office for Coastal Management/Sentinel Site Cooperative

Pacific Gas and Electric

Resource conservation districts

San Francisco Bay Conservation & Development Commission

San Francisco Bay Joint Venture

San Francisco Bay National Estuarine Research Reserve

San Francisco Bay Regional Water Quality Control Board

San Francisco Estuary Institute

San Francisco Public Utilities Commission

Save San Francisco Bay

Sonoma County Water Agency

U.S. Army Corps of Engineers

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

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Alameda County Water District

All Positives Possible

Amah Mutsun Land Trust

American Carbon Registry

Association of Bay Area Governments

Association of Ramaytush Ohlone

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Bay Area Clean Water Agencies

Bay Area Clean Water Agencies' Bay Area Pollution Prevention Group

Bay Area Climate Adaptation Network

Bay Area Ecosystems Climate Change Consortium

Bay Area Flood Protection Agencies Association

Bay Area Municipal Stormwater Collaborative

Bay Area One Water Network

Bay Area Pollution Prevention Group

Bay Area Regional Collaborative

Bay Area Regional Health Inequities Initiative

Bay Area Regional Reliability Partnership

Bay Area Ridge Trail Council

Bay Area Water Agencies Coalition

Bay Area Watershed Network

Buena Vista Rancheria

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California Department of Pesticide Regulation

California Department of Toxic Substances Control

California Department of Transportation

California Department of Water Resources

California Division of Boating and Waterways

California EcoRestore

California Indian Environmental Alliance

California Invasive Plant Council

California Ocean Protection Council

California Ocean Science Trust

California Office of Environmental Health Hazard Assessment

California Product Stewardship Council

California State Coastal Conservancy

California State Lands Commission

California State Parks Department of Boating and Waterways

California State University, East Bay

California State Water Resources Control Board

California Waterfowl

CalTrout

Centers for Disease Control and Prevention

Central and Northern California Ocean Observing System

Central California Vegetation Managers' Workgroup

Central Contra Costa Sanitary District

Central Valley Regional Water Quality Control Board

Citizens Committee to Complete the Refuge

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City of Hayward

City of Oakland

City of Palo Alto

City of Richmond

City of San Francisco

City of San Jose

City of San Pablo

Climate Plan

Committee of Western Regional Panel on Aquative Nuisance Species

Conservation Lands Network

Contra Costa Water District

D

Delta Conservancy

Delta Plan Interagency Implementation Committee

Delta Protection Commission

Delta Stewardship Council

Downtown Streets Team

Ducks Unlimited

E

East Bay Regional Park District

Environmental Science Associates

Envirospectives

Estuary NEWS

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Federal Aquative Nuisance Species Task Force

First Generation Environmental Health and Economic Development

Friends of the San Francisco Estuary

G

Golden Gate Audubon Society

Greater Farallones National Marine Sanctuary

Greenaction for Health and Environmental Justice

I

Interagency Ecological Program

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Los Angeles Metropolitan Water District

Lower Columbia Estuary Partnership

M

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Marin Department of Public Works Engineering Sea Level Rise Program

Marin Resource Conservation District

Merkel & Associates

Metropolitan Transportation Commission

Moss Landing Marine Lab

Mycelium Youth Network

N

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Natural Resources Conservation Service

NorCal Resilience Network

North Bay Water Reuse Authority

North Bay Watershed Association

O

Office of the Delta Watermaster, State Water Resources Control Board and Delta Stewardship Council

P

Pacific Institute

PlantRight Partnership

Point Blue Conservation Science

Potter Valley Tribe

Puget Sound Partnership

R

Reinventing the Nation's Urban Water Infrastructure (ReNUWIt)

ReScape California

Restore the Delta

Richardson's Bay Regional Agency

Romberg Tiburon Center

S

Sacramento Municipal Utility District

Sacramento-San Joaquin Delta Conservancy

San Francisco Bay Area Integrated Regional Water Management Coordinating Committee

San Francisco Bay Area Water Trail Project

San Francisco Bay Bird Observatory

San Francisco Bay Conservation & Development Commission

San Francisco Bay Joint Venture

San Francisco Bay National Estuarine Research Reserve

San Francisco Bay National Wildlife Refuge Complex

San Francisco Bay Regional Coastal Hazards Adaptation Resiliency Group

San Francisco Bay Regional Water Quality Control Board

San Francisco Bay Restoration Regulatory Integration Team

San Francisco Bay Sentinel Site Cooperative

San Francisco Bay Trail Project

San Francisco Baykeeper

San Francisco Estuary Institute

San Francisco Estuary Partnership

San Francisco State University Estuary & Ocean Science Center

San Francisquito Creek Joint Powers Authority

San Mateo Countywide Water Pollution Prevention Program

San Mateo Resource Conservation District

Santa Clara County Parks and Recreation Department

Santa Clara Valley Water District

Save the Bay

Sierra Club

Smithsonian Environmental Research Center

Sonoma Land Trust

South Bay Salt Pond Restoration Project, California State Coastal Conservancy

Southern California Coastal Water Research Project

SPUR

Stanford University

Strategic Growth Council

Suisun Resource Conservation District

Suscol Intertribal Council

Sustainable Silicon Valley

T

The Bay Foundation

The Bay Institute

The Nature Conservancy

The Watershed Project

Tillamook Estuaries Partnership

Together Bay Area

Tuolumne River Trust

U

University of California-Berkeley

University of California-Davis

University of California-Santa Cruz

Urban Tilth

U.S. Army Corps of Engineers

U.S. Coast Guard

U.S. Department of Agriculture

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Geological Survey

V

Valley Water

Virginia Institute of Marine Science

W

WaterReuse California

West Oakland Environmental Indicators Project

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Yolo Basin Foundation

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Alexandra Thomsen

Carmen Zamora (California Sea Grant fellow)

Adrien Baudrimont (former staff)

Kelly Santos (former California Sea Grant fellow)

San Francisco Estuary Partnership
Executive Council Approval of the 2022 San Francisco Estuary Blueprint

(Comprehensive Conservation and Management Plan for the San Francisco Estuary)

The Executive Council of the San Francisco Estuary Partnership has approved the 2022 Estuary Blueprint.

Jared Blumenfeld
Secretary

California Environmental Protection Agency

Therese W. McMillan
Executive Director

Association of Bay Area Governments Acting pursuant to the Contract for Services dated May 30, 2017

Wade Crowfoot
Secretary

California Natural Resources Agency

Paul Souza
Regional Director, Pacific Southwest Region

U.S. Fish and Wildlife Service

Martha Guzman

Regional Administrator, Region 9

U.S. Environmental Protection Agency

LETTER FROM THE IMPLEMENTATION COMMITTEE CHAIR AND VICE CHAIR

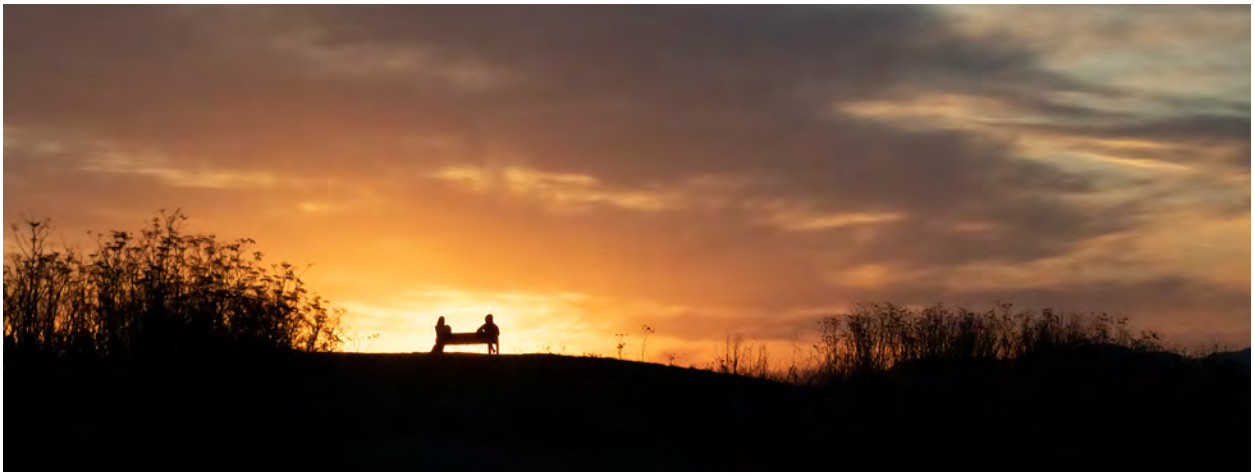


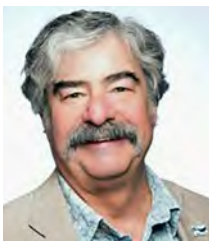
Photo: Peter Beeler

We are pleased to present the 2022 Estuary Blueprint, also known as the Comprehensive Conservation and Management Plan (CCMP). This update reflects hundreds of hours of discussions, research, and coordination by over 180 federal, state, and local agencies and organizations committed to improving the health of the San Francisco Bay and the Sacramento-San Joaquin Delta.

As never before, the Estuary Blueprint emphasizes the connection between the lower and upper Estuary. It recognizes that nature does not see the Bay and Delta as distinct, but rather as a holistic, integrated system forming one beautiful estuary. With this in mind, the Bay and the Delta cannot adapt to climate change independently of one another. Agencies and organizations—state, federal, Tribal, local, and non-governmental—must urgently mobilize our partnerships and collaborate to produce tangible results.

This update takes further steps to protect habitats and living resources, build resilience to sea level rise, improve water quality and quantity, and champion the Estuary. It also underscores the need for equity in our work, as well as the need to address resilience at the nexus of the social and ecological sciences. Just as the Bay and Delta work together to form the Estuary, the social and ecological sciences work together to provide us a more holistic understanding of the systems of which we are part.

While the Estuary Blueprint is action-oriented with tasks and milestones for restoring the Estuary's chemical, physical, and biological processes to health, we—the partners identified in these pages and others—must call upon ourselves to implement the Estuary Blueprint's vision. We must co-create an estuary that adapts to the challenges of climate change urgently and equitably.



Thomas Mumley, Implementation Committee Chair

San Francisco Bay Regional Water Quality Control Board

Amanda Bohl, Implementation Committee Vice Chair

Delta Stewardship Council

Photo: Nick Sebastian

INTRODUCTION

Photo: Noah Berger

In the past few years, the San Francisco Estuary region has confronted epic wildfires, historic rainfall intensity and flooding, and chronic drought. The whiplash of these events has confirmed that climate change has already begun to impact human and wildlife communities from Sacramento to San Francisco, and beyond.

Furthermore, a global COVID-19 pandemic has disrupted regional planning and project implementation everywhere, presenting new challenges to traditional processes and creating an unfamiliar working landscape for resource managers.

Finally, the pervasive, horrific violence against Black, Brown, and Asian and Asian-American people has amplified long-term calls for racial justice, galvanizing new commitments to address historic and present inequity through every thread of our social fabric.

These events have set the context for the multi-stakeholder process that updates the San Francisco Estuary Blueprint. The 2022 Estuary Blueprint is the product of hundreds of hours of collaboration by over 300 individuals committed to achieving a healthier, more resilient Estuary by 2050. The 25 Actions in the Blueprint advance stakeholder goals for our region by addressing both legacy and emerging issues, forging new relationships and practices, and preparing for an uncertain future. Stakeholders will also collaborate to advance the Blueprint goals more equitably with frontline communities, underserved populations, and Tribes, Tribal organizations, and Indigenous people. Grounded in the best available science, buoyed by over 30 years of collaboration, and rejuvenated by new stakeholders at the planning table, the contributors to the Blueprint worked towards this update with great adaptability, innovation, and urgency to guide the San Francisco Estuary region for the next five years.

What is to be the future of the Estuary that sits at the heart of 12 Bay Area and Central Valley counties and serves all of California as the hub of a critical water supply system? How can the communities that surround the Estuary best protect this economic engine and ecological treasure, as climate change exerts more and more pressure? Can we sustain all the beneficial uses of its waters—for drinking, irrigation, shipping, fishing, recreation—while reducing stresses on its habitats and wildlife and restoring them to health? If climate change and population growth continue as projected, what will the Estuary look like in 50 years? How do we plan for both expected changes and those we cannot yet foresee? What actions can we take now to help ensure a thriving Estuary in 2050, almost three decades into the future? These are the pressing questions that the San Francisco Estuary Partnership, working with hundreds of partners over the last 35 years, has sought to answer, and it is these questions that shape the core of the updated 2022 Estuary Blueprint.

Without the perseverance and dedication of the Estuary Blueprint's contributors, this plan and its progress—past and present—would not exist. Navigating the unpredictability of climate change toward a healthier, more resilient Estuary requires adaptability, innovation, and collaboration, and the Estuary Blueprint is the roadmap that gets us there.

About The Partnership

The San Francisco Estuary Partnership was established in 1988 by the State of California and the U.S. Environmental Protection Agency under the Clean Water Act's National Estuary Program when the San Francisco Estuary was designated as an estuary of national significance. The Partnership is a collaboration of local, state, and federal agencies, non-governmental organizations, academia, and business leaders working to protect and restore the San Francisco Bay-Delta Estuary. Section 320 of the Clean Water Act calls for each National Estuary Program to develop and implement a Comprehensive Conservation and Management Plan (CCMP) to establish priorities and guide decisions to address a range of environmental issues for the Estuary. The San Francisco Estuary Partnership's CCMP—first produced in 1993—is now known as the Estuary Blueprint. With the Estuary Blueprint as a guide, the San Francisco Estuary Partnership leverages federal, state, and local resources to support projects and programs to protect, enhance, and restore the Estuary system, working with a large suite of diverse partners. The Partnership's host entity is the Association of Bay Area Governments, which is staffed by the Metropolitan Transportation Commission.

About the San Francisco Estuary

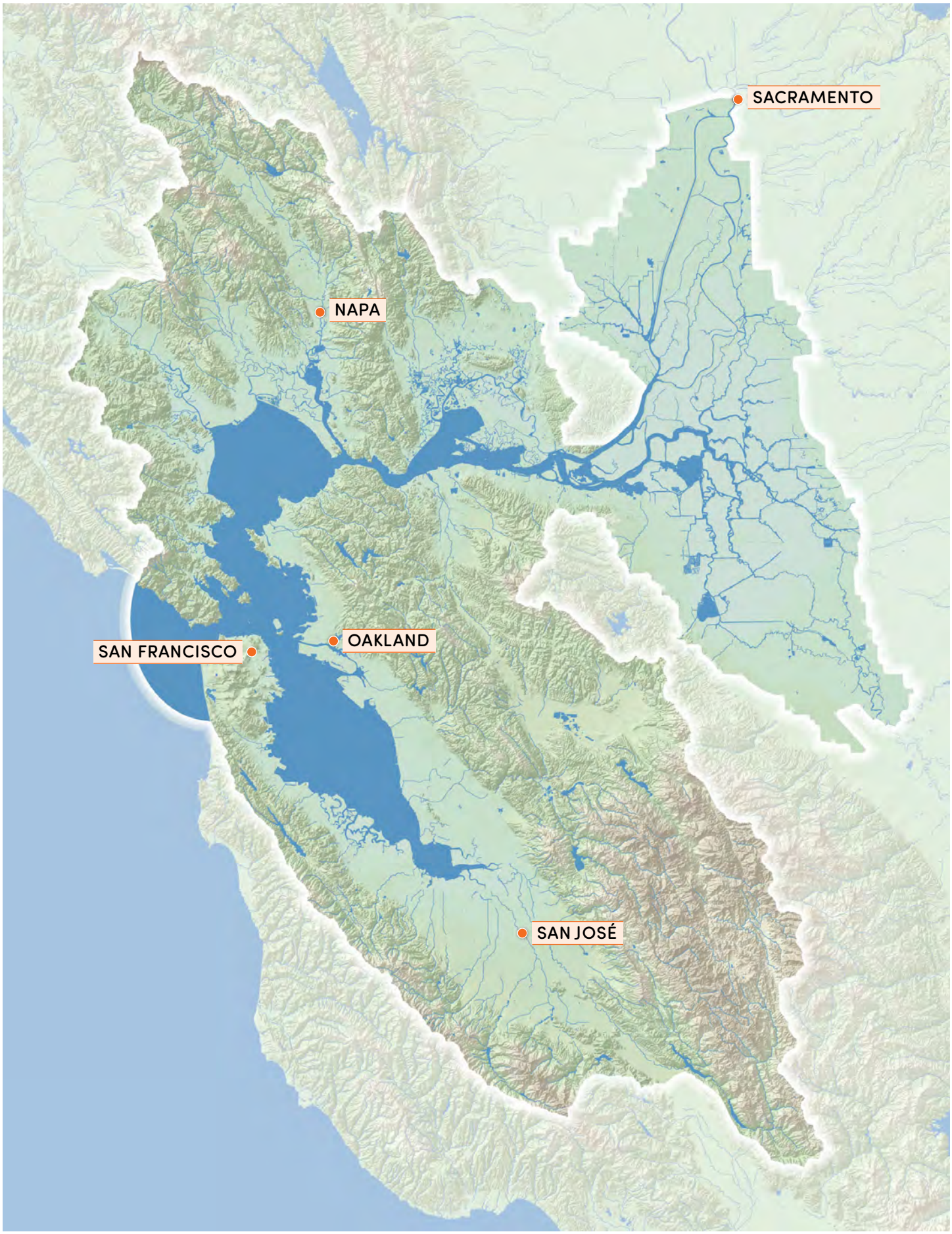
Our Estuary, the largest in western North America, encompasses San Francisco Bay and the Delta of the Sacramento and San Joaquin rivers in California. Unlike most estuaries that spread out into a wide delta of braided channels where rivers meet the sea, the San Francisco Estuary's Delta is more than 60 miles inland, trapped behind coastal ridges after rising seas flooded the Bay 10,000 years ago. Managers often divide this complex water body into the Bay and the Delta, or the upper and lower Estuary. However, it is all one system connected by freshwater outflow to the Pacific and by the ebb and flow of ocean tides far upstream into the Delta. The Estuary's watershed extends from the ridgeline of the Sierra Nevada mountains to the Golden Gate, including almost 60,000 square miles and nearly 40 percent of California.

The Estuary's waters and wetlands are a biological resource of tremendous importance—providing critical winter feeding habitat for over a million migratory birds each year, a productive nursery for many species of juvenile fish and shellfish, and a year-round home for a vast diversity of plants and animals. Half of California's surface water supply falls as rain or snow within this region.

Geographically, San Francisco Bay includes four smaller bays. The farthest upstream is Suisun Bay, which includes a vast area of marshes. Suisun Bay lies just below the confluence of the Sacramento and San Joaquin Rivers. Suisun and its neighbor San Pablo Bay, sometimes called the North Bay, are surrounded mostly by rural areas, and are strongly influenced by freshwater outflows from the rivers. The Central Bay, ringed by three bridges, is the deepest and saltiest of the four bays. Cities and industries occupy most of its shores. The shallower South Bay extends south into quiet backwaters surrounded by restored marshes, salt ponds, and suburban office parks and lagoon communities.

Upstream of the Bay, the Sacramento-San Joaquin River Delta is a 1,000 square-mile triangle of diked and drained wetlands. Only small remnants of once-extensive tule marshes still fringe the channels that wind between the flat, levee-rimmed farmlands of the Delta's myriad islands, many of which are now deeply subsided and below sea level. Before it was diked and drained, the Delta gathered the fresh waters of the Sacramento, San Joaquin, Mokelumne, and Cosumnes rivers and moved them all downstream through a complex array of tidally influenced channels into San Francisco Bay. Today, the Delta, with its rich farmland, is the engineered junction of one of the world's largest plumbing systems, where much of the system's fresh water is diverted to supply California's population centers and Central Valley agriculture.

Figure 1. Map of the San Francisco Estuary Partnership Study Area



Estuary Blueprint Purpose

The San Francisco Estuary Partnership's Estuary Blueprint is a collaborative agreement about what should be done to protect and restore the Estuary—a road map for restoring the Estuary's chemical, physical, biological, and social-ecological processes to health. The Estuary Blueprint does not hold regulatory authority but identifies consensus-based, collaboratively identified regional priorities, and tracks progress on achieving the Blueprint's actions via publicly available websites and documents. The plan asks participating entities to commit to the actions, but each entity retains its own discretion to make decisions related to the San Francisco Estuary and is not bound by the findings or recommendations in the Estuary Blueprint.

Photo: Karen McDowell

Estuary Blueprint History

The first Estuary Blueprint (then known as the Comprehensive Conservation and Management Plan) was produced in 1993 after several years of status assessments and policy discussions in which over 100 different stakeholder groups took part. It was the first plan to recognize that the Bay and the Delta should be managed as one Estuary and remains the only plan of such scope to date. After 14 years of implementation, the CCMP was updated in 2007 to include new and revised actions while maintaining many actions from the original.

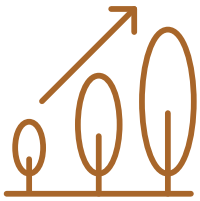
In 2016, the CCMP was revised to reflect the changing context of Estuary management, with a new focus on the need to plan for and adapt to climate change. The 2016 CCMP created a closer alignment with the State of the Estuary Report, which tracks the health of the Estuary and is updated every four to six years. It also represented a major overhaul of earlier versions, reducing over 200 actions to 32 actions with a clear five-year time frame for implementation of each action's tasks. The document was retitled the Estuary Blueprint to reflect this shift.

The 2022 Estuary Blueprint maintains the overall structure of the 2016 plan of actions to be carried out over five years, connected to longer-term goals and objectives with a target of 2050 for a healthy, resilient Estuary.

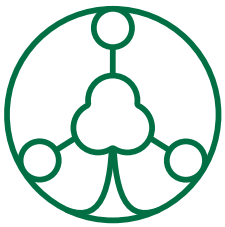
SAN FRANCISCO Estuary Blueprint

2022 Estuary Blueprint Update Process

The update of the Estuary Blueprint took place over two years and is the result of countless hours of effort from a broad range of organizations, agencies, and individuals across the Estuary. The 2022 update was guided by the following principles:



I. **Remain aspirational yet feasible:** The actions are aspirational but consist of a set of tasks to be achieved within the five-year time frame of the plan.



II. **Expand and deepen multi-sectoral engagement:** As a collaborative, consensus-based document, the Estuary Blueprint should reflect the agreement of as broad a set of stakeholders as possible. Deeper engagement by a broader set of stakeholders will result in a more robust plan.

III. **Integrate further across geographies and plans:** Building on the integration of plans in the 2016 Estuary Blueprint, this update seeks to emphasize the connections and commonalities between the upper and lower Estuary and incorporate relevant priorities in new or recently updated regional plans.

IV. **Focus on equity:** The 2022 Estuary Blueprint seeks to address this critical missing component of past plans by integrating issues of equity into every action and by explicitly creating a new action and associated tasks dedicated to improving equitable outcomes.

V. **Improve clarity and responsibility:** This update builds on the successful implementation of the 2016 Estuary Blueprint by strengthening the connections between actions, tasks, and associated milestones.

Several governing bodies directed the efforts of the Estuary Blueprint update.

- San Francisco Estuary Partnership Executive Council: The Executive Council is responsible for review and approval of the updated Blueprint and consists of: California Natural Resources Agency Secretary; California Environmental Protection Agency Secretary; U.S. Environmental Protection Agency Region 9 Administrator; U.S. Fish and Wildlife Service Pacific Southwest Region Director; and Association of Bay Area Governments Executive Director.
- San Francisco Estuary Partnership Implementation Committee (IC): The 39-member IC is composed of partners who are engaged in implementing the Estuary Blueprint. The IC meets quarterly and provides overall guidance, interim input, and review and approval of the updated Blueprint.
- Estuary Blueprint Update Steering Committee: Comprised of volunteers from the IC, the nine-person steering committee met monthly to guide and direct the overall update as representatives of the IC and served as content experts.
- Action Working Groups: Working groups were led by Estuary Partnership staff who organized participants around actions or clusters of actions and guided updates to the actions and tasks. Working group members included past Task Leads (called "Owners" in the 2016 Blueprint) and Collaborating Partners, IC and Steering Committee members, program partners, and other experts and interested individuals. These working groups provided guidance for revision of and updates to the actions' tasks.
- San Francisco Estuary Partnership Staff Team: This team managed the overall Blueprint update process, including developing agendas and facilitating steering committee meetings and working group meetings; providing guidance for and participating directly in working groups; and compiling all content.
- San Francisco Estuary Partnership Partners and General Public: Interested parties not on the steering committee and working groups provided input on interim products throughout the development process. Staff engaged partners and the general public through various forums including presentations, online meetings and listening sessions, the San Francisco Estuary Partnership website, social media, an online survey, and a public comment period.

Photo: Karl Nielsen

The 2022 Estuary Blueprint recognizes the connection between healthy, thriving communities and a healthy, resilient Estuary. It goes further than previous versions to elevate equity to a priority concern for the present and future.

The Estuary Blueprint update anticipates the disproportionate impacts of climate change on vulnerable, underserved, and marginalized communities, especially those that are non-White, non-native English speakers, elderly, poor, chronically ill, uninsured, and/or renters. Program leaders and partners acknowledge the subjugation, near decimation, and unjust theft of land from Indigenous peoples, the redlining and pollution of Black and other non-White communities, and the prolonged underinvestment and lack of accountability by government agencies and environmental groups. The 2022 Estuary Blueprint reflects upon and seeks to understand its place, and act towards ameliorating decades of mistrust, discrimination, and wrongdoing.

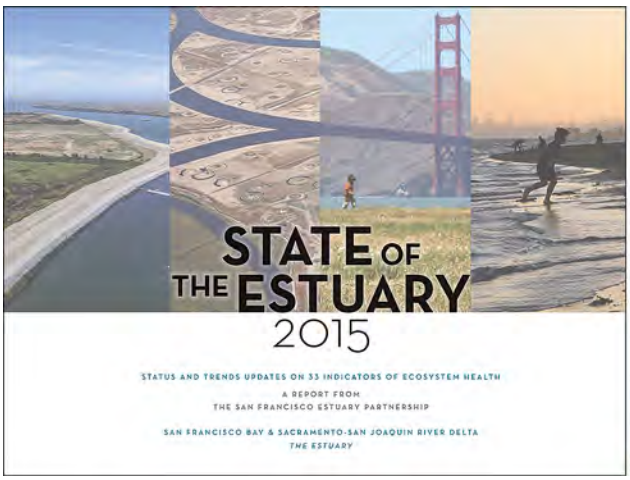
The Equity action in the 2022 Estuary Blueprint aims to promote environmental equity in the San Francisco Estuary region in concurrent, complementary ways. Equity is both integrated in actions throughout the Estuary Blueprint, and explicitly featured as its own action. This deliberate decision recognizes that if equity is not prioritized in our work, it will fall to the wayside and perpetuate an inequitable status quo. It also recognizes the need for broader stakeholder representation at the planning table in earlier phases of development. It seeks to prioritize the needs of those that have been marginalized from previous adaptation and other regional environmental planning processes and those that have historically lacked the ability to participate due to systemic and institutional barriers.

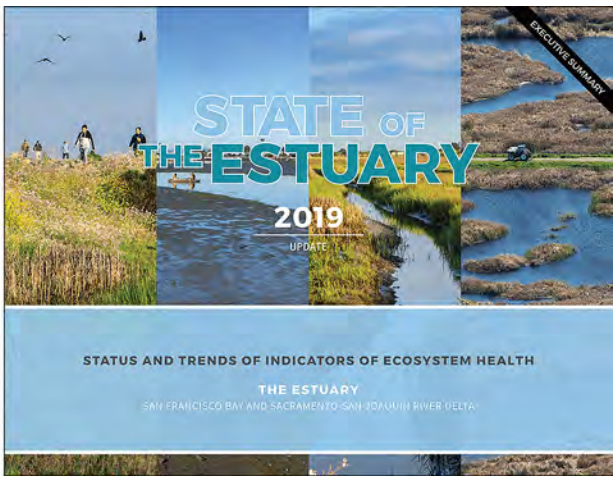
Photo: Karl Nielsen

Under Action 2, Task 2-1 will create a network of community-based organizations to increase collaboration between communities and government agencies. By setting a goal to fund projects that build the capacity of marginalized communities, Task 2-2 will support and elevate community voices that are invaluable to regional planning processes. Additionally, Tasks 2-3 and 2-4 will support work to recognize that those long involved with the efforts to improve the Estuary's ecosystems need to reflect on their role critically and iteratively in contributing to inequitable systems, as well as creating practical resources that can facilitate more equitable decision-making and project implementation processes.

The Equity action, select tasks related to equity, and the equity considerations featured in each action's overview reflect a priority of the San Francisco Estuary Partnership and the 2022 Estuary Blueprint: everyone — not a select few — should be able to benefit from a healthier, more resilient environment.

FINDINGS





The Estuary Partnership released a full State of the Estuary Report in 2015 and an interim State of the Estuary Report in 2019. The State of the Estuary Report is the most comprehensive health report completed for the Estuary and is updated regularly. It uses the best available science and most recent data to assess the status of various parts of the ecosystem. The State of the Estuary Report offers an assessment of progress toward solving the Estuary's most urgent problems using key indicators of estuarine health developed over the past 30 years.

The full 2015 State of the Estuary Report evaluated 33 indicators of estuarine health and found mixed results for different areas of the Estuary: 12 indicated poor condition and 21 fair-to-good condition.

The 2019 State of the Estuary Report offered an interim assessment of five key indicators and explored three potential new indicators as part of a greater focus on the nexus between human well-being and estuarine health and the pressing challenge of climate change. The following findings come from the 2019 interim State of the Estuary Report and the 2015 complete State of the Estuary Report, and form the basis for the goals, objectives, and actions of the 2016 and 2022 Estuary Blueprints.

How Healthy is the Estuary?

- The upper Estuary (Suisun Bay and the Delta) is in fair to poor condition and getting worse, while the lower Estuary (San Francisco Bay) is in better health but jeopardized by climate change.
- Freshwater inflows and beneficial floods now exert such a small fraction of their former influence that they no longer build and maintain the physical structure of habitats in the Estuary, drive historical seasonal changes, or support critical ecological functions.
- Changes to the hydrology of the Estuary's watersheds and the diking of tidal areas have eliminated estuarine wetlands and deprived the remaining wetlands of the sediment they need to build up their elevation in relation to sea level rise.
- This impairment of critical physical processes is intertwined with habitat loss, degradation, and fragmentation.
- These losses of physical processes and habitats have reverberated throughout biological systems, contributing to unproductive food webs, smaller and declining native fish and wildlife populations, and the dominance of invasive species.
- Certain indicators of both human and ecological health, such as the amount of open green space, demonstrate an inequitable distribution across communities in the Estuary.
- Human activities have severely altered the physical processes that create and maintain estuarine habitats and the benefits they provide to people; however, Estuary habitat restoration efforts have increased shoreline protection from sea level rise and storms, provided the public with access to nature and open space, supported endangered species, increased opportunities for carbon sequestration, and increased the aesthetic beauty of a highly populated area.

Can We Improve the Health of the Estuary?

The State of the Estuary Reports suggest that we can restore some aspects of ecosystem health when we choose to make the investment.

- Water quality has improved over the last few decades due to better management and regulation, though some legacy contaminants remain a problem.
- Focused collaboration, along with significant funding, has resulted in large gains in tidal marsh restoration over the last two decades. Improvements in marsh-dependent wildlife populations are now detectable.
- Investments in water conservation and recycling in urban areas are reducing demand for potable water, even while population is increasing.
- Despite these gains, impacts from climate change jeopardize the health of all parts of the Estuary.

What Will it Take to Achieve a Healthy Estuary?

A healthy Estuary needs more freshwater flows through the system, more flooding in the right places, more space for natural habitats and wildlife and connections between habitat patches, more sediment moving through watersheds, and less hardscape, among many other needs. A healthy Estuary also needs more real time monitoring of estuarine conditions, as well as funding to learn from and adapt to what works and doesn't work in restoration and intervention.

- Restoring the health of the upper Estuary will require significant investment. Restoration of critical physical processes can create resilience to climate change, habitats to support native wildlife, and benefits like shoreline protection and carbon sequestration. The health of the upper Estuary is also dependent on the management of nonnative species and the prevention of new invasive species.
- The health of the entire Estuary would benefit from more efficient use of the system's fresh water for human use, as well as changes in upstream water management.
- The Estuary's wetlands remain at risk unless we take a watershed-based, regional approach to managing sediment and fresh water as essential resources and allow for tidal wetlands to migrate landward.
- Wildlife conservation efforts should aim to ensure successful reproduction and habitat connectivity over time as climate change alters landscapes, as well as more focus on frequent population monitoring with a plan to intervene if an extreme event jeopardizes rare species.
- The interconnectedness of the Estuary and its surrounding communities needs to be recognized, and its legacies of environmental injustices acknowledged and addressed. It is critical to engage frontline and underserved communities, Tribes, Tribal organizations, and Indigenous communities as partners in protecting, restoring, and enhancing the Estuary.
- Moving forward, management actions must occur in the context of change. Sustaining a healthy Estuary while addressing the impacts of climate change, including prolonged drought and rising seas, will require collaboration, adaptation, flexibility, and resilience among all engaged communities and agencies from now on.

This 2022 Estuary Blueprint provides 25 immediate priorities for achieving a healthier Estuary.

The full background on the conclusions summarized above, as well as detailed findings, metrics, and technical appendices on Estuary health, can be found at sfestuary.org.

Photo: Karl Nielsen

The 2022 Estuary Blueprint recognizes that climate change is no longer a future abstraction, but a present reality already impacting the region.

In addition to preparing the region for more extreme weather events like prolonged drought and intense bursts of precipitation, scientists and planners are also confronted with the issue of looming sea level rise: a significant concern for both human and habitat investments around Estuary shores such as housing, regional infrastructure, and thousands of acres of restored wetlands.

To meet these extraordinary challenges, resilience has been incorporated as a throughline in the 2022 Estuary Blueprint. Steps to address and prepare for climate change begin with Blueprint Goal 2: Bolster the resilience of Estuary ecosystems, shorelines, and communities to climate change. Within this broad and overarching priority, numerous actions and objectives address more specific characteristics of resilience such as habitat and species diversity, buffer and transition zones, and connectivity and complexity in the design of natural and human infrastructure, among others. Each of the 25 actions in the Blueprint also examines climate resilience in their respective action backgrounds, using the Climate Change Considerations section to explain how each action will address or be impacted by climate change.

The 2022 Estuary Blueprint's approach has also been updated to take a holistic approach to increasing resilience: one that is premised on the belief that the resilience of geophysical environments and human communities are not only interconnected, but interdependent. Action 2 (Equity) was created to acknowledge that increased resilience in the region will not be possible without the buy-in of communities, especially those considered to be vulnerable, underserved, and frontline to the impacts of climate change.

Through the 2022 Estuary Blueprint, the San Francisco Estuary Partnership will continue to help partners and stakeholders visualize and build ecosystems and communities that are more resilient to climate change.

IMPLEMENTATION

Photo: Shira Bezalel

Where do we want to be in 2050?

What should be done in the next five years?

If we want a healthy, resilient Estuary by 2050, our work is clear and urgent. Our efforts over the next five years need to move regional strategies forward quickly to both clean up legacy issues from our past as well as confront the climate change impacts that have already arrived on our doorstep. The Estuary Blueprint, as the foundational Comprehensive Conservation and Management Plan (CCMP) for the San Francisco Estuary, focuses the region on the issues most in need of immediate, effective action.

The implementation section of the Estuary Blueprint contains goals, objectives, and actions to guide the region towards a healthier Estuary. The four goals provide a long-term vision for the Estuary. The 14 objectives delineate desired outcomes needed to achieve the goals, and the 25 actions lay out a set of priority tasks that address the work most urgently needed in our regional effort. The 25 actions advance multiple goals and objectives (see Nexus Table p. 16) and represent a cohesive, comprehensive approach over the next five years to address the most pressing threats to the Estuary.

The Estuary Blueprint presents an integrated approach to comprehensive regional efforts. Special spotlight sections integrate overarching themes of the Blueprint, including wildlife, resilience and adaptation, and equity. The Appendix highlights threatened and endangered species and analyzes how specific actions intersect with core management concepts including habitat recovery and protection, climate resilience, migratory and resident bird benefits, and invasive species reduction.

Goals

BLUEPRINT GOAL 1
Sustain and improve the Estuary's habitats and living resources

BLUEPRINT GOAL 2
Bolster the resilience of Estuary ecosystems, shorelines, and communities to climate change

BLUEPRINT GOAL 3
Improve water quality and increase the quantity of fresh water available to the Estuary

BLUEPRINT GOAL 4
Champion the Estuary

August 2011 (left) and September 2020 (right) images of Eden Landing Ecological Reserve near the mouth of Mt. Eden Creek. Photos: C. Benton

Objectives

A. Protect, restore, and enhance ecological conditions and processes that support self-sustaining natural communities

B. Eliminate or reduce threats to natural communities

C. Conduct scientific research and monitoring to measure the status of natural communities, develop and refine management actions, and track progress towards management targets

D. Increase resilience of tidal habitats and tributaries to climate change

E. Increase resilience of communities at risk from climate change impacts while promoting and protecting natural resources

F. Promote integrated, coordinated, multi-benefit approaches to increasing resilience

G. Increase drought resistance and water efficiency and reduce reliance on imported water

H. Improve freshwater flow patterns, quantity, and timing to better support natural resources

I. Reduce contaminants entering the system and improve water quality

J. Build public support for the protection and restoration of the Estuary

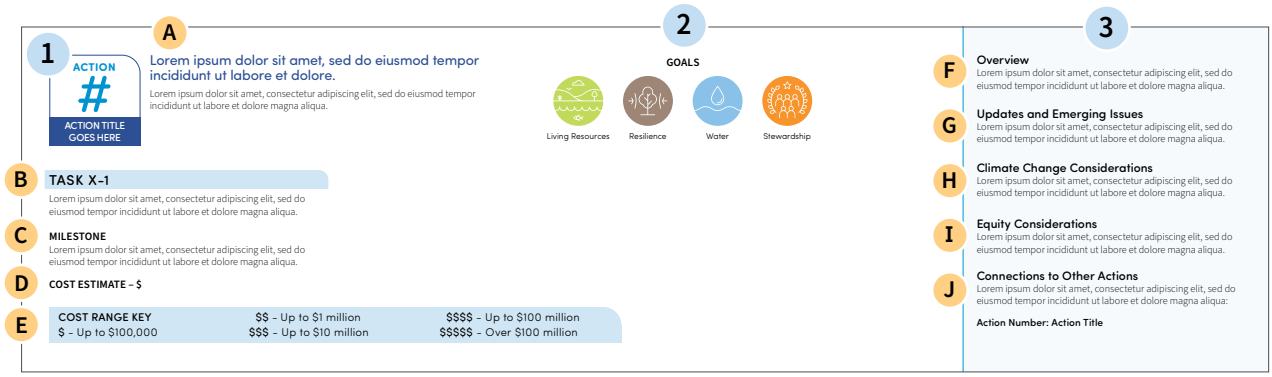
K. Strengthen regional leadership in support of Estuary health

L. Promote efficient and coordinated regional governance

M. Incorporate the best available social science and cultural knowledge when protecting and improving the Estuary

N. Engage frontline, underserved, and Indigenous communities as partners in protecting, restoring, and enhancing the Estuary

Anatomy of an Action



1 ACTION TITLE

The language of the action itself, describing the type of action (such as protect, improve, develop), the object of the action (such as habitats, monitoring programs, communities), and any key qualifiers or targets (such as watershed-scale, nature-based, multi-benefit).

A **Action Description** provides an expanded version of the action, including additional narrative or details.

B **TASK X-1** All actions include multiple tasks; some tasks occur in a logical progression, while others address a variety of geographic areas or gaps in achieving a comprehensive action.

C **MILESTONE** All tasks have one clear, measurable milestone, or "to do" item, to be completed over the next five years to support the larger action.

D **COST ESTIMATE** This symbol represents an estimate of the funding needed to fulfill the milestone associated with this task.

E **COST RANGE KEY** Defines the cost range per task.

2 GOALS ICONOGRAPHY

The icons represent the nexus of the action with one or more of the Blueprint Goals.

3 BACKGROUND

The background section provides key contextual information for the action under the following subheadings:

F **Overview** further explains the action and why it is a priority for a resilient and thriving Estuary;

G **Updates and Emerging Issues** conveys significant changes to the focus of the action between the 2016 Estuary Blueprint and the current Blueprint, and in some cases anticipates future shifts;

H **Climate Change Considerations** explains how the action addresses or may become more urgent and challenging with further climate change;

I **Equity Considerations** evaluates how the action addresses or impacts frontline, socially vulnerable and/or marginalized communities, including any ways the action addresses or should address these impacts in future versions of the Estuary Blueprint; and

J **Connections to Other Actions** emphasizes the core connections between specific actions.

TASK LEADS*

Entities listed as Task Leads have agreed to play a key role in advancing tasks as implementers, funders, trackers, conveners, or stewards.

COLLABORATING PARTNERS*

Collaborating Partners is a list of key entities, in addition to the Task Leads, engaged in accomplishing the task. This list describes the most central partners but may not include all possible partners associated with a collaborative task. Collaborating partners represent organizations that might implement, champion, inform, advise, or provide scientific or technical expertise in support of the action, tasks, and milestones.

* Task Leads and Collaborating Partners are listed by task in the Partners Table on p. 70

Table 1. Nexus of Goals and Actions Table

		BLUEPRINT GOAL 1 Sustain and improve the Estuary's habitats and living resources	BLUEPRINT GOAL 2 Bolster the resilience of Estuary ecosystems, shorelines, and communities to climate change
Action	Action Shorthand Description		
1	**Climate Resilience**	X	X
2	**Equity**	X	X
3	**Adaptation Planning**	X	X
4	**Adaptation Implementation**	X	X
5	**Watershed Connections**	X	X
6	**Sediment**	X	X
7	**Carbon Management**	X	X
8	**Wetland Monitoring**	X	X
9	**Intertidal/Subtidal Habitats**	X	X
10	**Tidal Marsh**	X	X
11	**Transition Zones**	X	X
12	**Managed Wetlands**	X	X
13	**Seasonal Wetlands**	X	X
14	**Creeks**	X	X
15	**Invasive Species**	X	
16	**Freshwater Flows**	X	X
17	**Water Conservation**	X	X
18	**Recycled Water**	X	X
19	**Stormwater Management**	X	X
20	**Nutrients**	X	X
21	**Emerging Contaminants**	X	
22	**Health Risks of Contaminants**		X
23	**Trash**	X	
24	**Public Access**	X	
25	**Champion the Estuary**	X	X

BLUEPRINT GOAL 3 Improve water quality and increase the quantity of fresh water available to the Estuary	**BLUEPRINT GOAL 4** Champion the Estuary
	X
X	X
	X
	X
X	
	X
X	X
	X
X	
X	
X	
X	X
X	X
X	X
X	X
X	
X	X
X	X
X	X
	X
X	X

Photo: Karl Nielsen

Actions

In many ways, the following actions form the heart of the 2022-2027 Estuary Blueprint. These 25 actions prioritize work on the areas identified as most urgently needing progress in the next five years.

ACTION 1
CLIMATE RESILIENCE

Plan for increased climate resilience that incorporates natural resource protection.

Facilitate regional planning efforts to understand and address climate change impacts and advance climate adaptation that emphasizes the protection of natural resources.

TASK 1-1

Implement the Bay Adapt Joint Platform to advance climate adaptation in the lower Estuary that supports protection of the Estuary's resources and its communities.

MILESTONE
"Vision Statement" for the Bay shoreline that sets a long-term picture of successful adaptation; regional and sub-regional objectives; regional and sub-regional strategies and actions; and guidelines and methodologies for evaluating local plans and projects for funding and other incentives.

COST ESTIMATE – $$

TASK 1-2

Complete and implement Delta Adapts to advance climate adaptation in the upper Estuary that supports protection of the Estuary's resources and its communities.

MILESTONE
Delta Adapts Adaptation Strategy.

COST ESTIMATE – $$

TASK 1-4

Determine need for new, or modification of existing, regulatory authority to protect shoreline habitats and open space while pursuing measures to protect communities and infrastructure from climate impacts through establishment of a collaborative working group.

MILESTONE
Shoreline regulatory authority Impact and Needs Assessment.

COST ESTIMATE – $$

TASK 1-5

Establish an independent Climate Science Consortium that supports needed science and provides high-quality science translation to advance adaptation and resource protection.

MILESTONE
Climate Science Consortium.

COST ESTIMATE – $$$

TASK 1-7

Fund and support completion of robust, coordinated city and county-level adaptation plans that prioritize natural features and ecosystem processes as resilience strategies.

MILESTONE
Five local adaptation plans that include strategies for protecting natural areas.

COST ESTIMATE – $$$

TASK 1-8

Determine potential influence of rising sea level on groundwater elevations (and contaminated sites) within counties using an interpolated groundwater model based on empirical measurements.

MILESTONE
Groundwater data model for nine counties.

COST ESTIMATE – $$

COST ESTIMATE KEY		
$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Stewardship

TASK 1-3

Establish a Regional Climate Resilience Equity Consortium run by community-based organizations to provide participation and input on an as-needed basis for climate resilience planning, policy, and implementation projects.

MILESTONE

Workplan including tasks, a cost estimate, and funding analysis for a Regional Climate Resilience Equity Consortium.

COST ESTIMATE – $$

TASK 1-6

Expand the use of the Adaptation Atlas to support analysis and selection of adaptation strategies within Operational Landscape Units (OLUs) to support natural resource protection and advancement of nature-based strategies.

MILESTONE

Adaptation strategies for one to two OLUs per year through collaborative process.

COST ESTIMATE – $$$

Photo: Andrew Innerarity

Overview

The Estuary needs robust climate resilience planning to guide major collaborative action in the decades to come. This Action responds to the climate crisis and accelerates regional climate adaptation by setting regional objectives and guidelines, supporting critical climate change science, and advancing adaptation planning at the local level. Natural resources protection and restoration are key components of a regional response to climate change.

Updates and Emerging Issues

Since 2016, much progress has been made in climate resilience planning, including completion of local and regional vulnerability assessments (including Adapting to Rising Tides Regional Sea Level Rise Vulnerability and Adaptation Study and Delta Adapts Vulnerability Assessment) and advancement of adaptation strategies (such as Bay Adapt Joint Platform and Delta Adapts Adaptation Plan). The updated Action supports and advances ongoing efforts for regional climate resilience planning with a focus on natural resource protection, as well as addressing the potential mobilization of nearshore contaminated groundwater.

Climate Change Considerations

The unpredictability and scale of climate change impacts will be felt regionally, so any planning that enhances resilience will need to be collaborative and coordinated. This Action recognizes the urgency of the climate crisis while exploring long-term solutions that sustain precious ecosystem processes.

Equity Considerations

Climate resilience and adaptation projects will need to pay special attention to social equity, since planning and implementing large projects to prepare the physical environment for sea level rise will inevitably affect the economic and social dimensions of its inhabitants. Furthermore, many nearshore sites with residual contamination in soil are located in underserved communities and communities of color who face health risks with current and future exposure. It is critical that agencies work in partnership with community leadership to address priority concerns.

Connections to Other Actions

Climate resilience shares intersections with many other Actions in the Blueprint, but is most closely connected with:

A2: Equity

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

A19: Stormwater Management

ACTION
2
EQUITY

Elevate frontline and Indigenous communities in planning for and benefiting from a healthy, resilient Estuary.

Support the role that Indigenous and frontline communities play in promoting Estuary health and resilience by advancing equity through regional strategies, including growing capacity for government agencies and for organizations with deep roots in frontline and underserved communities.

TASK 2-1

Develop a living network of Bay Area community-based organizations to foster collaboration and increase equity in planning and permitting decisions.

MILESTONE

A pilot Community-Based Organization Directory Map launched with a requisite training module.

COST ESTIMATE – $

TASK 2-2

Grow the capacity of community members and community-based organizations to be active leaders in improving the health of the Estuary, including funding, grant-making, and grant-writing assistance to result in restoration project planning, design, and implementation.

MILESTONE

20 projects that grow the capacity of frontline and underserved communities to plan and implement projects.

COST ESTIMATE – $$$

TASK 2-4

Develop Best Management Practices (BMPs) in partnership with Tribes, Tribal representatives, and Indigenous people for incorporating cultural knowledge and resource needs into the design and implementation of habitat restoration and nature-based shoreline adaptation projects.

MILESTONE

BMPs manual completed and disseminated to project managers and funders, with up to three associated workshops to train audiences in use of BMPs.

COST ESTIMATE – $$

Photo: Heidi Nutters

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 2-3

Develop strategies or Best Management Practices (BMPs) in partnership with frontline and underserved communities for incorporating community priorities into the design and implementation of habitat restoration and nature-based shoreline adaptation projects. Coordinate with the Community-Based Organization Directory module in partnership with frontline and underserved communities.

MILESTONE

A BMPs manual completed and disseminated to project managers and funders, including up to three associated workshops to train audiences in use of BMPs.

COST ESTIMATE – $$

Photo: Karl Nielsen

Overview

The people who live throughout the Estuary are a part of its history and future; they have an impact on it as much as this ecosystem has an impact on them. Without meaningful efforts to increase equity in our work, our mission to protect, restore, and enhance the Estuary can result in disproportionate impacts to frontline communities, Black people, Tribes and Indigenous people, and people of color. This Action commits the actors in the region to listen, support, and work collaboratively with these underserved populations for the purpose of creating a healthier Estuary for all.

Updates and Emerging Issues

This is a new Action that acknowledges the importance of environmental justice and equity in the Estuary Blueprint's vision. Future efforts include conducting a racial equity analysis of the Blueprint to inform the next update or revision.

Climate Change Considerations

Climate change will disproportionately affect marginalized communities, so it is imperative that local and regional governments work in tandem with these communities to plan, design, and implement resilience projects.

Equity Considerations

To adequately address environmental injustice in our work, it is important to prioritize equity implicitly and explicitly in the Estuary Blueprint. This Action explicitly dedicates the region to more equitable policies, processes, and outcomes.

Connections to Other Actions

While many Actions include considerations to equity in their Tasks and Milestones, this Action is most closely connected with:

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A14: Creeks

A16: Freshwater Flows

A20: Nutrients

A22: Health Risks of Contaminants

A24: Public Access

A25: Champion the Estuary

ACTION 3
ADAPTATION PLANNING

Overcome challenges to accelerate implementation of climate adaptation projects that prioritize natural and nature-based strategies.

Remove barriers that stand in the way of implementing projects that prepare and adapt the Estuary's ecosystems and communities for climate change. Barriers to the implementation of projects that address climate change include lack of technical expertise and data, lack of funding, and regulatory policies and processes.

TASK 3-1

Implement community-based climate adaptation solutions that prioritize natural resources by supporting frontline communities and community-based organizations as full partners and leaders in adaptation planning and implementation.

MILESTONE

Community-based organizations and frontline communities funded to lead or participate in at least one to two adaptation planning or implementation projects per year.

COST ESTIMATE – $$$

TASK 3-2

Establish a technical assistance "help desk" network that coordinates programs and entities to provide data and technical assistance for climate change adaptation for cities, counties, and other stakeholders that facilitates natural resource protection.

MILESTONE

Regional climate change adaptation "help desk" network.

COST ESTIMATE – $$$

TASK 3-4

Strengthen and improve the ability of the San Francisco Bay Restoration Regulatory Integration Team (BRRIT) to accelerate projects and incentivize nature-based approaches.

MILESTONE

Solutions for one to three high priority issues identified by the BRRIT's Policy Management Committee.

COST ESTIMATE – $$

TASK 3-5

Further integrate resilience and natural resource protection into Plan Bay Area by restructuring Metropolitan Transportation Commission and Association of Bay Area Governments' Priority Conservation Area Program to advance natural and nature-based strategies for climate resilience.

MILESTONE

Restructured Metropolitan Transportation Commission and Association of Bay Area Governments' Priority Conservation Area Program.

COST ESTIMATE – $$

TASK 3-7

Align Federal Emergency Management Agency hazard planning with climate adaptation planning to secure funding for protection of habitats and use of natural and nature-based strategies.

MILESTONE

15 grant applications submitted to Federal Emergency Management Agency Building Resilient Infrastructure and Communities (BRIC) and/or other Federal Emergency Management Agency grant programs for nature-based adaptation projects.

COST ESTIMATE – $$

Photo: Noah Berger

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Stewardship

TASK 3-3

Revise or create regulatory policies, guidelines, or regulations to accelerate natural and nature-based adaptation projects consistent with the overall protection of the health of the Estuary (such as San Francisco Bay Conservation & Development Commission's creation of new sediment management policies, revision of the Suisun Marsh Protection Plan, San Francisco Bay Regional Water Quality Control Board's revised sediment reuse and climate change policies, the Delta Stewardship Council's Delta Plan revised ecosystem guidelines, or creation of new programmatic permitting approaches).

MILESTONE

Three new or revised policies, guidelines, or regulations to facilitate natural or nature-based adaptation projects.

COST ESTIMATE – $$$

TASK 3-6

Increase funding for adaptation planning and implementation that values long-term protection of habitats and communities.

MILESTONE

A sea level rise adaptation funding and investment framework for the San Francisco Bay Area.

COST ESTIMATE – $

Photo: Carmen Erasmus

Overview

Advancing natural and nature-based infrastructure is a key strategy for the timely implementation of climate resilience projects. However, there are many barriers that stand in the way of projects so desperately needed by the Estuary's ecosystems and communities. The lack of technical expertise, data, and funding all hinder projects from being implemented in a timely manner. Additionally, regulatory and permitting processes for these innovative projects can be cumbersome, conflicting, or out-of-date given quickly changing conditions.

Updates and Emerging Issues

While much progress has been made since 2016 with regard to implementing climate adaptation projects, significant challenges remain that threaten our region's ability to respond to the urgency of current and future climate change impacts. This revised Action seeks to identify and address current barriers that impede timely implementation of shoreline natural and nature-based climate adaptation strategies.

Climate Change Considerations

The unpredictability and scale of climate change impacts will be felt regionally, so any planning that enhances resilience will need to be collaborative and coordinated. This Action recognizes the urgency of the climate crisis while exploring long-term solutions that sustain precious ecosystem processes.

Equity Considerations

This Action focuses on overcoming barriers to accomplishing natural and nature-based infrastructure, which includes building the capacity of frontline communities to be active leaders and collaborators in project planning and implementation.

Connections to Other Actions

Natural and nature-based infrastructure planning shares intersections with many other Actions in the Blueprint, but is most closely connected with:

A1: Climate Resilience

A2: Equity

A4: Adaptation Implementation

A5: Watershed Connections

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

ACTION 4
ADAPTATION IMPLEMENTATION

Implement climate adaptation projects that prioritize natural and nature-based strategies.

Facilitate the implementation of climate adaptation projects that prioritize natural and nature-based strategies to proactively address emerging climate change issues, such as sea level rise and saltwater intrusion, and recognize interactions between projects.

TASK 4-1

Advance design of shoreline and bank adaptation projects or pilot projects using natural or nature-based approaches, including horizontal levees, living shorelines, transition zones, and other innovative design approaches.

MILESTONE
Ten project designs.

COST ESTIMATE – $$$

TASK 4-2

Advance implementation of shoreline and bank adaptation projects using natural or nature-based approaches.

MILESTONE
Ten implemented projects.

COST ESTIMATE – $$$$

TASK 4-4

Spatially track shoreline adaptation projects to help communicate the region's progress, facilitate planning, evaluate project design and funding needs, and identify opportunities for local community input and use of nature-based adaptation strategies.

MILESTONE
Shoreline Adaptation Project Mapping Program within EcoAtlas for the San Francisco Bay.

COST ESTIMATE – $$

TASK 4-5

Share best practices, data, information, and lessons learned to advance implementation of nature-based infrastructure by expanding collaborative models such as the Transforming Urban Waters Initiative to address multiple types of natural and nature-based adaptation approaches.

MILESTONE
One to two collaborative meetings per year to address barriers to implementation for individual nature-based adaptation projects.

COST ESTIMATE – $$

Photo: Florence Low

Photo: San Francisco Bay Joint Venture

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Stewardship

TASK 4-3

Enhance existing subtidal and intertidal artificial structures or design features into new structures that better provide space for and protect native species and habitats. Explore design modifications to develop green-grey approaches to modify existing and create new improvements to traditional grey infrastructure (riprap, seawalls, levees, etc.).

MILESTONE

15 pilot projects implemented that include green-grey habitat enhancement features.

COST ESTIMATE – $$$$

Photo: City of Palo Alto

Overview

Natural and nature-based shoreline infrastructure consists of existing or restored landscapes such as tidal marshes and floodplains, as well as engineered systems that incorporate natural features or processes. Natural and nature-based infrastructure provides multiple benefits including flood protection, habitat, improved water quality, and recreational benefits, and can help communities adapt to sea level rise and restore ecosystems. Living shorelines, a type of nature-based infrastructure that often includes subtidal and intertidal habitats such as oyster reefs and eelgrass beds, can not only mitigate wave action, preventing storm surges, but also provide important ecosystem functions for wildlife and shoreline communities. Accelerating the implementation of natural and nature-based infrastructure projects is a key climate adaptation strategy.

Updates and Emerging Issues

This revised Action builds on Action 3 to facilitate and track implementation of climate adaptation projects.

Climate Change Considerations

The diversity of ecosystems and habitats in the San Francisco Estuary increases the resilience of the entire system. To support that diversity and resilience, climate planning must take a holistic and regional approach.

Equity Considerations

This Action recognizes the importance of community input and buy-in for the implementation of natural and nature-based infrastructure to address climate resilience and adaptation needs.

Connections to Other Actions

Natural and nature-based infrastructure implementation shares intersections with many other Actions in the Blueprint, but is most closely connected with:

A2: Equity

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

ACTION 5
WATERSHED CONNECTIONS

Restore watershed connections to the Estuary to improve habitat, flood protection, and water quality.

Plan and implement projects and programs that connect watersheds to the Estuary to enhance habitats, natural processes, and ecosystem services. Potential benefits may include tidal, intertidal, and open water habitat restoration; flood management; water quality improvement; fish passage and food supply; wave energy reduction; groundwater recharge; sediment delivery; wildfire management; and recreational opportunities.

TASK 5-1

Advance a watershed-based approach to landscapes to align reservoir, stormwater, flooding, groundwater, sediment, wildfire, restoration, nonpoint source pollution control, and climate change adaptation management activities as well as water supply planning, compensatory mitigation, and voluntary restoration, to provide multiple benefits.

MILESTONE

Demonstration watershed identified and principal land and resource managers convened to explore existing tools, datasets, and appropriate numerical models for the development of coordinated permitting and management activities in the watershed for multiple benefits.

COST ESTIMATE – $$

TASK 5-2

Increase environmental planner and practitioner use of planning tools and guidance documents developed for multi-benefit projects that restore watershed connections by improving the understanding of and access to such tools and documents, including examples of their successful use in the region to implement multi-benefit projects.

MILESTONE

Three to six workshops held on multi-benefit habitat restoration and flood management that provide a comprehensive review of the most recent tools and guidance documents for planners and practitioners.

COST ESTIMATE – $$

TASK 5-4

Develop a regional coarse sediment strategy to identify potential need for and sources of coarse sediment, reuse methods and locations, and logistical, financial, and regulatory challenges. Develop possible management techniques for transporting sediment trapped in flood control channels into Bay margin ecosystems through natural processes where possible and through active interventions where not possible.

MILESTONE

San Francisco Bay regional coarse sediment strategy and scientific report that identifies possible management techniques for transporting sediment in flood control channels to their marshes.

COST ESTIMATE – $$$

Photo: Paul Hames

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water

TASK 5-3

Advance the use and implementation of sediment management principles and approaches at the Bay margins identified in the 2021 Sediment for Survival Report to improve sediment supply and conveyance in Operational Landscape Units (OLU) with the greatest potential for tributary sediment supply to meet demands, given appropriate intervention.

MILESTONE

Stakeholders for one Operational Landscape Unit (OLU) identified and convened to demonstrate OLU partnership structure and advance sediment transport planning.

COST ESTIMATE – $$

Photo: Karen McDowell

Overview

Historically, watershed connections such as creeks and floodplains have provided important transition zones and habitat for wildlife, rich sediment and organic matter for diverse tidal marshlands, improved groundwater percolation for better water quality, and robust absorbent properties for runoff capture and flood control. Over time, humans have modified these important watershed connections in ways that now disrupt the natural exchange of water and sediment that nourishes complex habitat mosaics for native wildlife.

Updates and Emerging Issues

Since 2016, this Action has been updated to align with the findings and recommendations from the 2021 Sediment for Survival Report. The report integrates an Operational Landscape Unit (OLU) framework into a watershed-based approach to manage the complexity of the Bay shoreline. This Action now focuses on advancing sediment transport to supply sediment to the shoreline and on leveraging and encouraging natural ecosystem processes to accomplish watershed connectivity where flood control channels have disrupted natural sediment delivery to the Bay margins. In the future, additional opportunities for sediment transport will need to be identified, such as reservoir reoperations for sediment supply.

Climate Change Considerations

Significant amounts of sediment will be needed to combat the threat of drowning wetlands due to sea level rise. Improving watershed connections, and thus sediment deposition, has the potential to reduce flood hazards to frontline communities, whose flood control infrastructure is frequently outdated or failing.

Equity Considerations

Restoring watershed connections, if implemented with an equity lens, can provide benefits to frontline communities that frequently have outdated or failing flood control infrastructure and reduced or inaccessible green spaces. Watershed-based planning efforts should include community and Tribal input to ensure equitable outcomes.

Connections to Other Actions

Watershed connections provide unique habitat and ecosystem services closely related to or dependent upon:

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A6: Sediment

A7: Carbon Management

A11: Transition Zones

A14: Creeks

A19: Stormwater Management

ACTION 6

SEDIMENT

Manage sediment and soil on a regional scale and advance beneficial use.

Manage fine and coarse sediments and upland soils on a watershed and regional scale to enhance Estuary habitats and shoreline flood protection efforts through research to inform policy, evaluation of methodology, development of management tools and convening structures, and identification of funding opportunities for regional sediment coordination for beneficial reuse.

TASK 6-1

Increase the amount of beneficial reuse of dredged sediment by maximizing implementation of the Long-Term Management Strategy (LTMS) beneficial reuse goal, through scientific evaluation of dredging and beneficial reuse impacts to inform permitting and regulatory policy.

MILESTONE

Report documenting net impacts/benefits of beneficially reusing sediment from hydraulic dredging and, if deemed appropriate under the San Francisco Bay Regional Water Quality Control Board's California Environmental Quality Act (CEQA) analysis, incorporating beneficial reuse of hydraulically dredged material into the U.S. Army Corps of Engineers multi-year permit.

COST ESTIMATE – $$

TASK 6-2

Pilot shallow water placement of sediment in restoration projects and conduct pre- and post-placement modeling and monitoring such that the regulatory agencies can evaluate the benefits and impacts.

MILESTONE

2016 Water Resources Development Act Resilient San Francisco Bay Strategic Placement Project and associated monitoring completed.

COST ESTIMATE – $$$

TASK 6-4

Improve coordination of dredged sediment supply with demand to reduce sediment disposal and increase beneficial reuse by convening a long-term working group that includes restoration community practitioners, dredgers, and regulators. This group will coordinate a regional approach and develop a programmatic roadmap for beneficial reuse opportunities and increase the use of SediMatch by dredgers and restoration practitioners.

MILESTONE

One to two meetings of a long-term working group convened and one to three workshops held with small dredgers.

COST ESTIMATE – $$

TASK 6-5

Secure federal and non-federal (state and local) long-term funding sources for the incremental cost of beneficial reuse of dredged sediment beyond the U.S. Army Corps of Engineers least cost alternatives (Federal Standard), including costs to deliver and place sediment at beneficial reuse projects on the Estuary's shoreline.

MILESTONE

Long-term funding program, cost-shared with federal and non-federal funds, established for the incremental cost of beneficial reuse of dredged sediment for projects across the Estuary.

COST ESTIMATE – $$$$

TASK 6-7

Synthesize research and data on sediment supply and demand under various future climate scenarios in the Delta to inform future sediment management and monitoring considerations.

MILESTONE

Sediment supply and demand analysis for the upper Estuary report and sediment management and monitoring strategies under various future climate scenarios.

COST ESTIMATE – $$

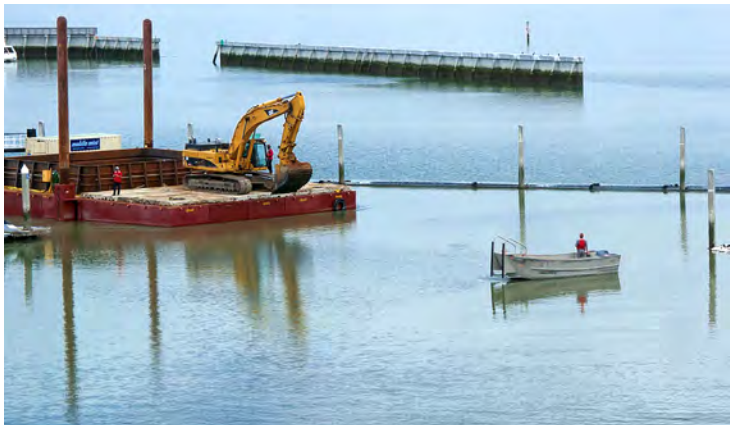


Photo: Nick Sebastian

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Stewardship

TASK 6-3

Update contaminant screening criteria and risk assessment methodology for dredged sediment and upland soils.

MILESTONE

Revised Beneficial reuse of Dredged Materials: Sediment Screening and Testing Guidelines and Master Quality Assurance Project Plan for upland material reuse at the Don Edwards San Francisco Bay National Wildlife Refuge.

COST ESTIMATE – $$

TASK 6-6

Obtain funding for research efforts to address the 16 critical knowledge gaps identified in the 2021 Sediment for Survival Report.

MILESTONE

Technical reports addressing sediment demand for vertical accretion, lateral movement of sediment, sediment supply, and organic matter accumulation.

COST ESTIMATE – $$$

Photo: Kelly Grow

Overview

Sediment provides the fundamental building material for estuarine ecosystems, habitat restoration, and shoreline protection. While watersheds naturally transport sediment with stream and river flows, human activities such as channeling, damming, and developing shorelines have led to a dramatic decrease in the Estuary's sediment supply. Moreover, most dredged sediment is not beneficially reused — this critical issue must be resolved for the region to meet its restoration goals and to adapt to sea level rise. This Action has been updated to prioritize the responsible and beneficial reuse of dredged materials for restoration.

Updates and Emerging Issues

The 2021 Sediment for Survival Report has articulated the urgent needs, possible sources, and practical methods of meeting the Estuary's demand for more sediment.

Climate Change Considerations

Sediment is a requirement for tidal marshes, particularly in the Bay, to successfully adapt to rising sea levels; it is also in critically short supply. Without overcoming regulatory, financial, and jurisdictional hurdles, resource managers will not be able to deliver enough sediment to restoration projects to allow wetlands to accrete quickly enough to outpace sea level rise. The ability of the region's environments and communities to adapt to the impacts of climate change will be greatly diminished if the sediment supply issue is not resolved soon.

Equity Considerations

Communities that inhabit Estuary margins are considered frontline communities to climate change, due to their vulnerability to the impacts of sea level rise, while also often consisting of communities of color and lower income residents. Restoring tidal marshes is a critical adaptation strategy to protect frontline communities and will require significant increase in sediment supply.

Connections to Other Actions

As one of the key components to the resilience of estuarine habitats, sediment is inextricably linked to the restoration of tidal habitats and all their geophysical and ecological benefits. Consequently, this Action connects to many Actions within the Blueprint, with special relevance to:

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

A7: Carbon Management

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A14: Creeks

A16: Freshwater Flows

ACTION 7
CARBON MANAGEMENT

Decrease carbon emissions and subsidence in the Delta and increase carbon sequestration on natural and agricultural lands.

Conduct wetland restoration, enhancement, and creation projects, and promote conversion of suitable agricultural lands in the Delta to rice cultivation to slow or reverse subsidence, reduce greenhouse gases in the atmosphere, and advance scientific understanding of carbon management. Projects should focus on converting the more subsided locations to managed wetlands and rice farming and converting less subsided locations to tidal wetlands.

TASK 7-1

Work with agencies and willing private landowners to obtain funding to plan and implement activities in the deeply subsided regions of the Delta that re-saturate the highly organic peat soils to reduce or halt greenhouse gas emissions caused by subsidence.

MILESTONE
Projects on 20,000 acres of deeply subsided lands in the Delta that halt subsidence and related greenhouse gas emissions.

COST ESTIMATE – $$$$$

TASK 7-2

Continue to conduct applied research to better understand the processes of carbon sequestration and greenhouse gas emissions generated from wetlands and open water systems in the Bay-Delta. Work within reference systems and utilize scenario testing to inform management and restoration approaches that can be applied at larger scales. Quantify the greenhouse gas fluxes from different types of wetlands and different management regimes.

MILESTONE
One to three technical reports on the carbon implications of land management and wetland restoration activities in the Delta and/or Bay.

COST ESTIMATE – $$

TASK 7-4

Advance research on submerged aquatic vegetation (SAV) and its potential for carbon management in the Estuary, and develop recommendations on how to better protect, plan for, and manage existing SAV habitats and restoration efforts to maximize the potential of native SAV to provide sustained carbon storage.

MILESTONE
Reported results and initial recommendations from at least one project gathering site-based carbon sediment core data in or adjacent to eelgrass habitat.

COST ESTIMATE – $$

TASK 7-5

Collect more data on San Francisco Bay carbon cycles, fluxes, and fates across a variety of ecosystems and land use types, including restored wetlands, to address gaps in our understanding of carbon sequestration in Bay systems.

MILESTONE
One to three study sites established with atmospheric and hydrologic carbon exchange measurements combined with soil sediment data collection that encompass the diversity of Bay Area wetlands regarding age, disturbance, and salinity.

COST ESTIMATE – $$$

Photo: Delta Conservancy

Photo: Kelly Grow

COST ESTIMATE KEY

$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 7-3

Increase economic impact of carbon markets in the Estuary to advance wetland restoration and management goals.

MILESTONE

Report detailing the potential impacts and benefits of various co-management activities on lands included in the carbon market, various strategies to scale participation in the market through regionally coordinated applications for multiple sites, and the institutional and regulatory barriers that limit entry of wetland restoration and agriculture projects into the carbon market.

COST ESTIMATE – $$

TASK 7-6

Promote use of carbon credit funding for wetland restoration in the Estuary.

MILESTONE

Pilot tidal wetland restoration projects in ecosystems that have not yet applied the American Carbon Registry Standards to qualify for the voluntary carbon market, such as tidal wetlands.

COST ESTIMATE – $$$

Photo: Florence Low

Overview

Wetlands play an important role in the global carbon cycle: they act as major carbon sinks due to their large standing biomass and their ability to capture and retain carbon in the form of peat. Carbon sequestration, through the restoration, enhancement, and creation of wetlands, can also reduce net greenhouse gas emissions and prevent further subsidence — a huge issue in the Delta. Former wetlands in the Delta have been diked off and drained, resulting in subsided organic soils 25 feet below sea level. These soils are a primary target for carbon management efforts in the Delta because they actively release greenhouse gases that can be attenuated through soil saturation.

Updates and Emerging Issues

Since 2016, this Action has shifted towards implementation. Additionally, agencies are looking for innovative ways to integrate carbon credits and multi-use lands into effective carbon sequestration practices. Many experts agree that accessing the carbon market is a difficult task in land management and carbon sequestration efforts, but doing so will be critical to creating a regional approach for funding restoration projects. Recent scientific studies have provided data on carbon fluxes in Bay Area wetland systems, but the scientific community has stressed that more data is needed to better understand carbon fluxes and life cycles in these systems before large scale carbon management measures can be deployed with certainty. These studies have shown that Bay Area wetlands are effective at sequestering carbon and release very limited quantities of methane, making them prime candidates for carbon credit funding. The social cost of carbon is an emerging concept in the Bay Area that estimates the long-term economic damages resulting from greenhouse gas emissions and should be directly addressed in future Actions and Tasks.

Climate Change Considerations

Restoring wetlands can dramatically increase the land's ability to sequester carbon and mitigate the effects of greenhouse gases in the atmosphere. However, in current climate models, rising seas are projected to threaten and drown wetlands that cannot accrete quickly enough to outpace sea level rise. In deeply subsided lands in the Delta, unvegetated mudflats are not capable of producing biomass and storing carbon at all. Conducting research about carbon storage in different habitats can help accelerate and prioritize restoration that enhances carbon storage.

Equity Considerations

Since global climate change disproportionately impacts frontline communities, carbon sequestration activities can mitigate negative impacts by directly reducing atmospheric carbon levels.

Connections to Other Actions

Carbon sequestration is an important ecosystem benefit provided by wetlands that helps mitigate excess carbon in the atmosphere. Thus, this Action is related closely to:

A1: Climate Resilience
A3: Adaptation Planning
A4: Adaptation Implementation
A6: Sediment
A8: Wetland Monitoring
A10: Tidal Marsh
A11: Transition Zones
A12: Managed Wetlands
A13: Seasonal Wetlands

ACTION 8
WETLAND MONITORING

Implement a Wetlands Regional Monitoring Program.

Implement a Wetlands Regional Monitoring Program (WRMP) for the Bay Area and the Delta to help local, regional, state, and federal agencies evaluate the effectiveness of efforts to sustain healthy aquatic habitats and resources.

TASK 8-1

Develop the WRMP Monitoring Network through the establishment of benchmark, reference, and restoration project sites.

MILESTONE
Five monitoring sites with biogeographic representation within San Francisco Bay.

COST ESTIMATE – $$

TASK 8-2

Determine how efforts to restore tidal marshes affect the distribution, abundance, and health of plants and animals and coordinate with related monitoring efforts, including the State of the Birds reporting.

MILESTONE
One to two Standard Operating Procedures for biological and ecological indicators.

COST ESTIMATE – $

TASK 8-4

Ensure that WRMP outreach and engagement includes diverse audiences. Increase engagement with community representatives, social science and community-based science, and Traditional Ecological Knowledge on the Steering Committee, Technical Advisory Committee, and in development of social indicators to monitor connections between people and wetlands. Examples may include cultural use, recreation, education and training opportunities, and flood protection.

MILESTONE
Standard Operating Procedures to monitor connections between people and wetlands.

COST ESTIMATE – $$

TASK 8-5

Strengthen partnerships and monitoring coordination between the lower and upper San Francisco Estuary.

MILESTONE
Workgroup to increase coordination between the Delta Interagency Ecological Program and the WRMP Technical Advisory Committee.

COST ESTIMATE – $

COST ESTIMATE KEY
$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Stewardship

TASK 8-3

Identify sustainable funding for the WRMP to support science, data management, and administration, and develop a strategy that is tied to the sources of funding.

MILESTONE

New funding sources secured for the WRMP.

COST ESTIMATE – $$

Photo: Kelly Grow

Photo: Darcie Luce

Overview

The Wetlands Regional Monitoring Program (WRMP) will improve understanding of the condition of tidal wetlands at a regional scale and support the design, implementation, and adaptive management of restoration projects. Monitoring and analysis will address landscape-scale drivers impacting restored and mature wetlands to help inform climate change adaptation and priority responses at a regional level. The WRMP development process was initially started with the 2016 Estuary Blueprint revision and has fostered regional support for the program. The program engages a broad range of stakeholders, including regulators, land managers, scientists, and community-based organizations.

Updates and Emerging Issues

Revised and new Tasks reflect next steps to move the program from development to implementation and increase its relevance to broader stakeholder groups.

Climate Change Considerations

Climate change will not directly impact implementation of the WRMP; however, the vulnerability of tidal wetlands to climate stressors (see Action 10) makes the role of the WRMP in evaluating changes and recommending management actions more essential.

Equity Considerations

Task 8.4 specifically focuses on incorporating an equity lens into the WRMP, including engaging new stakeholders and expertise on WRMP committees, in outreach, and in development of ecosystem services indicators.

Connections to Other Actions

The WRMP improves management of habitats addressed in the following Actions:

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

A12: Managed Wetlands

A13: Seasonal Wetlands

The WRMP may also contribute information to guide efforts in:

A5: Watershed Connections

A6: Sediment

A15: Invasive Species

ACTION 9
INTERTIDAL/ SUBTIDAL HABITATS

Protect, restore, and enhance intertidal and subtidal habitats.

Protect, restore, and enhance non-wetland intertidal, unvegetated tidal flat, and subtidal habitats to improve ecological complexity and completeness, and to deliver ecosystem services and water quality benefits to the Estuary.

TASK 9-1

Determine habitat suitability for native eelgrass in context with potential future climate changes in San Francisco Bay. Learn, respond, and adapt strategies to account for natural variability and climate change stressors.

MILESTONE
Habitat Suitability Model for Eelgrass in San Francisco Bay.

COST ESTIMATE – $$

TASK 9-2

Increase populations of Submerged Aquatic Vegetation (SAV), with a focus on native eelgrass (*Zostera marina*), by expanding the extent of existing beds and establishing new beds in the Bay.

MILESTONE
Submerged Aquatic Vegetation (SAV) coverage in the Bay increased by 75 acres.

COST ESTIMATE – $$$$

TASK 9-4

Work with regulatory agencies, including through the San Francisco Bay Restoration Regulatory Integration Team (BRRIT), to raise awareness among regulatory agencies on the status of eelgrass, oyster, and other types of subtidal and intertidal habitat restoration and benefits documented to date; and advance discussions on a programmatic permitting framework for living shorelines projects, including native oyster reefs, eelgrass beds, coarse beaches, rocky intertidal, and other nature-based shoreline protection methods designed in a multi-objective approach.

MILESTONE
Programmatic framework for permitting living shoreline projects.

COST ESTIMATE – $$$

TASK 9-5

Restore non-wetland intertidal and subtidal habitats other than eelgrass and oyster beds, such as rocky intertidal areas, coarse sediment beaches, macroalgal beds, and living shorelines. Identify appropriate and feasible sites, secure funds, and implement projects to create or improve these types of habitats as well as other projects that integrate multiple habitats.

MILESTONE
20 projects that focus on rocky intertidal, coarse sediment beach, macroalgal bed, living shorelines, and other integrated habitats.

COST ESTIMATE – $$$$

TASK 9-7

Protect and enhance unvegetated tidal flat habitats to be healthy and free of debris; functionally and physically linked to tidal wetland and/or open Estuary sites; and able to sustain diverse species of Bay invertebrates and local and migratory shorebirds.

MILESTONE
10 restoration site designs that include tidal flat enhancement and protection.

COST ESTIMATE – $$$

Photo: Ted Robertson Dutra

COST ESTIMATE KEY

$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water

TASK 9-3

Increase populations of native oysters (*Ostrea lurida*) by expanding the extent of existing beds or establishing new beds.

MILESTONE

20 projects that increase shellfish beds.

COST ESTIMATE – $$$$

TASK 9-6

Remove artificial structures that are known to contribute to shoreline debris and water quality degradation and that provide minimal habitat benefit (i.e., derelict creosote pilings, failing seawalls, failing riprap).

MILESTONE

10 projects that include the removal of artificial structures.

COST ESTIMATE – $$$$

Photo: Jude Stalker

Overview

Non-wetland intertidal, unvegetated tidal flat, and subtidal habitats are productive, important components of the Estuary ecosystem due to their ability to shelter, support, and attract biodiversity in benthic invertebrates, small fish, crabs, and shorebirds. This Action supports the restoration goals in the 2010 San Francisco Bay Subtidal Habitat Goals Report in order to achieve improved biodiversity, resilience, and water quality. Examples of non-wetland intertidal, tidal flat, and subtidal habitats include: oyster reefs, eelgrass beds, macroalgal beds, mudflats, rocky areas, and coarse sediment beaches.

Updates and Emerging Issues

Since 2016, this Action has expanded to include the removal or enhancement of artificial structures to explore their potential for increasing habitability for wildlife. Additionally, this Action now acknowledges the importance of both integrated and isolated species restoration approaches — eelgrass beds and oyster reefs are of particular interest since they can be considered ecosystem "engineers." Looking forward to 2027, this Action may contain new Tasks that address erosion from expanded Bay ferry routes.

Climate Change Considerations

Because of their physical location, intertidal and subtidal habitats will be affected by sea level rise. Especially when located in areas with little room for landward migration, such as in the Central Bay, these habitats will be at higher risk of drowning from sea level rise when compared to their counterparts in the North and South Bays where there is more room for movement. Additionally, intertidal and subtidal habitats are particularly vulnerable to other aspects of climate change, such as ocean acidification and temperature increases, which impact ecosystem engineers such as oysters and eelgrass.

Equity Considerations

As with other habitat types, projects to restore tidal flat and subtidal habitats should engage Tribes and frontline communities in planning and implementation; tasks under the Climate Resilience and Equity Actions address this need.

Connections to Other Actions

Since restoration of intertidal and subtidal habitats provides many ecosystem services, this Action is connected to other Actions that are focused on multi-benefit, nature-based projects, such as:

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A6: Sediment

A11: Transition Zones

A12: Managed Wetlands

A15: Invasive Species

A16: Freshwater Flows

ACTION
10
TIDAL MARSH

Protect, restore, and enhance tidal marsh habitat.

Restore and enhance complete tidal marsh ecosystems, considering sea level rise and other climate change stressors in restoration design and implementation, and protect historical San Francisco baylands for current and possible future ecosystem benefits.

TASK 10-1

Restore high quality tidal marsh habitat in the Estuary as part of multi-objective projects with diverse partners. Take into consideration sea level rise and potential climate adaptation design components during the design and permitting process.

MILESTONE

23,000 acres of tidal marsh restored in the Bay and 5,500 acres of tidal marsh restored in the Delta.

COST ESTIMATE – $$$$$

TASK 10-2

Enhance tidal marsh, including constructing and enhancing transition zones and high tide refugia features such as marsh islands, to increase ecological function and resilience to climate change.

MILESTONE

3,000 acres of tidal marsh enhanced in San Francisco Bay.

COST ESTIMATE – $$$$

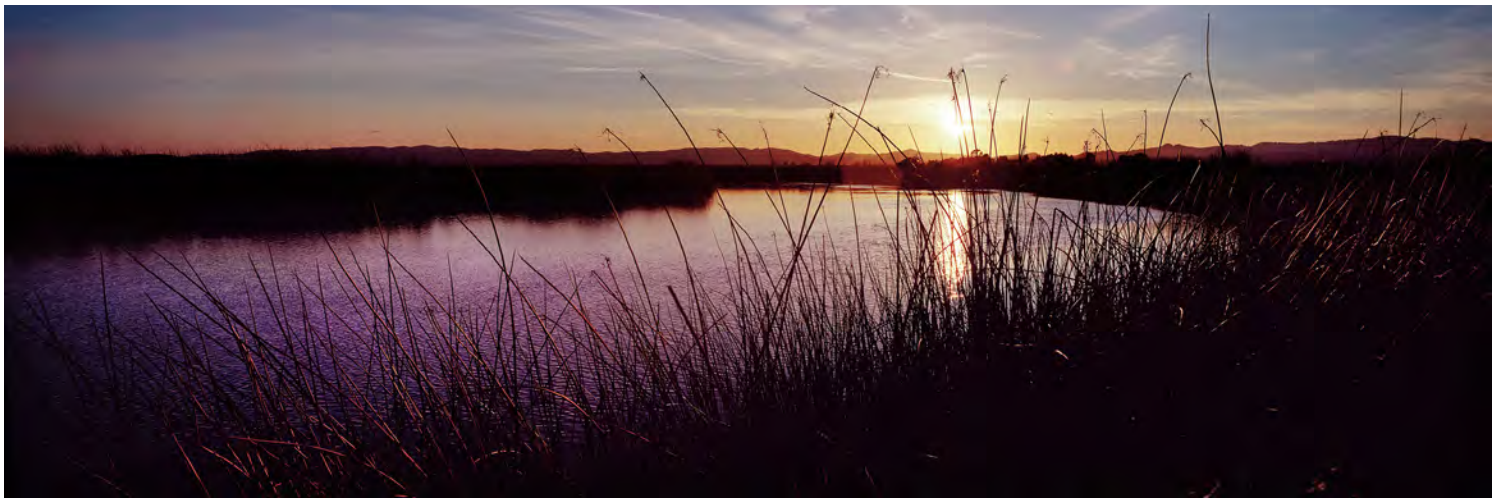


Photo: Paul Hames

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water

TASK 10-3

Protect San Francisco Bay historical baylands (including both tidal marsh and non-tidal wetlands and waters within the historical Bay margins) to preserve and enhance tidal habitats and adjacent habitats to allow for migration with sea level rise.

MILESTONE

20,000 acres of baylands protected through various mechanisms including acquisition, transfer of fee title, or easement.

COST ESTIMATE – $$$$$

Photo: Florence Low

Overview

Tidal marshes offer diverse ecosystem services to the San Francisco Estuary and its communities through their abilities to provide habitat for wildlife, stabilize shorelines, prevent erosion, absorb stormwater, and store carbon. Today, there are approximately 51,300 acres of tidal marsh in the Bay — about a quarter of the acreage that existed at the beginning of the 19th century. This Action seeks to increase tidal marsh area to 100,000 acres in the Bay as set forth in the 1999 Baylands Ecosystem Habitat Goals Report, and to 50,000 acres in the Delta by 2050 as set forth by the Delta Plan.

Updates and Emerging Issues

Since 2016, this Action has been updated to focus on tidal marshes, with tidal flats now included in Action 9. Restoration and enhancement milestones have been revised for the next five years and align with San Franciso Bay Joint Venture Implementation Plan and California EcoRestore acreage goals. The protection task has been expanded to focus on all undeveloped land within the historic San Francisco baylands that offer current habitat value and/or future enhancement or restoration opportunities.

Climate Change Considerations

Sea level rise and other climate change stressors present additional hurdles to the restoration of tidal marshes. The updated protective and enhancement milestones work in tandem with Actions 8: Wetland Monitoring and 11: Transition Zones, to increase the pace and scale of restoration, develop recommendations for climate-resilient restoration, and support the migration of tidal marshes upland as sea levels rise.

Equity Considerations

Ecosystem restoration and enhancement projects need to consider and incorporate the priorities of surrounding communities. Additionally, such projects should take into special consideration that many tidal marsh habitats carry great cultural significance and provide important resources to Tribes and Indigenous populations.

Connections to Other Actions

Restoration and enhancement of tidal marsh habitat and other similar habitats hold great potential for increasing climate resilience. This Action is closely connected with Actions that expedite the implementation of natural and nature-based infrastructure to address climate change:

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

A6: Sediment

A7: Carbon Management

A9: Intertidal/Subtidal Habitats

A11: Transition Zone

A12: Managed Wetlands

A15: Invasive Species

ACTION 11
TRANSITION ZONES

Protect, restore, and enhance estuarine-upland transition zones and adjacent upland ecosystems.

Protect estuarine-upland transition zones, and their ecosystem services, to help the Estuary adapt to rising sea levels. Include protection of adjacent upland ecosystems and diked historic baylands where feasible and appropriate. Integrate transition zones and adjacent upland ecosystems into restoration and enhancement projects in the Estuary to provide both migration space and high water refugia.

TASK 11-1

Enhance, restore, or create estuarine-upland transition zones in existing or restored tidal marshes.

MILESTONE
50 transition zone enhancement, restoration, or creation projects incorporated into existing or restored marshes and adjacent uplands.

COST ESTIMATE – $$$$

TASK 11-2

Protect transition zones, adjacent upland areas, and diked historic baylands for wetland migration space, based on identified needs and opportunities, through acquisition of fee title, partnerships to develop conservation easements, or other management agreements.

MILESTONE
30 sites protected or planned for protection as areas for future wetland migration space.

COST ESTIMATE – $$$$

TASK 11-4

Support information-sharing and knowledge transfer activities to address the challenges of restoring native plant communities in the transition zone. Topics may include sourcing native plants; designing, preparing, and maintaining sites; monitoring; and addressing plant pathogens.

MILESTONE
Three to five workgroup meetings to address transition zone restoration challenges.

COST ESTIMATE – $

Photo: Florence Low

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources

Resilience

TASK 11-3

Determine an approach for maintaining an updated estuarine-upland transition zone mapping inventory over time. Integrate the approach into long-term monitoring by the Wetlands Regional Monitoring Program (WRMP). Identify opportunities to coordinate with the Delta Adapts and Delta Plan Ecosystem Amendment analyses.

MILESTONE

Standard Operating Procedures for completing periodic mapping of Bay transition zones.

COST ESTIMATE – $

Photo: Rick Lewis

Overview

Efforts to address the ecological and economic threats imposed by sea-level rise and other aspects of climate change have begun to focus on the estuarine-terrestrial transition zone in areas above the current and future water lines. Estuarine-upland transition zones are defined as existing and predicted areas of interaction among tidal, terrestrial, and fluvial processes that result in unique mosaics of habitat types, assemblages of plant and animal species, and ecosystem services. Some non-tidal areas can also provide similar functions and services to estuarine-upland transition zones.

Updates and Emerging Issues

Since 2016, this Action has recognized the increasing importance of connectivity between habitat types. Its scope has expanded to include adjacent upland ecosystems and diked historic baylands in recognition of the similar functions and services that these areas can provide as sea level rises and transition zones migrate.

Climate Change Considerations

Climate change will directly impact transition zones due to their vulnerability to sea level rise. If managed properly, transition zones can accommodate Bay expansion without the loss of ecosystem services provided by tidal marshland. Protection of adjacent upland areas can help accommodate landward migration of transitional habitat with sea level rise.

Equity Considerations

Transition zones are home to many sites of cultural significance to Tribes and Indigenous populations. They also hold great potential ecosystem benefits to frontline communities, such as their ability to mitigate flood hazards, and provide access to nature and recreational opportunities.

Connections to Other Actions

As areas of interaction between many different habitat types, this Action is closely connected to Actions focused on specific habitats, including:

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A12: Managed Wetlands

A13: Seasonal Wetlands

A14: Creeks

Due to the importance of transition zones for boosting resilience to sea level rise, this Action is also closely connected with Actions that expedite the implementation of natural and nature-based infrastructure to address climate change.

A1: Climate Resilience

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

ACTION 12
MANAGED WETLANDS

Maximize habitat benefits of managed ponds and other non-tidal wetlands and waters.

Maximize habitat benefits of managed ponds and wetlands (including storage and treatment wetlands and ponds, current and former salt production ponds, and managed floodplains) for a wide range of species. Support studies and actions to enhance and expand habitat value of managed ponds and wetlands and minimize negative impacts to aquatic species and water quality.

TASK 12-1

Fund, implement, and monitor managed pond enhancements to increase nesting waterbird success and grow populations.

MILESTONE
Three projects to implement and test techniques, and monitoring reports on outcomes.

COST ESTIMATE – $$

TASK 12-2

Investigate the effectiveness of specific habitat enhancement measures (such as changes in configuration, management, or operation of managed ponds or wetlands) to provide increased successful bird nesting, foraging, roosting, and high tide refugia with surveys for three to five years following implementation of measures.

MILESTONE
Five reports summarizing results of habitat enhancement measures.

COST ESTIMATE – $$

TASK 12-4

Develop a methodology for assessing the risk-adjusted long-term costs and benefits of managed ponds, managed wetlands, and non-tidal wetlands and waters. Methodology should take into account habitat benefits for multiple species and changes in operations and maintenance requirements to adapt to sea level rise and climate change and prevent water quality impacts. In the upper Estuary, the methodology should also account for the cost/benefit of how the water is "sourced" and how the actions impact partners.

MILESTONE
Methodology tested and evaluated for future use across the region.

COST ESTIMATE – $$

TASK 12-5

Develop and implement predation control measures on managed ponds. These measures include camouflaging habitats and installing exclusion fencing.

MILESTONE
Measures tested and implemented at five sites.

COST ESTIMATE – $$$

COST ESTIMATE KEY
$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources

Resilience

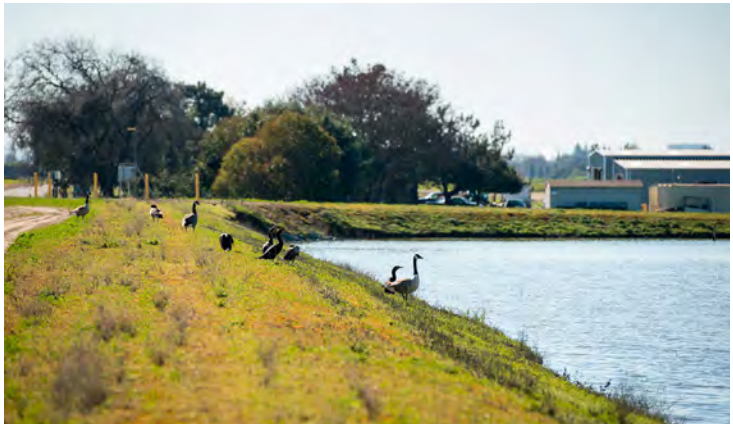
TASK 12-3

Study the ability of managed ponds and other non-tidal habitats to sustain diverse species of vertebrates, invertebrates, and endemic and endangered plants over time. Analyze species use, density, and diversity as compared to tidal wetlands.

MILESTONE

Report released and results shared comparing species use and diversity in various managed pond and wetland habitats.

COST ESTIMATE – $$



Photos (Top, Bottom): Florence Low

Overview

For more than a century, humans have managed marsh and pond habitats to attract waterfowl for hunting. More recently, diked former wetlands and salt ponds are being retained and enhanced as managed ponds that address subsidence issues, species protection goals, and restoration priorities. Managed ponds (shallow or deep open water areas) provide valuable habitat for critical vegetation, small mammals, and a wide variety of waterbirds. Managed wetlands (such as diked marshes) can provide habitat for critical vegetation, marsh-dependent birds, and small mammals where full tidal restoration is not feasible.

Updates and Emerging Issues

Since 2016, this Action has been expanded to include managed wetland and inundated floodplain habitats, and its focus has shifted to balancing the benefits of such habitats between waterbirds and fish. Tasks and milestones pertaining to integrated predator control have been moved to Action 15: Invasive Species.

Climate Change Considerations

The effects of climate change and sea level rise challenge the long-term viability of managed ponds. Projected higher water levels, more frequent and intense storms, and regional salinity shifts may make it difficult or even impossible in the future for managers to maintain target habitat conditions inside the ponds, which may become subtidal habitat. Tasks under this Action will help evaluate the costs and benefits of maintaining these areas under climate change scenarios to inform future management.

Equity Considerations

Managed wetlands, as with other types of wetlands, are frequently located in areas of great cultural significance to Tribes and may support culturally important plants. Both Tribes and surrounding frontline communities must be involved in planning activities for managed wetlands.

Connections to Other Actions

Managed ponds can expand valuable habitat for diverse species of flora and fauna when other habitat types are not available, like the habitats addressed in:

A8: Wetland Monitoring

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

A14: Creeks

ACTION
13
SEASONAL WETLANDS

Protect, restore, and enhance seasonal wetlands.

Protect, restore, and enhance non-tidal seasonal wetlands outside of historical tidal areas, including vernal pool complexes, using conservation easements and related protection tools, restoration, and improved grazing management practices.

TASK 13-1

Protect non-tidal seasonal wetlands including vernal pool complexes using conservation easements or other protection tools.

MILESTONE

At least 1,500 acres of seasonal wetlands protected in the Bay region.

COST ESTIMATE – $$$

TASK 13-2

Restore non-tidal seasonal wetlands, including vernal pool complexes.

MILESTONE

At least 800 acres of seasonal wetlands restored in the Bay region and 3,200 acres in the Delta region.

COST ESTIMATE – $$$$

Photo: UC Davis

Photo: Florence Low

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources

Resilience

TASK 13-3

Advance best practices for grazing management to protect natural seasonal wetlands and enhance habitat value of stock ponds.

MILESTONE

Four workshops around the region for landowners.

COST ESTIMATE – $

Photo: Kelly Grow

Overview

Seasonal wetlands can be found upland and are called "seasonal" because they periodically flood or fill with rain, runoff, or groundwater during winter rains. Their salinities lie on a spectrum of salty to fresh, since many seasonal wetlands may be former tidal marshes that have been closed off from tidal action by dikes and levees. Seasonal wetlands also provide habitat for large numbers of waterfowl and shorebirds during migratory periods and support rare and endangered plants and invertebrates.

Updates and Emerging Issues

Since 2016, this Action's Tasks have been expanded to cover seasonal wetlands more generally: not just vernal pool complexes. Also, this Action's protection and restoration Tasks are now aligned with the goals of The Conservation Lands Network 2.0 Report and San Francisco Bay Joint Venture. Looking ahead to the next Estuary Blueprint revision, this Action is expected to explore more opportunities to partner with landowners around grazing management and forest management best practices.

Climate Change Considerations

Climate change will bring more extreme and unpredictable weather to the region. Extended dry periods and prolonged or extreme flooding may result in the increased precariousness of seasonal wetlands.

Equity Considerations

Like other habitat-oriented Actions, projects to restore seasonal wetlands should engage Tribes and frontline communities in planning and implementation. Tasks under the Climate Resilience and Equity Actions address this need.

Connections to Other Actions

This Action is connected to other Actions focused on restoring, protecting, and conserving habitat, including:

A8: Wetland Monitoring

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

A14: Creeks

ACTION 14
CREEKS

Conserve and enhance riparian and instream habitats throughout the Estuary's watersheds.

Conserve stream reaches and restore riparian habitats by defining impairments and threats, filling data gaps, developing science-based tools, securing necessary funding, and designing, advancing, and collaborating on projects.

TASK 14-1

Establish advisory group to assess the capacities of regional restoration tracking platforms, such as EcoAtlas and EcoRestore, to include riparian and aquatic instream habitat restoration project metrics such as benthic macroinvertebrate indicators, canopy cover, native riparian plant species, fish barrier removal, gravel augmentation, restored access for fish rearing on floodplains and other off-channel habitats, carbon sequestration, required pre/post project monitoring data, and costs by funding source.

MILESTONE
New metrics identified to add to regional data sets.

COST ESTIMATE – $

TASK 14-2

Compile and provide technical and policy guidance to the watershed restoration community and decision-makers to accelerate the pace and scale of riparian and instream habitat restoration and protection. This guidance potentially includes stream and watershed data, characterization of key habitat areas for salmonids and other native fish assemblages, development setback policies, erosion control and regenerative and firewise landscaping measures, land acquisition/conservation easements, unplanned chloramine and firefighting chemical discharges, and best practices for community engagement in restoration stewardship, maintenance, and monitoring support.

MILESTONE
Appropriate guidance documents identified, and engagement strategy developed for sharing with planners and practitioners.

COST ESTIMATE – $

TASK 14-4

Implement riparian corridor and instream habitat restoration/enhancement and conservation/acquisition/preservation projects emphasizing multi-objective and multi-benefit efforts.

MILESTONE
5,000 acres of creek corridor and adjacent upland habitat conserved, and 2,000 acres of riparian corridor and instream habitat restored or enhanced.

COST ESTIMATE – $$$$$

Photo: Ben Botkin

Photo: Amber Manfree

COST ESTIMATE KEY
$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water

TASK 14-3

Seek additional funding for riparian conservation and restoration activities including floodplain acquisition, establishment of a network of streamflow gages, fish population surveys with a focus on anadromous salmonid streams, and long-term public engagement such as watershed planning and project stewardship.

MILESTONE

Biennial lists of prospective riparian restoration projects, acquisition and conservation actions, data gaps, and other watershed management requests to help policymakers secure and allocate regional, state, and federal funding.

COST ESTIMATE – $

TASK 14-5

Pilot the use of cooperative working arrangements among homeless advocacy organizations, local governments, and watershed organizations to create a stream steward program composed of people experiencing homelessness at a creekside encampment (to be selected). The program would provide stipends, stewardship training and resources, potable water and sanitary services, and connection to available social services. This approach would provide resources for both protecting the waterway and support services to find long-term housing for unsheltered participants.

MILESTONE

Initiate pilot program.

COST ESTIMATE – $$$

Photo: Kelly Grow

Overview

Habitats in and around rivers and creeks are extremely important to frogs, turtles, and iconic California fish species such as salmon and steelhead trout. The restoration of riparian habitats also reduces flood risk and improves watershed connectivity. While this action emphasizes critical instream habitat, it also supports efforts to daylight stream reaches and restore urban waterways.

Updates and Emerging Issues

Since 2016, many of the Tasks and Milestones for this Action were not accomplished due to a lack of funding and ownership. To address these issues, this Action's emphasis has shifted away from fisheries toward riparian restoration and activation of the Bay Area Watershed Network (BAWN) as a center point for its revised Tasks and Milestones.

Climate Change Considerations

Local creeks and rivers hold cultural and ecological significance for Tribal members and Tribal groups. Tribal participation and consideration of Traditional Ecological Knowledge should be woven into all Action Tasks. Underhoused populations that reside along creeks are also stakeholders in riparian restoration. Synergies between riparian restoration efforts and unhoused and underhoused populations can be found through cooperative stewardship arrangements, housing organizations, and social service providers.

Equity Considerations

Disadvantaged communities may lack access to parks and open space. Creek restoration on public lands can include public access components, bringing people closer to the healing power of nature.

Connections to Other Actions

Creeks are important to wildlife, underhoused populations, and geological and fluvial processes in the Estuary's watershed. Thus, this Action is closely connected to:

A2: Equity

A5: Watershed Connections

A6: Sediment

A16: Freshwater Flows

A24: Public Access

ACTION 15
INVASIVE SPECIES

Minimize the impact of invasive species.

Reduce the impact of invasive species through prevention, early detection, rapid response, eradication, and control. Conduct work with national, state, and regional coordinating bodies and the key agencies implementing specific programs.

TASK 15-1

Maintain, expand, and improve invasive species prevention programs (including for ballast water, marine biofouling, trailer boats, and organisms in trade). Actions may include developing new or expanding existing policies and programs, conducting outreach (e.g., to the boating community, Weed Management Area partnerships, etc.) and working with existing entities to identify priority activities.

MILESTONE

Five to seven new or expanded policies or programs, list of priority activities in various programs, and two outreach campaigns implemented through pertinent networks.

COST ESTIMATE – $

TASK 15-2

Increase early detection, monitoring, and rapid response programs by identifying additional funding sources and creating a Rapid Response Fund. Monitoring includes: 1) assessing and mapping Estuary-wide distribution of key invasive species; and 2) increasing citizen scientist monitoring through Calflora, iNaturalist, and other similar websites.

MILESTONE

Rapid response fund established, and three to four funding sources identified for monitoring and/or mapping.

COST ESTIMATE – $$$

TASK 15-4

Develop new early detection tools using eDNA (i.e., eDNA meta barcoding) for specific environments and suites of species (i.e., marine species).

MILESTONE

One to three techniques for early detection, such as pilot eDNA meta barcoding or other eDNA techniques.

COST ESTIMATE – $$

TASK 15-5

Implement eradication and control programs with priority given to species that can be eradicated and/or species that have extensive impacts on habitats important to the health of the estuarine ecosystem. Research and test pilot control measures for key invasive species.

MILESTONE

For two to five key invasive species, total acreage of species reduced and/or number of acres being managed to reduce species increased.

COST ESTIMATE – $$$

TASK 15-7

Finalize Best Management Practices (BMPs) for reducing the spread of aquatic invasive species through biofouling of mobile marine infrastructure (MMI) in collaboration with regulatory agencies for incorporation into permits.

MILESTONE

Final BMPs released for reducing the spread of aquatic invasive species through biofouling of mobile marine infrastructure.

COST ESTIMATE – $$

Photo: Water Education Foundation

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources

TASK 15-3

Develop Early Detection and Rapid Response (EDRR) Frameworks at the local or national scale by setting up a framework to detect and respond to invasive species and a series of sustained and coordinated actions with associated responsible agencies and partners.

MILESTONE

At least one new EDRR Framework.

COST ESTIMATE – $$

TASK 15-6

Ensure regulatory agencies and project proponents include requirements to prevent the introduction and spread of invasive species, including using native-only plant lists, using sources with a clean supply of native plant species that are free of pathogens, and confirming that Best Management Practices (BMPs) are shared for invasive species where they exist (for example: Invasive Spartina Project BMPs 2016, California State Lands Commission's BMPs for marina leases).

MILESTONE

Number of permits or leases with improved native and invasive species requirements increased.

COST ESTIMATE – $$

Photo: Florence Low

Overview

Invasive species threaten native species and the delicate habitats of the Estuary. Prevention is regarded as the first and most important line of defense against invasions. It is critical to continue the work on key pathways/vectors, including ballast water, to reduce the risk of introducing new invaders. If an invader does slip through, this Action calls for key Tasks on Early Detection and Rapid Response (EDRR). Finally, this Action calls for the implementation of eradication and control programs with priority given to species that can be eradicated and/or species that have extensive impacts on habitats important to the health of the estuarine ecosystem.

Updates and Emerging Issues

This Action continues to support activities through existing bodies such as the Federal Aquatic Nuisance Species Task Force, the Western Regional Panel on Aquatic Nuisance Species, and Pacific Ballast Water Group, just to name a few. This Action has also included new Tasks and Milestones such as the pilot use of eDNA for early detection, the development of an EDRR framework, and finalizing Best Management Practices (BMPs) for reducing the spread of aquatic invasive species through biofouling of mobile marine infrastructure.

Climate Change Considerations

Climate change can exacerbate the proliferation of many invasive species in the Estuary due to warmer temperatures and longer growing seasons. Ecological resilience to climate change can be improved by preventing the adverse impacts of invasive species, making it even more urgent to implement the prevention and EDRR tasks in this Action.

Equity Considerations

Invasive species may displace culturally significant plants and animals for Tribes and can interfere with significant activities — such as subsistence fishing — on which vulnerable populations might rely. In addition, invasive species control and eradication efforts can have unintended economic and other impacts on frontline and underserved communities if an equity lens is not applied.

Connections to Other Actions

Invasive species can be accidentally introduced during restoration activities, particularly dredging and planting. Thus, this Action is closely connected to:

A5: Watershed Connections

A6: Sediment

A9: Intertidal/Subtidal Habitats

A10: Tidal Marsh

A11: Transition Zones

A12: Managed Wetlands

A13: Seasonal Wetlands

A14: Creeks

ACTION 16
FRESHWATER FLOWS

Improve the timing, amount, and duration of freshwater flows critical to Estuary health.

Inform elected officials, Tribes, and the public, including frontline communities, about the critical importance of freshwater flows through the Sacrament/San Joaquin Delta to San Francisco Bay and ultimately out the Golden Gate. Work with partners to adjust the timing, amount, and duration of freshwater flows as part of a more natural flow regime through the Delta and San Francisco Bay to better support all public trust uses.

TASK 16-1

Update and implement the San Francisco Bay/Sacramento-San Joaquin Delta Estuary Water Quality Control Plan (Bay-Delta WQCP) with timely and scientifically sound information and keep the public and non-governmental organizations (NGOs), Tribes, and local, state, and federal officials informed.

MILESTONE
Completed update and implementation of the Bay-Delta WQCP.

COST ESTIMATE – $$

TASK 16-2

Initiate research to assess critical ecological connections between the inland (Bay-Delta-Central Valley watershed) and coastal portions of the Estuary, including but not limited to:

1. The relationship between the freshwater plume from San Francisco Bay to nearshore waters and the abundance, distribution, and other population viability attributes of coastal fish and wildlife.

2. The relationship between flows and salmon abundance; the health of the Southern Resident population of orca (*Orcinus orca*) and other oceangoing species; and the abundance of various runs of Chinook salmon (*Oncorhynchus tshawytscha*) originating in the upper Estuary's watersheds (Sacramento River and Central Valley Evolutionarily Significant Units).

MILESTONE
One to two technical papers describing the initial findings, as well as a white paper synthesizing overall findings for a lay audience.

COST ESTIMATE – $$

TASK 16-4

Undertake a study to assess the social, cultural, and economic values, including non-monetary values, of freshwater flows to residents of the Estuary and beyond, including Tribes.

MILESTONE
Report synthesizing values of freshwater flows.

COST ESTIMATE – $$

TASK 16-6

Explore potential collaboration on freshwater flows priority needs and populations of endangered species with other West Coast National Estuary Programs (Puget Sound Partnership, Tillamook Estuaries Partnership, Lower Columbia Estuary Partnership, San Francisco Estuary Partnership, The Bay Foundation), Tribal Marine Stewards Network, and sovereign Tribal nations to collaborate on shared freshwater flows priority actions.

MILESTONE
One meeting between West Coast National Estuary Programs and Tribal representatives.

COST ESTIMATE – $

COST ESTIMATE KEY

$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 16-3

Integrate Tribal priorities regarding improvements to freshwater flows, such as pursuing legal personhood for traditional waterways and incorporating Traditional Ecological Knowledge into water management and decision-making for tributaries of the San Francisco Estuary. Support Tribes in developing capacity to co-manage or lead freshwater flows resources management.

MILESTONE

At least one convening of Tribes and Tribal organizations to review state data and plans, including opportunities for Tribe-to-Tribe conversations, in preparation for meeting with state agencies at the Tribal Water Summit or similar event.

COST ESTIMATE – $

TASK 16-5

Synthesize recent studies on the effect of flow regimes on survival of juvenile salmonids and Delta water temperatures to support future updates to instream flow management decisions that are protective of native fishes for the Sacramento and San Joaquin rivers and Delta.

MILESTONE

One or more technical reports distributed to decision-makers, managers, Tribes, and the public.

COST ESTIMATE – $

Photos (Left, Right): Ken James

Overview

The flow of fresh water from the watershed to the Estuary to the Pacific Ocean is a critical hydrologic process that influences almost all ecological processes and organisms in the Estuary. Altered freshwater flow regimes are one of the many powerful stressors affecting the health of the Estuary today, and studies show that current flows, particularly from the Sacramento and San Joaquin rivers and their tributaries, are insufficient to protect public trust resources, such as valuable aquatic ecosystems and multiple fish species.

Updates and Emerging Issues

Since 2016, this Action's focus remains largely similar to the last iteration of the Blueprint with the addition of expanding engaged stakeholders to include the priorities of Tribes and communities. Additionally, this task has identified natural and social science knowledge gaps to be filled and disseminated.

Climate Change Considerations

As climate change accelerates over the next decades, weather patterns are expected to become more extreme, leading to longer periods of drought, larger storms, and higher temperatures. Sierra snowpack may melt faster and earlier, leading to higher instream temperatures, with potentially devastating impacts on reservoir operations and salmonid mortality, as has occurred recently. Initiating research and providing management guidance through this Action will help address these vulnerabilities.

Equity Considerations

Tribes have long been excluded from restoration and management decisions that affect the flow of fresh water so vital to their peoples' histories, cultures, and livelihoods. Integrating Tribal priorities and Traditional Ecological Knowledge (TEK) into management decisions will build the foundation for future collaborative management practices and Tribal leadership in freshwater flows resources management.

Connections to Other Actions

As a critical hydrologic process, freshwater flows play important roles in the following Actions:

A5: Watershed Connections

A6: Sediment

A11: Transition Zones

A14: Creeks

A17: Water Conservation

A18: Recycled Water

ACTION 17
WATER CONSERVATION

Reduce water use around the Estuary.

Explore opportunities to reduce water exports from the Estuary through demand management such as reduced water use for landscaping, and residential water conservation.

TASK 17-1

Advance the installation of 'smart' water meters and monitors, including Advanced Metering Infrastructure or AMI, as industry best practice throughout the Estuary and provide support for obtaining funding for agencies working towards this goal.

MILESTONE
All major Bay Area water agencies substantially advanced in early phase conversion to 'smart' water meters, such as piloting testing or proof of concept.

COST ESTIMATE – $$$$

TASK 17-2

Expand Bay Area Regional Energy Network (BayREN)'s Water Upgrades $ave Program or similar water efficiency programs to expedite customer participation and utility investment in indoor and outdoor water efficiency projects for single family residential, multifamily residential, commercial, and institutional customers to reduce water waste from inefficient fixtures and leaks.

MILESTONE
18 municipal water utilities enrolled in the Water Upgrades $ave Program or similar programs.

COST ESTIMATE – $$$$

TASK 17-4

Develop a model ordinance for water efficient retrofit on resale or retrofit on listing, based on such examples as existing City of Davis, Santa Cruz County, and/or City and County of San Francisco ordinances, taking into account contingencies that do not delay close of escrow.

MILESTONE
Model retrofit ordinance for use by Estuary cities and counties.

COST ESTIMATE – $

TASK 17-5

Convene Bay Area water and wastewater agencies to discuss regional water conservation targets, opportunities, and limitations, resulting in a synthesis report.

MILESTONE
One workshop held with Estuary stakeholders, resulting in a synthesis report.

COST ESTIMATE – $

COST ESTIMATE KEY
$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 17-3

Improve Model Water Efficient Landscape Ordinance (MWELO) compliance by providing MWELO and regenerative landscape trainings, and an MWELO Toolkit to municipal staff throughout the Estuary and other regions that obtain water from the Estuary or its watersheds.

MILESTONE

20 regenerative landscape and MWELO trainings throughout the Estuary and its watersheds.

COST ESTIMATE – $$

Photo: Kelly Grow

Overview

Water conservation remains the most cost-effective and environmentally friendly way to reduce demand on overextended groundwater aquifers and riverine systems. Although California has passed legislation to require efficient water use both indoors and outdoors, opportunities still exist to improve implementation of these laws and address remaining gaps across the residential, agricultural, commercial, and industrial sectors.

Updates and Emerging Issues

This Action combines the two 2016 Actions on outdoor landscaping and agricultural water use efficiency and expands its focus to a suite of water conservation strategies targeting indoor residential use, outdoor water use across all sectors, and repairs. Additionally, this Action will anticipate emerging issues by laying out a task to convene water utility agencies and planners to consider the future of water conservation in the Bay Area.

Climate Change Considerations

This Action addresses water supply issues that will be exacerbated by climate change. Over the long term, other methods of extending water supply during long droughts, in addition to water use efficiency, may need to be developed or expanded. Additionally, exceptionally efficient use may create challenges for wastewater systems.

Equity Considerations

Multifamily residential units, especially rental units, pose one of the remaining challenges to increasing residential water use efficiency. Renters may pay into a shared water bill without seeing it, and therefore may unknowingly subsidize the cost of water wasted due to inefficient fixtures and leaks. Strategies to increase customer participation in water conservation programs can result in more affordable water bills for renters.

Connections to Other Actions

This Action connects to other Actions that focus on water supply, including:

A16: Freshwater Flows

A18: Recycled Water

A19: Stormwater Management

ACTION 18
RECYCLED WATER

Expand the use of recycled water.

Work with water agencies, municipalities, and stakeholders to reduce barriers to the broader use of recycled water. Support the use of the right water at the right time and in the right place.

TASK 18-1

Share recycled water informational materials, resources, and program models among municipalities, wastewater agencies, and drinking water agencies.

MILESTONE
Platform for sharing resources.

COST ESTIMATE – $

TASK 18-2

Collaborate with the Bay Area Clean Water Agencies' Recycled Water Committee stakeholders and others to identify opportunities to expand incorporation of recycled water in local and regional water resources planning processes.

MILESTONE
Bay Area Clean Water Agencies Recycled Water Study finalized.

COST ESTIMATE – $$

TASK 18-4

Evaluate reverse osmosis concentrate (ROC) management options to protect San Francisco Bay health and water quality while providing multiple stakeholder-driven benefits.

MILESTONE
Two to three semi-annual inter-agency discussions convened on the pathways to permitting ROC management.

COST ESTIMATE – $

Photo: Kelly Grow

COST ESTIMATE KEY
$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 18-3

Collaborate with the Bay Area Clean Water Agencies' Recycled Water Committee and others to convene stakeholders to identify opportunities for the broader use of recycled water, understand funding and planning gaps, and address regulatory and permitting constraints.

MILESTONE

Forum to discuss overcoming challenges to regional recycled water projects.

COST ESTIMATE – $

Photo: Florence Low

Overview

Recycled water refers to water that is treated to potable or non-potable standards for a beneficial use. In the Bay Area, local wastewater agencies work individually and through partnerships like the Bay Area Clean Water Agencies (BACWA) to implement strategic uses of recycled water, minimize its costs and maximize its benefits, and communicate a unified message about its complexities to the public. Without strong cross-jurisdictional governance and management structures, approaches to managing recycled water can be inconsistent and inefficient.

Updates and Emerging Issues

Since 2016, this Action has been revised to include more measurable and achievable milestones. Additionally, advanced treatment of recycled water via reverse osmosis produces a concentrate, the management of which needs to be considered in planning efforts. Lastly, a deeper understanding of the connection between recycled water and estuarine health needs to be established in order to secure more public and elected buy-in.

Climate Change Considerations

This Action addresses water supply issues that will be exacerbated by climate change. As climate change prolongs droughts and the public practices increased water efficiency, recycled water faces the unique challenge of unpredictable supply and competition that affects industries such as landscaping and refineries.

Equity Considerations

Much of the Bay Area's wastewater treatment infrastructure lies along the shoreline, as well as in or near frontline communities. Regional resilience planning efforts will need to consider pollution risks for these communities as the shoreline infrastructure adapts to rising seas.

Connections to Other Actions

The challenge posed by reverse osmosis concentrate management connects this Action to:

A20: Nutrients

A21: Emerging Contaminants

A22: Health Risks of Contaminants

This Action is also connected to other water supply Actions, such as:

A16: Freshwater Flows

A17: Water Conservation

A19: Stormwater Management

ACTION 19
STORMWATER MANAGEMENT

Manage stormwater with low impact development and green stormwater infrastructure.

Implement Low Impact Development (LID) and Green Stormwater Infrastructure (GSI) to reduce polluted stormwater to the Estuary. Develop planning and tracking tools, technical materials, policy recommendations, and financing strategy guidance to aid agencies with implementation.

TASK 19-1

Expand funding opportunities for Green Stormwater Infrastructure (GSI) planning and implementation, including those identified in the Roadmap of Funding Solutions for Sustainable Streets. Expand effort to engage utility agencies that also maintain infrastructure in the public realm to increase collaboration and cooperation.

MILESTONE

10 stormwater management/transportation planning meetings with Metropolitan Transportation Commission, San Francisco Bay Regional Water Quality Control Board, and others.

COST ESTIMATE – $

TASK 19-2

Improve the San Francisco Bay Low Impact Development (LID) Tracker Tool and the process to efficiently receive pertinent GSI project information reported to the San Francisco Bay Regional Water Quality Control Board to increase the number of projects in the Tracker Tool and allow reporting on the cumulative pollutant reduction effectiveness of GSI projects on the water quality of San Francisco Bay.

MILESTONE

A permanent agency home and budget for the LID Tracker Tool with budget for coordination with municipalities and countywide clean water programs, project data compilation and entry, and ongoing software maintenance.

COST ESTIMATE – $$

TASK 19-4

Develop a stormwater asset management module within the Metropolitan Transportation Commission's StreetSaver Program to help Bay Area municipal jurisdictions improve inventory, inspection, and maintenance of storm drain and green infrastructure assets along streets.

MILESTONE

Revised StreetSaver Program that includes a stormwater asset management module consistent with requirements in stormwater permits.

COST ESTIMATE – $$

Photo: Lonny Meyer

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 19-3

Pilot an alternative or in-lieu LID compliance Compliance program for San Francisco Bay Regional Water Quality Control Board that demonstrates to municipalities a programmatic approach to alternative compliance that can provide funding for both capital implementation and long-term operations of multi-benefit Green Stormwater Infrastructure, and result in projects that provide a net environmental benefit or equivalent or increased water quality benefit.

MILESTONE

San Francisco Bay Regional Water Quality Control Board-approved alternative compliance pilot program with two public projects identified for receiving resources from regulated project proponents.

COST ESTIMATE – $$$

Photo: Jennifer Krebs

Overview

In cities around the region, impervious surfaces such as streets and sidewalks typically represent 15-25 percent of land cover. Impervious surfaces prevent stormwater from being filtered through the soil, resulting in stormwater runoff that carries pollutants like oil, grease, pesticides, and heavy metals down drains and straight into the Estuary. As climate change brings more extreme weather events to the Estuary, green stormwater infrastructure (GSI) and low impact development (LID) installations can reduce runoff volumes and distribute runoff into inlets across a longer period of time, helping to reduce the impacts of urbanization on local hydrology and water quality.

Updates and Emerging Issues

Since 2016, this Action's focus has shifted from planning to implementation, with projects being tracked regionally via an LID Tracker Tool, built by the San Francisco Estuary Institute to be compatible with other GIS-based software programs. Additionally, this Action now explores creative ways to fund stormwater infrastructure projects, such as an in-lieu alternative compliance pilot program that would allow cities to get GSI funding from private projects where on-site treatment is infeasible. While the action is focused on the Estuary due to San Francisco Bay Regional Water Quality Control Board requirements and intense urbanization, LID/GSI is an effective strategy in Delta watersheds as well.

Climate Change Considerations

Climate change will bring more extreme weather events to the Estuary, causing periods of drought and periods of intense precipitation. GSI/LID installations can distribute runoff into inlets over a longer period of time, helping reduce flooding caused by overwhelmed stormwater systems.

Equity Considerations

GI/LID techniques often improve community aesthetics and create more pedestrian friendly spaces, which are needed in many underserved communities. However, these projects can also raise property values and lead to green gentrification, further exacerbating displacement in communities already vulnerable to hot real estate markets.

Connections to Other Actions

The use of GSI/LID to prevent water pollution and flooding hazards closely connects this action with:

A1: Climate Resilience

A2: Equity

A3: Adaptation Planning

A4: Adaptation Implementation

A18: Recycled Water

A20: Nutrients

A21: Emerging Contaminants

A22: Health Risks of Contaminants

ACTION 20 NUTRIENTS

Advance nutrient management in the Estuary.

Support water quality investigations, consistent monitoring and modeling, and analysis of management alternatives for nutrients, along with disseminating public-facing outreach materials on resulting data and management decisions.

TASK 20-1

Ensure the continuation of a long-term monitoring and modeling program of nutrient-related indicators in San Francisco Bay through the San Francisco Bay Regional Water Quality Control Board's Nutrient Management Strategy and program partnerships, and in the Delta through the U.S. Geological Survey and Interagency Ecological Program.

MILESTONE
Funding for long-term monitoring and modeling program renewed at sustainable levels, and additional funding sources investigated.

COST ESTIMATE – $$$$

TASK 20-2

Implement and iterate the Science Plan and Nutrient Assessment Framework of the San Francisco Bay Nutrient Management Strategy to establish the status and trends of nutrient indicators and quantitatively inform San Francisco Bay's response to nutrient loading.

MILESTONE
Completed round of modeling and synthesis studies and final version of the Assessment Framework developed by 2024 to inform future permits and other management actions.

COST ESTIMATE – $$$

TASK 20-3

Undertake studies in the Estuary related to developing and evaluating alternatives for nutrient management actions, including initial considerations of costs and environmental effects.

MILESTONE
Evaluation of opportunities completed to manage nutrient loading via nature-based solutions and recycled water.

COST ESTIMATE – $$

TASK 20-4

Disseminate information to decision-makers and the public regarding the status and trends of nutrient-related indicators and research findings, as well as the opportunities, constraints, and costs associated with various nutrient load management strategies.

MILESTONE
Outreach materials related to the status and trends of crucial nutrient indicators shared via an annually updated web-based portal and public-facing syntheses of research findings shared annually.

COST ESTIMATE – $$

TASK 20-5

Develop a framework for monitoring, modeling, and disseminating information on the extent, severity, and impacts of Harmful Algal Blooms (HABs) in the Delta.

MILESTONE
HABs framework for the Delta.

COST ESTIMATE – $$

COST ESTIMATE KEY		
$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water

Photo: Ken James

Photo: Florence Low

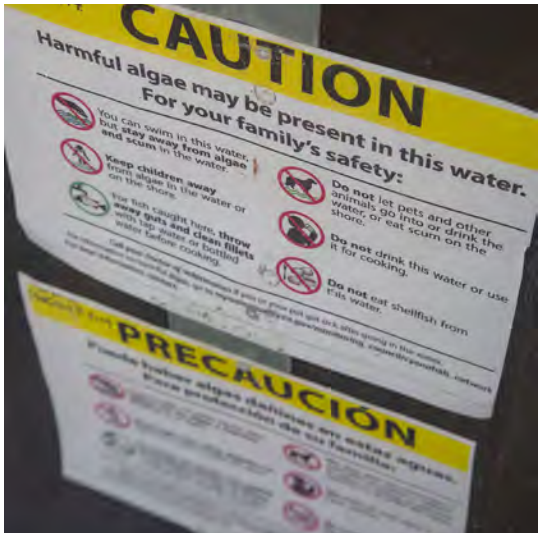


Photo: Josh Baar

Overview

Excess levels of nutrients, such as nitrogen and phosphorus, can cause problems like algae blooms and oxygen levels that are too low to support diverse native fish communities. Historically, the San Francisco Bay has not experienced the adverse effects of nutrient loading even though it is nutrient-enriched compared to other estuaries. However, widespread nutrients affect Suisun and San Pablo Bays, which highlights the need for a holistic understanding of nutrient dynamics throughout the entire Estuary. Thus, robust long-term monitoring and continuing investigations must inform nutrient management.

Updates and Emerging Issues

Since 2016, the San Francisco Bay Nutrient Management Strategy has been established as a joint fact-finding initiative. Looking forward to 2027, permits will be revised to incentivize nutrient reduction strategies before nutrients reach wastewater treatment plants. Future priorities must include increasing the funding pool across a wider range of sources, ensuring diverse engagement from communities as nutrient reduction strategies emerge, and continuing to study nutrient dynamics across the entire Estuary to identify the most appropriate set of management needs.

Climate Change Considerations

Scientists believe warming oceans are causing a cascade of changes with a nexus to nutrients. These changes include increased upwelling of nutrient-rich waters, phytoplankton production, ocean acidification, harmful algae blooms, and hypoxia. In shallower portions of the Bay, fish will become less resilient to low dissolved oxygen levels as temperatures increase. Looking to the 2027 update, a Task researching the potential for wastewater-borne nutrients to exacerbate climate change impacts may be needed. Current Tasks focus on preliminary research on the effects of nutrient loading on the Estuary.

Equity Considerations

Successful nutrient management will enable ongoing access to surface waters that support subsistence fishing and cultural uses, promote multi-benefit water quality projects to increase access to green infrastructure and open space, and increase job opportunities in the wastewater sector. To ensure this vision, regional decision-makers must engage diverse communities in more accessible and appropriate ways as shoreline resilience and nutrient management efforts emerge. Wastewater treatment upgrades and climate adaptation measures will affect historically low-income communities close to treatment facilities, and managers have increasingly recognized the need to engage communities traditionally excluded from decision-making processes.

Connections to Other Actions

Factors related to nutrient management in the Estuary connect this action to:

A1: Climate Resilience

A2: Equity

A3: Adaptation Planning

A4: Adaptation Implementation

A15: Invasive Species

A16: Freshwater Flows

A18: Recycled Water

A21: Emerging Contaminants

A22: Health Risks of Contaminants

A24: Public Access

ACTION 21
EMERGING CONTAMINANTS

Address emerging contaminants in the Estuary's waters.

Advance action plans for specific contaminants of emerging concern (CECs), and the associated Regional Monitoring Program (RMP) CECs monitoring strategy. Support and expand existing education and public outreach and other pollution prevention efforts to reduce CECs.

TASK 21-1

Review and update the San Francisco Bay Regional Monitoring Program contaminants of emerging concern (CEC) and microplastics monitoring strategies every two years. Develop management-relevant information to support selection and implementation of management measures addressing CECs and microplastics by the Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board.

MILESTONE
Updated RMP monitoring strategies every two years with distribution of associated management-relevant information.

COST ESTIMATE – $$

TASK 21-2

Reduce pesticides coming into the Estuary, particularly from pet flea and tick control products by supporting and working with the Department of Pesticide Regulation and veterinarians.

MILESTONE
At least one pesticide-reduction management measure implemented.

COST ESTIMATE – $

TASK 21-4

Support the Department of Toxic Substances Control's (DTSC) Safer Consumer Products Program's efforts to reduce CECs like PFAS (Per- and polyfluoroalkyl substances: stain and water repelling chemicals widely used in industrial and consumer products) and ethoxylated surfactants found in cleaning products and detergents to protect people (e.g., fish consumers) and the Bay ecosystem by providing management-relevant information, and through local implementation of measures to promote safer alternatives (e.g., purchasing preferences).

MILESTONE
Management-relevant information provided to support two management actions.

COST ESTIMATE – $$

Photo: Florence Low

COST ESTIMATE KEY

$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Water | Stewardship

TASK 21-3

Support statewide efforts to address microplastic pollution by providing management-relevant information to the Ocean Protection Council, the Department of Toxic Substances Control, and other agency partners to support management actions.

MILESTONE

Management-relevant information to support two management actions.

COST ESTIMATE – $$

Photo: San Francisco Estuary Institute

Overview

Over 100,000 chemicals have been registered or approved for commercial use in the United States; however, the lack of complete information about these chemicals limits the ability of scientists to assess their potential risk. Contaminants of Emerging Concern (CECs) have the potential to harm people and wildlife, and have not yet been adequately addressed through regulation. In the San Francisco Estuary, a tiered, risk-based approach is used to classify CECs as high, moderate, or low concern, with an additional category of possible concern where risks are uncertain or unknown.

Updates and Emerging Issues

Since 2016, the Estuary's Regional Monitoring Program has classified microplastics and key plastic ingredients, two common ant, termite, and flea pesticides, and per- and polyfluoroalkyl substances (PFAS) as contaminants of moderate concern for the Estuary. This Action continues to monitor and research CECs and their potential impacts on the Estuary. Looking forward to 2027, pesticides related to pet products are anticipated to become a bigger issue.

Climate Change Considerations

CECs can be mobilized from the soil due to sea level rise, and leach into groundwater supplies. While the Regional Monitoring Program and the San Francisco Estuary Institute track CECs, the effects of climate change on high-risk locations have yet to be identified. Task 1-8 will be a first step in studying the potential influence of rising sea level on contaminated sites around Bay margins.

Equity Considerations

Frontline, disadvantaged, underserved, and Tribal communities carry the highest risk of exposure to CECs due to their proximity to contaminated lands and practices such as subsistence fishing.

Connections to Other Actions

CECs negatively and inequitably impact water quality and public health; thus, this Action is closely related to:

A2: Equity

A18: Recycled Water

A19: Stormwater Management

A20: Nutrients

A22: Health Risks of Contaminants

ACTION 22
HEALTH RISKS OF CONTAMINANTS

Reduce human health risks due to legacy contaminants and contaminants in fish.

Addresses legacy contaminants and contaminants in fish and health risks related to fish consumption, and cultural and traditional uses. Support underserved and disadvantaged communities and Tribes' efforts to collect toxic site and fish consumption data and to implement projects to mitigate health impacts.

TASK 22-1

Collaborate with Tribes and subsistence fishing communities to acknowledge the importance of Tribal cultural and traditional uses of water as well as subsistence fishing, and designate Tribal Tradition and Culture, Tribal Subsistence Fishing, and Subsistence Fishing Beneficial uses of water bodies in the San Francisco Bay Region.

MILESTONE

San Francisco Bay Regional Water Quality Control Board's Basin Plan amended to designate additional Beneficial uses.

COST ESTIMATE – $$

TASK 22-2

Partner with community-based organizations to collect information on subsistence fishing in the Estuary, focusing on disadvantaged and underserved communities, to develop an understanding of health risks and how stakeholder values, and cultural, recreational, natural resource, and agricultural uses vary geographically and across demographics.

MILESTONE

Funding secured for community-based organizations to collect data on subsistence fishing practices and consumption in at least two communities in the San Francisco Estuary.

COST ESTIMATE – $$

TASK 22-4

Develop Advisory Tissue Levels for one or more chemicals found in San Francisco Estuary fish, such as PFAS (per- and polyfluoralkyl substances) chemicals.

MILESTONE

Advisory Tissue Levels developed for one or more chemicals and, as appropriate, fish advisories for specific water bodies (e.g., the Delta or San Francisco Bay) within the San Francisco Bay Estuary system.

COST ESTIMATE – $$

TASK 22-5

Work with regulators and frontline, underserved, or disadvantaged communities to collect information on community-identified and -prioritized potential toxic water quality sites not listed on regulatory lists for cleanup.

MILESTONE

Develop community-based toxic sites maps under the guidance of at least three frontline, underserved, and/or disadvantaged communities around the Estuary in partnership with regulatory agencies.

COST ESTIMATE – $$

Photo: Rick Lewis

Photos: Florence Low

COST ESTIMATE KEY

$ - Up to $100,000
$$ - Up to $1 million
$$$ - Up to $10 million
$$$$ - Up to $100 million
$$$$$ - Over $100 million

GOALS

Resilience | Water | Stewardship

TASK 22-3

Conduct thorough fish monitoring in the locations where communities with high rates of consumption collect fish from the Bay. Analyze the species they consume and the pollutants that they are concerned about. Coordinate this monitoring with the consumption survey work of Task 22-2 in partnership with community-based organizations.

MILESTONE

Fish contamination in priority locations identified and monitored in at least two communities in the San Francisco Estuary.

COST ESTIMATE – $$$

TASK 22-6

Use the results of community-based toxic sites mapping to produce an updated and prioritized list of toxic sites, including the status of sediment quality and indicators of bioaccumulation associated with fish consumption warnings, to inform management needs.

MILESTONE

Updated and prioritized known toxic sites lists, including community-identified toxic sites, to inform management needs.

COST ESTIMATE – $

Photo: Karl Nielsen

Overview

Organisms living in or near the Estuary can absorb contaminants in the water, such as mercury, polychlorinated biphenyls (PCBs), and per-/polyfluoroalkyl substances (PFAS). In a food web, contaminants become more and more concentrated as predators consume prey and accumulate contaminants through their diet. The concentration of contaminants in fish can make them unsafe for human consumption in the Estuary, and can disproportionately impact Tribal, disadvantaged, and underserved communities that fish for cultural and subsistence purposes.

Updates and Emerging Issues

Since 2016, this Action has shifted to addressing water quality from a habitat-centric approach (Total Maximum Daily Loads, or TMDLs) to a human-centric approach (exposure to hazardous levels of contaminants by subsistence fishers).

Climate Change Considerations

With sea level rise and, in some areas, associated groundwater rise, contaminants from current and former industrial sites along the Bay margins may be mobilized in groundwater or leach into the Estuary. Task 1-8 will be a first step in studying the potential influence of rising sea level on contaminated sites around Bay margins.

Equity Considerations

Some contaminants may be more concentrated in waters near former industrial sites, disproportionately affecting communities that fish for subsistence or cultural purposes, including communities of color and lower income residents, and Tribes. In addition, Tribes feel strongly that a Tribal Beneficial use designation is appropriate for all waterbodies throughout the Estuary, on the basis of widespread and varied Tribal traditional use of Estuary waterbodies since time immemorial.

Connections to Other Actions

The contamination of fish negatively and inequitably impacts public health, and is closely related to water quality; thus, this Action is connected to:

A2: Equity

A18: Recycled Water

A19: Stormwater Management

A20: Nutrients

A21: Emerging Contaminants

A24: Public Access

ACTION 23

TRASH

Reduce trash and marine debris in the Estuary.

Support regional municipalities and agencies in attaining trash reduction objectives by assisting in source reduction activities. Prevent and remove abandoned and derelict vessels (ADVs) as a source of marine debris and develop new indicators and metrics for tracking trash.

TASK 23-1

Continue partnerships with municipalities, counties, pollution prevention organizations, and other stakeholders to research and implement effective extended producer responsibility (EPR) strategies or bans for items such as plastic products, microplastics, and tobacco products in the Estuary.

MILESTONE

New bans or extended producer responsibility (EPR) strategies such as reduction ordinances based on recommendations (i.e., source control).

COST ESTIMATE – $$

TASK 23-2

Develop an indicator based on regionally meaningful metrics of trash in the Estuary and its watersheds for use in the State of the Estuary report.

MILESTONE

New trash indicator developed for the San Francisco Bay and its watersheds for inclusion in a future State of the Estuary Report.

COST ESTIMATE – $$

TASK 23-4

Control trash discharges from municipal storm drain systems to the Estuary and its tributaries through implementation of trash capture systems or other equivalent controls in accordance with the San Francisco Bay Municipal Regional Stormwater Permit and the Statewide Water Quality Control Plans for Trash.

MILESTONE

Complete implementation of full trash capture systems or other equivalent controls by municipalities subject to the San Francisco Bay Municipal Regional Stormwater Permit and 40 percent implementation by other municipalities.

COST ESTIMATE – $$

Photo: John Chacon

COST ESTIMATE KEY		
$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Resilience | Water | Stewardship

TASK 23-3

Advance new or modified statutory authority to prevent abandoned and derelict vessels (ADVs), potentially pertaining to registration requirements, insurance requirements, and resale restrictions for recreational and commercial vessels, and seek funding for removal of ADVs such as time of purchase fees or insurance requirements.

MILESTONE

Findings and recommendations report released by inter-agency U.S. Coast Guard Abandoned and Derelict Vessel Subgroup, for use by state and local agencies and legislators.

COST ESTIMATE – $

Photo: Florence Low

Overview

Every year, 1.36 million gallons of trash flows into San Francisco Bay and its creeks from storm drains. While trash is one of the easiest pollutants to see, it is one of the most difficult to measure, which creates a unique challenge for addressing this issue. Additionally, abandoned and derelict vessels (ADVs) and other large marine debris can damage habitat, leak chemicals, and pose hazards to navigation. This Action focuses on reducing debris on land and water through coordinated control and monitoring, policy change, and funding.

Updates and Emerging Issues

While municipal governments have made progress reducing the amount of trash entering storm drains, significant work still needs to be done by municipalities to achieve regulatory milestones as trash continues to be a persistent and ongoing water quality issue. In addition, growing concern for marine debris has resulted in a new task specifically addressing clean up and removal of ADVs. However, conflicting perspectives on where to prioritize funding has stalled the implementation of coordinated monitoring, regulatory enforcement, and public engagement.

Climate Change Considerations

As climate change creates more extreme and unpredictable storms, the risk and volume of trash entering the Estuary via storm drains and waterways may increase dramatically. Tasks under this Action will improve monitoring and understanding of effective strategies to reduce this risk.

Equity Considerations

By focusing on producer responsibility as a means of source control, the environmental costs and responsibilities of trash are expected to decrease for consumers. Illegal dumping, ADVs, and trash hot spots are more prevalent in disadvantaged and underserved communities where clean up and removal by local municipalities may be underfunded.

Connections to Other Actions

The prevalence of trash, ADVs, and other marine debris in the Estuary is closely related to stormwater runoff, water quality, and habitat. Thus, this Action is closely connected with:

A9: Intertidal/Subtidal Habitats

A19: Stormwater Management

A21: Emerging Contaminants

A22: Health Risks of Contaminants

ACTION 24
PUBLIC ACCESS

Provide equitable public access and recreational opportunities compatible with wildlife.

Provide Estuary-oriented and upper watershed access to open space that avoids adverse impacts to sensitive habitats and wildlife while providing buffers to climate change impacts and accommodating equitable access and cultural uses, environmental education, biking, commuting, hiking, paddling, wildlife viewing, and other activities. These opportunities will increase citizen and decision-maker appreciation of the value of natural resources, and foster support for Estuary protection and restoration.

TASK 24-1

Add to the San Francisco Bay Trail, closing critical gaps in the main alignment (the "spine") that links the shoreline of all nine Bay Area counties, while avoiding adverse effects on sensitive resources and wildlife.

MILESTONE
18 miles of new trail segments to the Bay Trail Spine.

COST ESTIMATE – $$$$

TASK 24-2

Add to the San Francisco Bay Area Water Trail, creating or enhancing high quality public water access and paddle-in camping opportunities. Access should be designed to avoid adverse impacts to sensitive resources and wildlife.

MILESTONE
Six (with two specifically in the Suisun Marsh area) new or enhanced San Francisco Bay Area Water Trail sites, including two new or enhanced kayak-in campgrounds.

COST ESTIMATE – $$

TASK 24-4

Track progress towards increasing quality and quantity of shoreline and upper watershed open spaces for habitat health and connectivity, reduced carbon emissions, improved air quality, and other climate change benefits, and multiple public uses including recreational, cultural, religious, and stewardship uses.

MILESTONE
Revised shoreline open space indicator and new riparian corridor indicator for the State of the Estuary Report.

COST ESTIMATE – $$

Photo: Karl Nielsen

COST ESTIMATE KEY		
$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources

Stewardship

TASK 24-3

Advance the consideration of equity and resilience within parks and open space planning efforts through development of two new Bay Area Greenprint modules using Geographic Information System (GIS)-based analytics and tools.

MILESTONE

Resilience and Equity Modules for Bay Area GreenPrint released.

COST ESTIMATE – $

Photo: Kelly Grow

Overview

The Estuary provides unique opportunities for recreational and educational experiences due to its vital role in providing refuge, forage, and nesting habitat for wildlife. Public access to the Estuary's natural resources inspires people to take an active interest in Estuary protection and restoration efforts; however, public access can also have adverse effects on wildlife and habitats if it is not sited, designed, and managed responsibly.

Updates and Emerging Issues

Since 2016, this Action has updated its Milestones for the San Francisco Bay Trail and the San Francisco Bay Area Water Trail.

Climate Change Considerations

This Action supports efforts to avoid adverse impacts to habitat and wildlife while supporting public access to open space. Looking to the future, rising sea levels may decrease acreage of open space for both wildlife and public access, and this Action will need to balance public access against adverse impacts to wildlife habitat.

Equity Considerations

This Action recognizes that public access to open space is not equitable for all populations and seeks to consider equity modules in local open space planning efforts. Additionally, this Action now considers the use of open space for cultural and religious purposes and acknowledges its positive effect on public health.

Connections to Other Actions

Public access to open space plays an important role in cultivating diverse and active stewardship of the Estuary. Consequently, this Action is closely connected to:

A1: Climate Resilience

A2: Equity

A3: Adaptation Planning

A4: Adaptation Implementation

A5: Watershed Connections

A8: Wetland Monitoring

A10: Tidal Marsh

A12: Managed Wetlands

A14: Creeks

A25: Champion the Estuary

ACTION 25 CHAMPION THE ESTUARY

Champion the Estuary.

Educate partners, stakeholders, national, local, and regional leaders, and other targeted audiences about the priorities in the Estuary Blueprint. Provide local decision-makers, the public, and youth with the kind of reliable information necessary to make policy and personal decisions in favor of Estuary health.

TASK 25-1

Update and advance implementation of the Estuary Partnership's Strategic Communications Plan, leveraging existing platforms and partnerships to increase awareness of and engagement in the goals of the Estuary Blueprint.

MILESTONE
Update and fund the Strategic Communications Plan.

COST ESTIMATE – $$

TASK 25-2

Provide the latest information on the science and management of the Estuary and advance integrated conferences that span the Estuary.

MILESTONE
Annual conferences that focus on the San Francisco Estuary.

COST ESTIMATE – $$$

TASK 25-4

Support and expand Estuary-oriented outreach and education programs provided by local and community-based organizations, either through direct funding, by developing materials, or through other tools to be identified in collaboration with existing programs.

MILESTONE
Existing or new outreach and education programs expanded to reach 500 new participants.

COST ESTIMATE – $$

Photo: Kelly Grow

COST ESTIMATE KEY		
$ - Up to $100,000	$$ - Up to $1 million	$$$$ - Up to $100 million
	$$$ - Up to $10 million	$$$$$ - Over $100 million

GOALS

Living Resources | Resilience | Water | Stewardship

TASK 25-3

Provide current information on the health of the Estuary and results of management approaches by periodically updating the State of the Estuary Report.

MILESTONE

Updated State of the Estuary Report.

COST ESTIMATE – $$

Photo: San Francisco Estuary Partnership Archive

Overview

The future of the Estuary depends on support from diverse, engaged audiences. Support can be cultivated through place-based environmental education and outreach in Estuary watersheds. The San Francisco Estuary Partnership is actively developing, expanding, and funding public engagement initiatives to increase support for the restoration and protection of the San Francisco Estuary.

Updates and Emerging Issues

Since 2016, this Action has shifted away from a focus on the Estuary Blueprint itself and toward support for the Estuary as a whole. The Action has been updated to include Tasks on K-12 outreach and education, with particular emphasis on climate change.

Climate Change Considerations

Communicating the urgency of the climate crisis to current and future audiences can garner support for a healthy, resilient Estuary and can foster greater participation in Estuary Blueprint priorities.

Equity Considerations

Estuary-oriented outreach and education programs are most effectively conducted by local and community-based organizations, which have established trust and relationships in the communities they serve. While providing resources to these organizations, the San Francisco Estuary Partnership must consider dimensions of equity to appropriately prioritize and allocate resources.

Connections to Other Actions

Championing the Estuary connects this Action to all Actions in the Estuary Blueprint. However, this Action is most directly related to:

A2: Equity

A24: Public Access

Table 2. Task Leads and Collaborating Partners for Estuary Blueprint Actions

ACTION	TASK	TASK LEAD(S)
1 Climate Resilience	1–1	San Francisco Bay Conservation & Development Commission
	1–2	Delta Stewardship Council
	1–3	Bay Area Climate Adaptation Network, NorCal Resilience Network, San Francisco Bay Regional Water Quality Control Board, community-based organizations
	1–4	San Francisco Estuary Partnership (Coordinator)
	1–5	Bay Area Climate Adaptation Network, Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute
	1–6	San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	1–7	Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Estuary Partnership, local jurisdictions
	1–8	Pathways Climate Institute, San Francisco Estuary Institute, University of California-Berkeley

COLLABORATING PARTNERS
Bay Area Climate Adaptation Network, Bay Area Regional Collaborative, California Department of Transportation, California State Coastal Conservancy, Delta Conservancy, Delta Stewardship Council, Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Regional Coastal Hazards Adaptation Resiliency Group (CHARG), San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute, San Francisco Estuary Partnership, U.S. Army Corps of Engineers, community-based organizations, environmental organizations, local jurisdictions
Delta Conservancy, San Francisco Estuary Institute, San Francisco Estuary Partnership, U.S. Army Corps of Engineers, community-based organizations, environmental organizations, local jurisdictions
Bay Area Regional Collaborative, California State Coastal Conservancy, Delta Stewardship Council, Metropolitan Transportation Commission and Association of Bay Area Governments, National Oceanic and Atmospheric Administration - Fisheries, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Partnership, West Oakland Environmental Indicators Project, local jurisdictions
Bay Area Council, Sierra Club California, regulatory agencies
Bay Area Climate Adaptation Network, Bay Area Regional Collaborative, California State Coastal Conservancy, Delta Stewardship Council, National Oceanic and Atmospheric Administration, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Coastal Hazards Adaptation Resiliency Group (CHARG), San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership
Local jurisdictions
Bay Area Climate Adaptation Network, Bay Area Regional Collaborative, California State Coastal Conservancy, Delta Stewardship Council, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute, Strategic Growth Council
San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, Counties

ACTION	TASK	TASK LEAD(S)
2 Equity	2–1	San Francisco Bay Conservation & Development Commission in coordination with Bay Area-based organizations, San Francisco Bay Conservation & Development Commission's Environmental Justice (EJ) Advisors, and regional partners
	2–2	San Francisco Estuary Partnership (Coordinator)
	2–3	Delta Stewardship Council, San Francisco Bay Conservation & Development Commission
	2–4	California Indian Environmental Alliance (CIEA), San Francisco Estuary Partnership (Coordinator), Tribes
3 Adaptation Planning	3–1	Bay Area Climate Adaptation Network, Bay Area Regional Collaborative
	3–2	Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Conservation & Development Commission
	3–3	San Francisco Estuary Partnership (Coordinator)
	3–4	San Francisco Bay Restoration Regulatory Integration Team (BRRIT) Policy Management Committee
	3–5	Metropolitan Transportation Commission and Association of Bay Area Governments
	3–6	Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Conservation & Development Commission
	3–7	Metropolitan Transportation Commission and Association of Bay Area Governments

COLLABORATING PARTNERS
Bay Area Climate Adaptation Network, Bay Area Regional Health Inequities Initiative, Delta Stewardship Council, San Francisco Bay Regional Water Quality Control Board, community-based organizations, interested Bay Area counties
Audubon California, California State Coastal Conservancy, San Francisco Bay Restoration Authority, non-governmental organizations, other grantmaking institutions, regulatory agencies
California Department of Fish & Wildlife, California Department of Water Resources, San Francisco Bay Regional Water Quality Control Board, University of California-Davis
California State Coastal Conservancy, Centers for Disease Control and Prevention, Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Conservation & Development Commission
California Department of Water Resources, California State Coastal Conservancy, Metropolitan Transportation Commission and Association of Bay Area Governments, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Restoration Authority, San Francisco Estuary Partnership, U.S. Army Corps of Engineers, community-based organizations, local jurisdictions
Bay Area Climate Adaptation Network, Bay Area Regional Collaborative, California State Coastal Conservancy, Delta Stewardship Council, National Oceanic and Atmospheric Administration, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Water Quality Control Board, San Francisco Estuary Institute, San Francisco Estuary Partnership
Audubon California, California Department of Fish & Wildlife, Central Valley Regional Water Quality Control Board, Delta Stewardship Council, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service
Project implementers
California State Coastal Conservancy, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Partnership, local jurisdictions
California State Coastal Conservancy, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Restoration Authority, San Francisco Estuary Partnership
Local jurisdictions

ACTION	TASK	TASK LEAD(S)
4 Adaptation Implementation	4-1	San Francisco Estuary Partnership (Coordinator)
	4-2	San Francisco Estuary Partnership (Coordinator)
	4-3	California State Coastal Conservancy
	4-4	San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute
	4-5	San Francisco Estuary Partnership
5 Watershed Connections	5-1	San Francisco Estuary Institute, local watershed management agencies
	5-2	San Francisco Estuary Institute
	5-3	San Francisco Estuary Institute, San Francisco Estuary Partnership
	5-4	Marin Department of Public Works Engineering Sea Level Rise Program (E-SLR)

COLLABORATING PARTNERS
Audubon California, California Department of Fish & Wildlife, California State Coastal Conservancy, Central Valley Regional Water Quality Control Board, Delta Stewardship Council, San Francisco Bay Conservation & Development Commission, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Restoration Authority, U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, California State Coastal Conservancy, Central Valley Regional Water Quality Control Board, Delta Stewardship Council, San Francisco Bay Conservation & Development Commission, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Restoration Authority, U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service
Audubon California, California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Estuary Institute, San Francisco State University Estuary & Ocean Science Center, Smithsonian Environmental Research Center, U.S. Fish & Wildlife Service
California State Coastal Conservancy, San Francisco Bay Regional Water Quality Control Board, Metropolitan Transportation Commission and Association of Bay Area Governments
Central Valley Regional Water Quality Control Board, Delta Stewardship Council, San Francisco Bay Conservation & Development Commission, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute, local jurisdictions
California Department of Fish & Wildlife, California Department of Water Resources, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, Santa Clara Valley Water District, State Water Resources Control Board, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency
Delta Stewardship Council, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership
Bay Area Flood Protection Agencies Association, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Coastal Hazards Adaptation Resiliency Group (CHARG), San Francisco Bay Regional Water Quality Control Board
California State Coastal Conservancy, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute, San Francisco Estuary Partnership, Santa Clara Valley Water District

ACTION	TASK	TASK LEAD(S)
6 Sediment	6-1	LTMS Partner Agencies (U.S. Army Corps of Engineers, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency)
	6-2	California State Coastal Conservancy, San Francisco Bay Conservation & Development Commission, U.S. Army Corps of Engineers
	6-3	San Francisco Bay Regional Water Quality Control Board
	6-4	San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute
	6-5	California State Coastal Conservancy, San Francisco Bay Conservation & Development Commission
	6-6	San Francisco Estuary Institute
	6-7	Delta Stewardship Council
7 Carbon Management	7-1	California Department of Water Resources, Delta Conservancy
	7-2	California Department of Water Resources, Delta Stewardship Council, U.S. Geological Survey
	7-3	Delta Conservancy, Delta Stewardship Council
	7-4	California State Coastal Conservancy, San Francisco State University Estuary & Ocean Science Center
	7-5	San Francisco Bay National Estuarine Research Reserve
	7-6	California Department of Water Resources, Delta Conservancy

COLLABORATING PARTNERS
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service
California State Coastal Conservancy, Centers for Disease Control and Prevention, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service
San Francisco Bay Joint Venture, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency
San Francisco Estuary Partnership, U.S. Army Corps of Engineers
San Francisco Bay Conservation & Development Commission, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, Santa Clara Valley Water District, U.S. Army Corps of Engineers, U.S. Geological Survey
San Francisco Estuary Institute
Delta Stewardship Council, Ducks Unlimited
California State University East Bay, San Francisco Bay National Estuarine Research Reserve, University of California-Berkeley
American Carbon Registry
California Ocean Protection Council, San Francisco Estuary Partnership, U.S. Geological Survey
California State University East Bay, Delta Stewardship Council, U.S. Geological Survey, University of California-Berkeley
American Carbon Registry, California State University East Bay, California Air Resources Board

ACTION	TASK	TASK LEAD(S)
8 Wetland Monitoring	8-1	San Francisco Estuary Institute, San Francisco Estuary Partnership
	8-2	San Francisco Estuary Institute
	8-3	San Francisco Estuary Institute, San Francisco Estuary Partnership
	8-4	San Francisco Estuary Institute, San Francisco Estuary Partnership
	8-5	Delta Stewardship Council, San Francisco Bay National Estuarine Research Reserve, San Francisco Estuary Institute, San Francisco Estuary Partnership, WRMP Technical Advisory Committee Chair & Vice Chair
9 Intertidal/ Subtidal Habitats	9-1	Audubon California, San Francisco State University Estuary & Ocean Science Center
	9-2	California State Coastal Conservancy
	9-3	California State Coastal Conservancy
	9-4	California State Coastal Conservancy
	9-5	California State Coastal Conservancy
	9-6	California State Coastal Conservancy
	9-7	California Department of Fish & Wildlife, San Francisco Bay Joint Venture

COLLABORATING PARTNERS
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers), U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service, U.S. Geological Survey, WRMP Steering Committee (San Francisco Bay National Estuarine Research Reserve, WRMP Technical Advisory Committee)
WRMP Steering Committee and WRMP Technical Advisory Committee
San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, U.S. Geological Survey, and others
WRMP Steering Committee and WRMP Technical Advisory Committee
WRMP Steering Committee and WRMP Technical Advisory Committee
California Department of Fish & Wildlife, Merkel & Associates, National Oceanic and Atmospheric Administration, Ocean Protection Council, San Francisco Bay Joint Venture
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Joint Venture, San Francisco State University Estuary & Ocean Science Center, Smithsonian Environmental Research Center, U.S. Army Corps of Engineers
National Oceanic and Atmospheric Administration, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Restoration Authority, San Francisco State University Estuary & Ocean Science Center, Smithsonian Environmental Research Center
California Department of Fish and Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Estuary Institute, San Francisco State University Estuary & Ocean Science Center, State Water Resources Control Board, U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco State University Estuary & Ocean Science Center, Smithsonian Environmental Research Center, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco State University Estuary & Ocean Science Center, Smithsonian Environmental Research Center, U.S. Fish & Wildlife Service
California State Coastal Conservancy, San Francisco Estuary Institute, San Francisco State University Estuary & Ocean Science Center

ACTION	TASK	TASK LEAD(S)
10 Tidal Marsh	10-1	California EcoRestore, San Francisco Bay Joint Venture
	10-2	San Francisco Bay Joint Venture
	10-3	San Francisco Bay Joint Venture
11 Transition Zones	11-1	San Francisco Bay Joint Venture, San Francisco Estuary Partnership
	11-2	San Francisco Bay Joint Venture, San Francisco Estuary Partnership
	11-3	San Francisco Estuary Institute
	11-4	Central California Vegetation Managers' Workgroup
12 Managed Wetlands	12-1	California Department of Fish & Wildlife, California State Coastal Conservancy,, U.S. Fish & Wildlife Service
	12-2	California Department of Fish & Wildlife, California State Coastal Conservancy, U.S. Fish & Wildlife Service
	12-3	California State Coastal Conservancy
	12-4	California State Coastal Conservancy
	12-5	California State Coastal Conservancy

COLLABORATING PARTNERS
San Francisco Bay National Estuarine Research Reserve, restoration community including government agencies, non-profit organizations, and private entities
Restoration community including government agencies, non-profit organizations, and private entities.
San Francisco Bay National Estuarine Research Reserve, restoration community including government agencies, non-profit organizations, and private entities
San Francisco Bay National Estuarine Research Reserve, restoration community including government agencies, non-profit organizations, and private entities
San Francisco Bay National Estuarine Research Reserve, restoration community including government agencies, non-profit organizations, and private entities
Geospatial Workgroup and WRMP Technical Advisory Committee
Central California Vegetation Managers' Workgroup (Novato Baylands Stewards, others), Point Blue's Students and Teachers Restoring A Watershed (STRAW) Program, San Francisco Bay National Estuarine Research Reserve
California Department of Water Resources, California Waterfowl, Delta Conservancy, Ducks Unlimited, National Oceanic and Atmospheric Administration, Point Blue Conservation Science, San Francisco Bay Bird Observatory, Suisun Resource Conservation District, U.S. Geological Survey, University of California-Davis, Yolo Basin Foundation
California Department of Water Resources, California Waterfowl, Delta Conservancy, Ducks Unlimited, National Oceanic and Atmospheric Administration, Point Blue Conservation Science, San Francisco Bay Bird Observatory, Suisun Resource Conservation District, U.S. Geological Survey, University of California-Davis, Yolo Basin Foundation
California Department of Fish & Wildlife, California Department of Water Resources, California Waterfowl, Delta Conservancy, Ducks Unlimited, Point Blue Conservation Science, San Francisco Bay Bird Observatory, San Francisco Bay National Estuarine Research Reserve, Suisun Resource Conservation District, U.S. Fish & Wildlife Service, U.S. Geological Survey, University of California-Davis, Yolo Basin Foundation
California Department of Fish & Wildlife, California Waterfowl, Ducks Unlimited, Point Blue Conservation Science, San Francisco Bay Bird Observatory, Suisun Resource Conservation District, U.S. Fish & Wildlife Service, U.S. Geological Survey, University of California-Davis, Yolo Basin Foundation
California Department of Fish & Wildlife, California Department of Water Resources, California Waterfowl, Delta Conservancy, Ducks Unlimited, Point Blue Conservation Science, San Francisco Bay Bird Observatory, Suisun Resource Conservation District, U.S. Fish & Wildlife Service, U.S. Geological Survey, University of California-Davis, Yolo Basin Foundation

ACTION	TASK	TASK LEAD(S)
13 Seasonal Wetlands	13-1	San Francisco Bay Joint Venture
	13-2	Delta Stewardship Council, San Francisco Bay Joint Venture
	13-3	Natural Resources Conservation Service, Resource Conservation Districts
14 Creeks	14-1	San Francisco Bay Joint Venture, San Francisco Estuary Partnership (Coordinator)
	14-2	San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership
	14-3	Delta Stewardship Council, San Francisco Estuary Partnership
	14-4	San Francisco Bay Joint Venture, San Francisco Estuary Partnership (Coordinator)
	14-5	San Francisco Estuary Partnership (Coordinator)

COLLABORATING PARTNERS
Natural Resources Conservation Service, Resource Conservation Districts, San Francisco Bay National Estuarine Research Reserve
Natural Resources Conservation Service, Resource Conservation Districts, San Francisco Bay National Estuarine Research Reserve
San Francisco Bay Joint Venture, San Francisco Bay National Estuarine Research Reserve, San Francisco Estuary Partnership
California Department of Fish & Wildlife, Conservation Lands Network, Delta Plan Interagency Implementation Committee (DPIIC), National Oceanic and Atmospheric Administration, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute, Santa Clara Valley Water District, TOGETHER Bay Area
Bay Area Flood Protection Agency Association, Bay Area Watershed Network, California Department of Fish & Wildlife, Conservation Lands Network, National Oceanic and Atmospheric Administration, ReScape California, Resource Conservation Districts, TOGETHER Bay Area, U.S. Army Corps of Engineers
California Department of Fish & Wildlife, Conservation Lands Network, Delta Plan Interagency Implementation Committee (DPIIC), National Oceanic and Atmospheric Administration, Resource Conservation Districts, TOGETHER Bay Area, U.S. Army Corps of Engineers, flood control districts, land trusts
California Department of Fish & Wildlife, Conservation Lands Network, National Oceanic and Atmospheric Administration, Resource Conservation Districts, State Water Resources Control Board, TOGETHER Bay Area, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, flood control districts, land trusts, local municipalities, non-governmental organizations
Downtown Streets Team, city/county health services departments, homeless advocacy organizations, local non-governmental organizations

ACTION	TASK	TASK LEAD(S)
15 Invasive Species	15-1	California Department of Fish & Wildlife, California Department of Food & Agriculture, California Invasive Plant Council, California State Lands Commission, San Francisco Estuary Partnership, U.S. Fish & Wildlife Service
	15-2	California Department of Fish & Wildlife, California Invasive Plant Council, California State Coastal Conservancy, U.S. Fish & Wildlife Service
	15-3	Delta Conservancy, Delta Stewardship Council, San Francisco Estuary Partnership, U.S. Fish & Wildlife Service
	15-4	California Department of Fish & Wildlife
	15-5	California Invasive Plant Council, California State Coastal Conservancy
	15-6	California State Coastal Conservancy
	15-7	Coastal Committee of the Western Regional Panel on Aquatic Nuisance Species, San Francisco Estuary Partnership

COLLABORATING PARTNERS
California State Coastal Conservancy's Invasive Spartina Project, California State Parks Division of Boating and Waterways, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, National Oceanic and Atmospheric Administration, PlantRight Partnership, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, Suisun Resource Conservation District, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Agriculture, U.S. Environmental Protection Agency
California State Lands Commission, California State Parks Division of Boating and Waterways, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, National Fish and Wildlife Foundation, National Oceanic and Atmospheric Administration, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Environmental Protection Agency
California Department of Fish & Wildlife, California Invasive Plant Council, California State Lands Commission, California State Parks Division of Boating and Waterways, Central Valley Regional Water Quality Control Board, National Oceanic and Atmospheric Administration, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Agriculture, U.S. Environmental Protection Agency
California Invasive Plant Council, California State Coastal Conservancy's Invasive Spartina Project, California State Lands Commission, California State Parks Division of Boating and Waterways, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, Moss Landing Marine Lab, National Oceanic and Atmospheric Administration, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership, Smithsonian Environmental Research Center, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, California State Parks Division of Boating and Waterways, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, National Oceanic and Atmospheric Administration, San Francisco Bay National Estuarine Research Reserve, San Francisco Bay Regional Water Quality Control Board, California State Coastal Conservancy,'s Invasive Spartina Project, U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Fish & Wildlife Service
Bay Restoration Regulatory Integration Team (BRRIT), California Department of Fish & Wildlife, California Invasive Plant Council, California State Lands Commission, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service
California Department of Fish & Wildlife, California State Lands Commission, Central Valley Regional Water Quality Control Board, Delta Conservancy, Delta Stewardship Council, Federal Aquatic Nuisance Species Task Force, National Oceanic and Atmospheric Administration, San Francisco Bay Conservation & Development Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Agriculture, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service

ACTION	TASK	TASK LEAD(S)
16 Freshwater Flows	16-1	State Water Resources Control Board
	16-2	The Bay Institute
	16-3	Tribes, California Indian Environmental Alliance
	16-4	San Francisco Estuary Partnership (Coordinator)
	16-5	National Oceanic and Atmospheric Association
	16-6	San Francisco Estuary Partnership
17 Water Conservation	17-1	Bay Area Regional Reliability (BARR) water agencies
	17-2	Metropolitan Transportation Commission and Association of Bay Area Governments
	17-3	ReScape California
	17-4	San Francisco Estuary Partnership (Coordinator)
	17-5	Bay Area One Water Network
18 Recycled Water	18-1	San Francisco Estuary Partnership
	18-2	Bay Area Clean Water Agencies
	18-3	Bay Area Clean Water Agencies
	18-4	Santa Clara Valley Water District

COLLABORATING PARTNERS
California Department of Fish and Wildlife, National Oceanic and Atmospheric Administration, San Francisco Estuary Partnership, Tribes, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, non-governmental organizations, water agencies
National Oceanic and Atmospheric Administration, Virginia Institute of Marine Science
California Department of Water Resources, San Francisco Estuary Partnership, State Tribal Liaisons
California Indian Environmental Alliance, Delta Protection Commission, Tribes, fishing organizations, local universities or colleges, recreation organizations, tourist organizations
California Indian Environmental Alliance, San Francisco Baykeeper, The Nature Conservancy, Tribes, U.S. Environmental Protection Agency
Lower Columbia Estuary Partnership, Puget Sound Partnership, The Bay Foundation, Tillamook Estuaries Partnership, Tribes
None identified
ReScape California, water agencies
Local jurisdictions
Metropolitan Transportation Commission and Association of Bay Area Governments, Santa Clara Valley Water District, Sustainable Silicon Valley, local jurisdictions
Bay Area water and wastewater agencies, Climate Plan, San Francisco Estuary Partnership
Bay Area Clean Water Agencies, Metropolitan Transportation Commission and Association of Bay Area Governments, WateReuse California, various municipalities, water and wastewater agencies
Various municipalities, water and wastewater agencies
Bay Area One Water Network, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership, various municipalities, water and wastewater agencies
Bay Area One Water Network, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership

ACTION	TASK	TASK LEAD(S)
19 Stormwater Management	19-1	Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Estuary Partnership
	19-2	San Francisco Estuary Institute, San Francisco Estuary Partnership
	19-3	City of San Pablo, City of Walnut Creek, Contra Costa County, Contra Costa Countywide Clean Water Program
	19-4	Metropolitan Transportation Commission and Association of Bay Area Governments
20 Nutrients	20-1	Bay Area Clean Water Agencies, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	20-2	Bay Area Clean Water Agencies, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	20-3	Bay Area Clean Water Agencies, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	20-4	Bay Area Clean Water Agencies, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	20-5	Central Valley Regional Water Quality Control Board, Delta Stewardship Council, State Water Resources Control Board
21 Emerging Contaminants	21-1	San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Institute
	21-2	Bay Area Clean Water Agencies' Bay Area Pollution Prevention Group, California Department of Pesticide Regulations
	21-3	San Francisco Estuary Institute
	21-4	San Francisco Estuary Institute

COLLABORATING PARTNERS
Bay Area Flood Protection Agencies Association, Bay Area Municipal Stormwater Collaborative, California Department of Transportation, ReScape California, San Franciso Bay Regional Water Quality Control Board, Save the Bay, State Water Resources Control Board
Bay Area Municipal Stormwater Collaborative, Metropolitan Transportation Commission and Association of Bay Area Governments, San Francisco Bay Regional Water Quality Control Board
Bay Area Municipal Stormwater Collaborative, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership, San Mateo Countywide Water Pollution Prevention Program, U.S. Environmental Protection Agency
Bay Area county and municipal agencies, Bay Area Municipal Stormwater Collaborative, San Francisco Bay Regional Water Quality Control Board, San Francisco Estuary Partnership
Central Valley Regional Water Quality Control Board, Interagency Ecological Program, San Francisco Bay National Estuarine Research Reserve, U.S. Geological Survey
Southern California Coastal Water Research Project, Stanford University, University of California-Berkeley, University of California-Santa Cruz, and other research partners
Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt), San Francisco Estuary Partnership, Santa Clara Valley Water District
None identified
California Department of Fish & Wildlife, Restore the Delta, San Francisco Baykeeper, U.S. Geological Survey
Bay Area Clean Water Agencies' Bay Area Pollution Prevention Group
Veterinarians
California Department of Toxic Substances Control, Ocean Protection Council
Bay Area Clean Water Agencies including member agencies

ACTION	TASK	TASK LEAD(S)
22 Health Risks of Contaminants	22-1	San Francisco Bay Regional Water Quality Control Board
	22-2	San Francisco Estuary Partnership (Coordinator)
	22-3	San Francisco Estuary Institute
	22-4	California Office of Environmental Health Hazard Assessment (OEHHA)
	22-5	San Francisco Estuary Partnership (Coordinator)
	22-6	San Francisco Bay Regional Water Quality Control Board
23 Trash	23-1	San Francisco Estuary Partnership (Coordinator)
	23-2	San Francisco Estuary Institute, San Francisco Estuary Partnership
	23-3	San Francisco Bay Conservation & Development Commission
	23-4	San Francisco Bay Regional Water Quality Control Board

COLLABORATING PARTNERS
Tribes, California Indian Environmental Alliance
All Positives Possible, California Indian Environmental Alliance, First Generation Environmental Health & Economic Development, Greenaction for Health and Environmental Justice, National Oceanic and Atmospheric Administration, Tribes, other community-based organizations representing disadvantaged and underserved communities
All Positives Possible, First Generation Environmental Health & Economic Development, Greenaction for Health and Environmental Justice, and other community-based organizations
U.S. Environmental Protection Agency
All Positives Possible, California Department of Toxic Substances Control, First Generation Environmental Health & Economic Development, Greenaction for Health and Environmental Justice, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, other community-based organizations representing disadvantaged and underserved communities
All Positives Possible, California Indian Environmental Alliance, First Generation Environmental Health & Economic Development, Greenaction for Health and Environmental Justice, San Francisco Estuary Partnership, Tribes, other community-based organizations representing disadvantaged and underserved communities
Bay Area Clean Water Agencies' Bay Area Pollution Prevention Group, California Product Stewardship Council, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, and various municipalities
California Coastal Commission, San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, and municipalities
Local governments within the San Francisco Bay and the Estuary subject to the Statewide Water Quality Control Plan for Trash

ACTION	TASK	TASK LEAD(S)
24 Public Access	24-1	Metropolitan Transportation Commission and Association of Bay Area Governments
	24-2	Metropolitan Transportation Commission and Association of Bay Area Governments, California State Coastal Conservancy
	24-3	San Francisco Estuary Partnership (Coordinator)
	24-4	San Francisco Estuary Institute, San Francisco Estuary Partnership
25 Champion the Estuary	25-1	San Francisco Estuary Partnership
	25-2	Delta Stewardship Council, San Francisco Estuary Partnership
	25-3	Delta Stewardship Council, San Francisco Estuary Institute, San Francisco Estuary Partnership
	25-4	San Francisco Estuary Partnership

COLLABORATING PARTNERS
California State Coastal Conservancy, San Francisco Bay Conservation & Development Commission, Bay area cities, counties, special districts, and non-profit organizations
California State Parks Division of Boating and Waterways, San Francisco Bay Conservation & Development Commission, San Francisco Bay National Estuarine Research Reserve
San Francisco Bay National Estuarine Research Reserve, The Nature Conservancy
San Francisco Bay National Estuarine Research Reserve, Tribes, community-based organizations
Estuary NEWS Magazine, San Francisco Bay Joint Venture, Metropolitan Transportation Commission and Association of Bay Area Governments
Conference planning partners and attendees
Scientific agencies and organizations, academia
Community-based organizations offering outreach and education programs

Photo: Kelly Grow

For the San Francisco Estuary region, perhaps the biggest adaptation challenges will be the rising Bay and sinking Delta, more frequent and intense fire in the watershed, prolonged drought, and less and less dependable rain and water supply.

Rather than running from these potentially life-altering transformations, adaptation requires making the most of changed but still powerful natural processes. Working with nature, but speeding and shaping its work to our goals, is one key to adaptation. Finetuning how we do this is a core action path for the Blueprint.

First, the Blueprint places a priority on building nature-based, rather than hard, infrastructure. The scope of such infrastructure may range from restored wetlands and creek mouths to human-engineered oyster reefs and coarse gravel and cobble beaches, to slow wind and waves from eroding our shores. Even old flood control channels and urban drainage systems are being revamped outside of former constraints to absorb more rapid rainfall and filter out pollutants. Engineering with nature has become a much more refined practice in the last decade. Regional engineers, biologists, and resource managers have developed new manuals such as the The San Francisco Estuary Institute's "San Francisco Bay Shoreline Adaptation Atlas." The Atlas breaks the region down into operational landscape units and details exactly where nature-based projects may be suitable, and how to size and shape projects to optimize remaining opportunities and open space around the Bay. Early experiments in nature-based infrastructure and wetland restoration are also now being carefully monitored to guide future projects.

Second, Blueprint actions recognize that the region is on the cusp of scaling up to bigger and more connected nature-based adaptation projects. Those spearheading nature-based projects and living shorelines are moving beyond pilots to proposals for whole groups of projects that can be permitted all at once, rather than project by project.

To support this push, the Blueprint aims to make the process of creating these adaptation projects more timely and less onerous. Actions and tasks include facilitation of interagency coordination on permitting, help desks offering technical support, and incentives and funding for nature-based approaches to adaptation. They also recommend a serious review of existing regional, state and federal policies and priorities for conservation of natural lands and hazard response. Building more resilience to a climate-changed future may require policy and regulatory change. Without these kinds of actions, all of the enthusiasm for, and investment in, innovations in bayshore adaptation could stall out before meaningful progress can be made.

Third, Blueprint actions now deepen the region's commitment to listening to local knowledge and honoring the views of both Indigenous people and people living in highest risk zones, who may not have the ability to adapt or flee as easily as richer neighbors. In the process, partners again recognize the importance of honoring the natural riches and ecosystems remaining around the Estuary. As Valentin Lopez, chairman of the Amah Mutsun Tribal Band, recently shared: "We don't need to create infrastructure, we need to restore infrastructure given to us by the Creator."

Blueprint actions commit planners to empower local communities to add their views and voices to the region's adaptation vision. Planning resilient infrastructure must involve the communities who will be living with it as full partners. If adaptation is inequitable, it cannot last.

Similarly, the Blueprint recognizes that underserved communities, already bearing more than their share of environmental injustices, shouldn't be saddled with more. Preemptive action must be taken to secure legacy contaminants lurking in shoreline landfills and industrial and military zones, soon to be infiltrated by rising groundwater and sea levels.

The Blueprint calls for all these efforts and actions to be both place-based—centered in the local environment and local vision—as well as coordinated across the region. If all of these projects aren't connected, and transparent to those around them, somebody will be left out. One city may succeed in adapting at the expense of their neighbor, or a community at the other end of the Estuary. Our changing Estuary, rainfall, and fire danger levels cannot be managed by a single jurisdiction.

In sum, Blueprint actions seek to facilitate broader cross-sector collaboration among those with local knowledge, those caring for the environment, those working on nature-based adaptations to climate change, and those building hard and soft infrastructure around the Estuary. Collaboration in adaptation often remains in the shadows when the big yellow backhoes and planting crews begin their work. Yet it is perhaps more central to progress than any other activity undertaken by Estuary management partners in the past. Adaptation cannot move forward without painstaking collaboration. Hidden or not, this uphill battle remains at the core of Blueprint actions to sustain the Estuary and adapt to the future.

Photo: Nick Sebastian

TRACKING PROGRESS

Introduction

Monitoring represents a critical component of an adaptive management cycle. For the 2022 Estuary Blueprint, our monitoring approach includes two primary components: 1) linking environmental outcomes in the Blueprint to the State of the Estuary Reports, and 2) linking programmatic success, or outputs, through implementation of tasks with clear milestones.

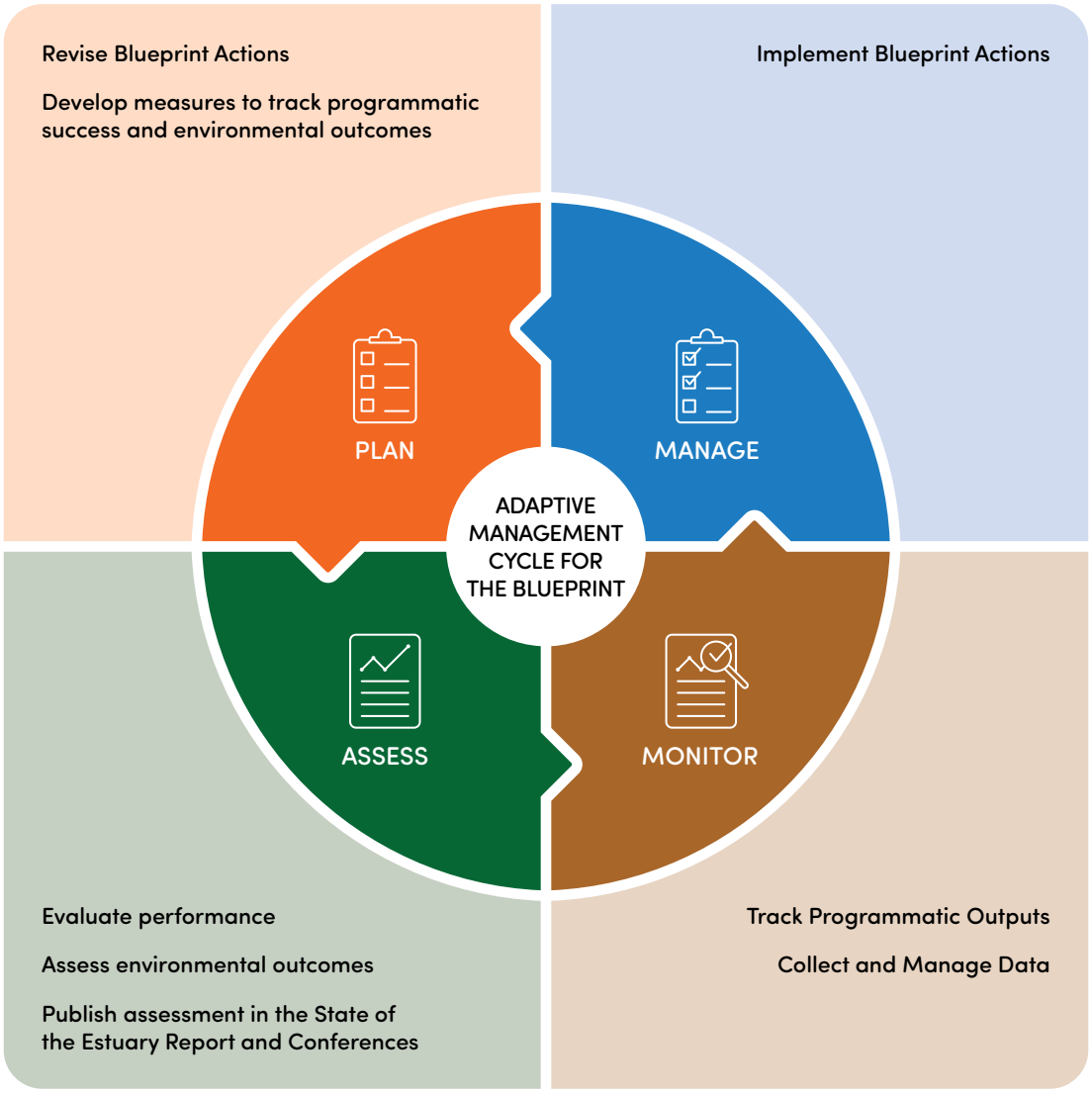


Photo: Noah Berger

Tracking Environmental Outcomes

The State of the Estuary Report is the most comprehensive health report for the San Francisco Bay and Delta together. The report uses the best available science and most recent data to assess the status of various parts of the ecosystem and identify trends in the Estuary's health. Published regularly since 1998, the report updates key indicators of ecological health, so that conservation and restoration efforts can target areas of greatest need.

For evaluating wildlife health, the Sensitive Species tables in the Appendix also provide a resource for understanding linkages between Blueprint actions and critical management issues for threatened and endangered species. The San Francisco Estuary Partnership does not perform monitoring directly, but relies on partners to undertake the monitoring necessary to assess the health of the Estuary. Monitoring data provided in future revisions of the State of the Estuary Report will inform future Blueprint updates and revisions.

For this update, Blueprint goals and actions were linked to environmental indicators in the State of the Estuary Report. The following table depicts these linkages. When considering the stressors, threats, and existing conditions described for each health indicator, most have direct ties to the Blueprint at all levels. Two actions do not have a direct link: Actions 2 and 25 represent programmatic approaches to engaging the Estuary's human communities with work to advance estuarine health and resilience.

Some aspects of the Estuary's health are much more challenging to measure with science-based indicators. These are described as "emerging indicators" in the table below. These emerging indicators will inform priorities in future updates to the Blueprints and may be included in future State of the Estuary reports.

Finally, there are many management decisions at multiple scales of governance, from local to federal, that have bearing on any evaluation of progress in sustaining estuarine health but that are not called out specifically in the Blueprint. Future revisions of both the State of the Estuary Report and the Estuary Blueprint will identify new points of alignment and will make even stronger linkages between science, assessment, and management actions.

Photo: Ken James

Tracking Programmatic Outputs

Programmatic outputs reflect the work of many partners who have carefully provided input to develop outputs that are both achievable and that reflect a larger, ambitious vision for the Estuary. Each task in the Estuary Blueprint links to a specific, measurable milestone. In addition, tasks are linked to "Task Leads" in the document. Task Leads are entities convening, stewarding, tracking, or implementing an action. "Collaborating Partners" include entities working to support and sometimes implement tasks.

The San Francisco Estuary Partnership will be working to encourage ongoing partner engagement and partnership expansion. The State of the Estuary Report, and its alignment with the Blueprint, will continue to serve as a powerful tool for detecting and interpreting trends in reaching Estuary goals related to ecosystem health, resilience, water quality and quantity, and stewardship. However, because of the natural variability of the Estuary, and the time it may take to detect improvements based upon the goals in the Blueprint, management actions are also tracked quarterly to provide early indications of program success. This information provides the basis for expected changes in environmental conditions as described in Blueprint Goals, Objectives, and Actions. Partnership staff have developed a suite of resources to track and communicate programmatic outputs. An internal tracking database will allow staff to report on progress for tasks and milestones. This database will link directly to an external tracking system and will be made available online.

Table 3. State of the Estuary 2015 Indicator Table

STATE OF THE ESTUARY 2015 INDICATOR	2022 ESTUARY BLUEPRINT		
	GOALS	OBJECTIVES	ACTIONS
WATER			
Safe for Swimming	1, 3	a, b, i	20, 21
Safe for Aquatic Life	1, 3	a, b, i	19, 20, 21
Fish Safe to Eat	1, 3	a, b, i	21, 22
Freshwater Flow*	3	a, b, h	16
HABITAT			
Open Water Habitat	3	h	6, 16, 20
Eelgrass	1, 2	a, d, e	9, 15, 5, 6, 4, 16, 20
Tidal Marsh*	1, 2	a, d, e	4, 6, 7, 8, 10, 11
WILDLIFE			
Benthic Invertebrates	2	a, e	15
Fish*	2, 3	a, e, h	5, 6, 9, 10, 12, 14, 16
Harbor Seals	2, 3	a, e, i	20, 21, 24
Winter Waterfowl	1, 2	a, b, e	9, 10, 11, 12, 13
Breeding Waterfowl	1, 2	a, b, e	9, 10, 11, 12, 13
Shorebirds	1, 2	a, b, e	5, 11
Herons and Egrets	1, 2	a, b, e	5, 11
Tidal Marsh Birds	1, 2	a, b, e	9, 10, 11, 12, 13, 15
Ridgway's Rail	1, 2	a, b, e	9, 10, 11, 12, 13, 15

STATE OF THE ESTUARY 2015 INDICATOR	2022 ESTUARY BLUEPRINT		
	GOALS	OBJECTIVES	ACTIONS
PROCESSES			
Migration Space	1, 2, 4	a, b, d, f, k	1, 3, 4, 5, 6, 11
Beneficial Floods*	2	d, e	5, 6
Zooplankton as Food	1, 3	a, b, c, h	15, 16
Feeding Chicks	1	b, e	10, 12, 15
PEOPLE			
Urban Water Use*	3	g	16, 17, 18, 19
Recycled Water Use	3	g	18
Public Access/Trail Access	4	j, k, l	24
2015 EMERGING INDICATOR			
Pervasive Pesticides	1, 3	b, i	14, 22
Oyster Beds	1, 2	a, d, e	3, 4, 9
Woody Riparian	1, 2	a, e	14, 24
Watersheds	1	a	5, 6, 14, 19
Managed Ponds	1	a	12
Sediment	1, 2	a, d, e	5, 6, 14
Invasions	1, 3	a, b, i	15
2019 EMERGING INDICATOR			
Subsided Lands			1, 3, 4, 5, 6, 7, 8
Shore Resilience		m, n	1, 3, 4, 5, 6, 8, 9, 10, 11
Urban Green Space		m, n	2, 24

*Updated in 2019 State of the Estuary Report

Photo: Karl Nielsen

NEXT STEPS

Photo: Ben Botkin

Looking ahead, the 2022 Estuary Blueprint provides a comprehensive plan to address priority concerns about natural resource management and Estuary health. It provides ambitious, meaningful goals for its partners to achieve by 2050 and a prioritized five-year action plan for advancing those goals in the immediate future.

In five years, partners will develop and negotiate priorities for the next five-year time frame and will incorporate them in the 2028-2033 Estuary Blueprint. As the tangible and collaborative outgrowth of more than 25 years of planning and partnership, the 2022 Blueprint offers an inspiring call to continue, expand, and improve our efforts to protect the San Francisco Estuary.

In particular, the 2022 Estuary Blueprint makes critical advances in several key areas, including focusing on a limited number of priority actions that strategically and collaboratively move the region towards our long-term goals, building the flexibility and adaptability required by projected climate change, and providing a structure to track programmatic and environmental progress.

Several areas of the 2022 Estuary Blueprint provide important building blocks for future updates. A few are highlighted below:

Focus on Equity. The 2022 update of the Estuary Blueprint elevates the role that Indigenous and frontline communities play in advancing Estuary health and resilience as reflected by the addition of a new objective, the integration of equity through many updated actions, and a new action specifically focused on creating more equitable outcomes for Indigenous and frontline communities. A racial equity analysis of the current Blueprint will inform continued efforts to build on and expand the integration of equity in the next update.

Align the Blueprint further with the State of the Estuary Report. The State of the Estuary Report assesses indicators of environmental health that are linked to a variety of Estuary Blueprint actions, advancing an adaptive management cycle for the region. There are areas, however, where the connections between actions and environmental indicators can be strengthened, such as climate resilience and equity. The next revision cycles of both the State of the Estuary Report and the Estuary Blueprint provide an opportunity to strengthen our ability to track environmental outcomes.

Advance an Estuary-wide Approach to Ecosystem Resilience. The 2022 Estuary Blueprint makes great strides towards a more comprehensive approach to managing the Estuary as a whole. The next update will build on these efforts to further advance coordination throughout the entire Estuary.

Integrate Estuary Health with Community Well-being. The Estuary Blueprint recognizes that the health of the Estuary and the health of our communities are interdependent. The 2022 Blueprint provides a foundation for a more integrated perspective with a new objective on incorporating social science and cultural knowledge. An integrated approach to increasing the health and resilience of the Estuary and its surrounding communities is increasingly important, necessitating new partnerships with professionals and communities.

Adapt to a Changing Environment. By the time the next Blueprint update occurs, we will be facing yet more difficult decisions that may require trade-offs between species, habitats and communities at risk, choosing between shoreline protection and strategic relocation, and allocating shrinking resources such as fresh water. Continuing to provide a collaborative forum and plan for conversations and strategic decision-making concerning these difficult choices will remain, as it has for the past 30 years, a priority among Blueprint partners.

As a comprehensive guide toward a healthy, resilient future for the Estuary, the 2022 Estuary Blueprint, and the hard work of the hundreds of people who created it, represents the strength and power in collaboration. Putting this plan to work will ultimately be the best demonstration of partnership in action.

Photo: Karl Nielsen

Photo: Monty Schmitt

Sensitive Species

Numerous individuals and organizations work tirelessly to protect the fish and wildlife that make the San Francisco Estuary unique. The Estuary Blueprint supports their efforts by taking a habitat- and process-based approach, examining the connections between the San Francisco Bay (the lower Estuary) and the Delta (upper Estuary). This approach leads to actions that build stronger ecosystems across the Estuary as a whole. Rather than focus on individual species, the Blueprint emphasizes actions that can have a broad range of benefits to fish and wildlife, including bringing attention and funding to restoration efforts, as well as building species-level resilience to climate change. This section provides an overview of these benefits. Nineteen species of concern were selected for analysis. While this list is not exhaustive, it represents some of the Estuary's key species, especially those that are already threatened or endangered.

The overarching goals of the Blueprint, especially Goal 1, to "sustain and improve the Estuary's habitats and living resources," aim to promote and protect species in this Estuary. Here, the impacts of the Blueprint are broken into more species-specific topics to provide a better understanding of the benefit of each action to sensitive species in the Estuary.

Table 4. Estuary Blueprint Sensitive Species

SPECIES		STATUS	
TYPE	NAME	FEDERAL	STATE
Amphibian	**California Tiger Salamander**	Endangered	Threatened
	Red-legged Frog	Threatened	Not Listed
Bird	**California Black Rail**	Not Listed	Threatened
	California Least Tern	Endangered	Endangered
	Canvasback	Not Listed	Not Listed
	Greater Scaup	Not Listed	Not Listed
	Ridgway's Rail	Endangered	Endangered
	Snowy Plover	Threatened	Not Listed

PRIMARY HABITAT	GREATEST THREATS
• Annual grass, with seasonal ponds and/or vernal pools	• Habitat loss
• Quiet pools of streams, marshes, and occasionally ponds • Permanent pools for larval development	• Habitat loss (draining of wetlands and pools)
• Tidal emergent wetlands dominated by pickleweed, or brackish marshes supporting bulrushes	• Habitat loss (tidal marsh)
• Migratory • Can be found in abandoned salt ponds and along estuarine shores	• Habitat loss (dredging and nesting disturbance)
• Migratory • Prefers shallow water for diving and foraging	• Habitat loss and degradation (wetland fill and nesting disturbance) • Food limitation – reduction in submerged aquatic vegetation
• Migratory • Marshy, flat, and sheltered grasses, such as those found in large bays and inshore waters. Rarely found in freshwater	• Habitat loss and degradation (shrinking marshlands) • Food limitation – reduction in mollusks, crustaceans, and insects
• Saline or brackish emergent wetlands dominated by picklewood, cordgrass, and bulrush	• Habitat loss (filling and diking of emergent wetland) • Fragmentation through disruption of habitat corridors • Predation by non-native red fox and feral cats
• Sandy marine and estuarine shores • Salt pond levees can be used as nesting habitat	• Habitat loss (tidal marsh dredging and nesting disturbance)

SPECIES		STATUS	
TYPE	NAME	FEDERAL	STATE
Fish	**Chinook Salmon (Various ESUs)**	Threatened/Endangered	Threatened/Endangered
	Coho Salmon (Central California Coast ESU)	Endangered	Endangered
	Delta Smelt	Threatened	Endangered
	Green Sturgeon	Threatened	Not Listed
	Longfin Smelt	Not Listed	Threatened
	Sacramento Splittail	Not Listed	Not Listed
	Steelhead Trout	Threatened	Not Listed

PRIMARY HABITAT	GREATEST THREATS
• Migratory • Freshwater streams and rivers for spawning, travel from ocean	• Habitat loss and degradation • Fragmentation and deterioration of natural linkages for migration and spawning • Range minimization
• Migratory • Freshwater streams and rivers for spawning, travel from ocean	• Habitat loss and degradation • Fragmentation and deterioration of natural linkages for migration and spawning • Range minimization
• Migratory • Brackish-water associated with the mixing zone • Disperse widely into river channels and tidally influenced backwater sloughs • Spawn in shallow, fresh, or slightly brackish water upstream of the mixing zone	• Direct entrainments by state and federal water export facilities • Summer and fall increases in salinity and water clarity • Predation by introduced species • Habitat loss and degradation
• Migratory • Freshwater streams and rivers for spawning, travel from ocean	• Habitat loss and degradation • Fragmentation and deterioration of natural linkages for migration and spawning • Range minimization
• Migratory • Low salinity/freshwater reaches of coastal rivers and tributary streams for spawning • Bays, estuaries, and coastal areas for most of adult lives	• Range minimization • Decreases in volume of seasonal freshwater flows in the Estuary, influenced by drought and state and federal pumping operations • Invasive species (overbite clam)
• Migratory • Estuarine waters, such as slow moving rivers and sloughs • Flooded vegetation for spawning	• Habitat degradation (contaminants) • Range minimization • Decreases in volume of seasonal freshwater flows in the Estuary, influenced by drought and state and federal pumping operations
• Migratory • Freshwater streams and rivers for spawning, travel from ocean	• Habitat loss and degradation • Fragmentation and deterioration of natural linkages for migration and spawning • Range minimization

SPECIES		STATUS	
TYPE	NAME	FEDERAL	STATE
Mammal	**Salt Marsh Harvest Mouse**	Endangered	Endangered
Plant	**California Seablite**	Endangered	Not Listed
	Soft Bird's-beak	Endangered	Rare
	Suisun Thistle	Endangered	Not listed

PRIMARY HABITAT	GREATEST THREATS
• Saline emergent wetlands and marshes • Pickleweed and adjacent grasslands are preferred for cover	• Habitat loss (filling, diking, and urban development of diked salt marshes)
• Tidally influenced salt marsh and estuaries • Most commonly found in the narrow ecotone between salt marsh and stable dune scrub communities occurring at the edge of the salt marsh	• Habitat loss • Range reduction
• Upper reaches of salt grass/pickleweed marshes near the limits of tidal action	• Habitat loss (diking of Suisun Marsh, conversion of tidal brackish marsh to non-tidal wetlands) • Invasive species (*Lepidium latifolium* in brackish tidal marsh)
• Upper intertidal marsh plain near the smallest branches of natural, small tidal creeks, banks, ditches, and marsh edges that are very infrequently flooded	• Habitat loss (diking of Suisun Marsh, conversion of tidal brackish marsh to non-tidal wetlands) • Invasive species (*Lepidium latifolium* in brackish tidal marsh)

Photo: Cris Benton

Key Management Concepts Legend

Photo: Florence Low

Habitat Protection and Recovery

Actions that protect, enhance, restore, or rebuild both aquatic and terrestrial habitat of species of concern

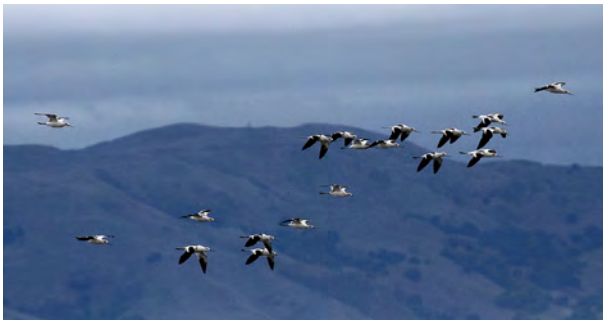


Photo: Rick Lewis

Migratory Benefit

Actions that protect or restore essential migration routes for species of concern

Photo: Leia Giambastiani

Advocacy for Species

In alignment with Blueprint Goal 4, these actions bring attention, funding, and research to species of concern

Photo: Ken James

Resilience to Climate Change

Actions that enhance the ability of species of concern to withstand impacts of climate change

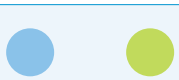
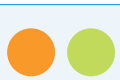
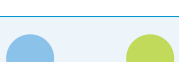
Photo: Dale Kolke

Invasive Species Reduction

Actions that remove or reduce the efficacy of invasive species that threaten species of concern

Table 5. 2022 Estuary Blueprint Benefits to Sensitive Species Table

SENSITIVE SPECIES	1. CLIMATE RESILIENCE	2. EQUITY	3. ADAPTATION PLANNING	4. ADAPTATION IMPLEMENTATION
California Tiger Salamander	● ● ●			● ● ●
Red-legged Frog	● ● ●		● ●	● ● ●
California Black Rail	● ● ●		● ●	● ● ●
California Least Tern	● ● ●		● ●	● ● ●
Canvasback	● ● ●		● ●	● ● ●
Greater Scaup	● ● ●		● ●	● ● ●
Ridgway's Rail	● ● ●		● ●	● ● ●
Snowy Plover	● ● ●		● ●	● ● ●
Chinook Salmon	● ● ●		● ●	● ● ●
Coho Salmon	● ● ●		● ●	● ● ●
Delta Smelt	● ● ●		● ●	● ● ●
Green Sturgeon	● ● ●		● ●	● ● ●
Longfin Smelt	● ● ●		● ●	● ● ●
Sacramento Splittail	● ● ●		● ●	● ● ●
Steelhead Trout	● ● ●		● ●	● ● ●
Salt Marsh Harvest Mouse	● ● ●		● ●	● ● ●
California Seablite	● ● ●		● ●	● ● ●
Soft Bird's-beak	● ● ●		● ●	● ● ●
Suisun Thistle	● ● ●		● ●	● ● ●

5. WATERSHED CONNECTIONS	6. SEDIMENT	7. CARBON MANAGEMENT	8. WETLAND MONITORING
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			

 Habitat Protection and Recovery

 Migratory Benefit

 Advocacy for Species

 Resilience to Climate Change

 Invasive Species Reduction

SENSITIVE SPECIES	9. INTERTIDAL/ SUBTIDAL HABITATS	10. TIDAL MARSH	11. TRANSITION ZONES	12. MANAGED WETLANDS
California Tiger Salamander				
Red-legged Frog				
California Black Rail				
California Least Tern				
Canvasback				
Greater Scaup				
Ridgway's Rail				
Snowy Plover				
Chinook Salmon				
Coho Salmon				
Delta Smelt				
Green Sturgeon				
Longfin Smelt				
Sacramento Splittail				
Steelhead Trout				
Salt Marsh Harvest Mouse				
California Seablite				
Soft Bird's-beak				
Suisun Thistle				

13. SEASONAL WETLANDS	14. CREEKS	15. INVASIVE SPECIES	16. FRESHWATER FLOWS	17. WATER CONSERVATION


Habitat Protection and Recovery


Migratory Benefit


Advocacy for Species


Resilience to Climate Change

Invasive Species Reduction

SENSITIVE SPECIES	18. RECYCLED WATER	19. STORMWATER	20. NUTRIENTS	21. EMERGING CONTAMINANTS
California Tiger Salamander	●	●	● ● ●	● ●
Red-legged Frog	●	●	● ● ●	● ●
California Black Rail	●	●	● ● ●	● ●
California Least Tern	●	●	● ● ●	● ●
Canvasback	●	● ●	● ● ●	● ●
Greater Scaup	●	● ●	● ● ●	● ●
Ridgway's Rail	●	●	● ● ●	● ●
Snowy Plover	●	●	● ● ●	● ●
Chinook Salmon	● ●	● ●	● ● ●	● ●
Coho Salmon	● ●	● ●	● ● ●	● ●
Delta Smelt	● ●	● ●	● ● ●	● ●
Green Sturgeon	● ●	● ●	● ● ●	● ●
Longfin Smelt	● ●	● ●	● ● ●	● ●
Sacramento Splittail	● ●	● ●	● ● ●	● ●
Steelhead Trout	● ●	● ●	● ● ●	● ●
Salt Marsh Harvest Mouse	●	●	● ● ●	● ●
California Seablite	●	●	● ● ●	● ●
Soft Bird's-beak	●	●	● ● ●	● ●
Suisun Thistle	●	●	● ● ●	● ●

22. HEALTH RISKS OF CONTAMINANTS	23. TRASH	24. PUBLIC ACCESS	25. CHAMPION THE ESTUARY

Habitat Protection and Recovery

Migratory Benefit

Advocacy for Species

Resilience to Climate Change

Invasive Species Reduction

Photo: Ben Botkin

By emphasizing planning and action around diverse habitat mosaics and whole watersheds, the 2022 Estuary Blueprint supports the health of the larger estuarine ecosystem and natural communities that support threatened, endangered, migratory, and resident species alike.

The San Francisco Estuary flows through a variety of urban, rural, and natural habitats and across myriad socioeconomic and political boundaries. The Estuary Blueprint addresses these challenging and changing conditions for sensitive species in a holistic way. It accounts for conditions across the entire plan area, ranging from stream flows to transitional habitats and migration corridors. It ensures that actions appropriately target critical, science-based recommendations for improving the health of the Estuary.

The 2015 State of the Estuary Report is the most comprehensive assessment of the Estuary's conditions ever completed for the San Francisco Estuary. Its findings, along with the updates from the 2019 State of the Estuary Report, are meticulously detailed for many species and biological communities, ranging from benthic invertebrates to wintering waterfowl. The report's assessment of ecosystem health includes specific indicators for various sensitive species such as Ridgway's Rail, as well as for the degree of invasion by non-native aquatic organisms and plants, among other indications of healthy life in the Estuary. These indicators were used to guide development of Estuary Blueprint goals, objectives, and actions.

Collaborative regional efforts are promoting wildlife monitoring to understand how populations are responding to environmental change and conservation action. The Wetlands Regional Monitoring Program will track the response of wildlife indicators (resident tidal marsh birds, small mammals, and fishes) to environmental change and inform adaptive management of baylands habitats. Additionally, the San Francisco Bay Joint Venture (SFBJV) Implementation Plan, due to be released in 2022, identifies habitat goals and associated bird indicators. The SFBJV and Point Blue will also be releasing a State of the Birds Framework which aims to inform future and existing habitat restoration, acquisition, and management practices with the current science on the state of the Bay's bird populations. Population trends, threats, and recommended actions for land and water managers, policy-makers, non-profit conservation groups, and researchers will be included. The report will enhance conservation in San Francisco Bay by (1) guiding habitat restoration, management, and acquisition; (2) increasing knowledge of the population status of San Francisco Bay's birds and the threats to their habitats; and (3) influencing public policy and public awareness of bird and ecosystem conservation needs.

The Tracking Progress section of the Blueprint links the species-specific indicators in the State of the Estuary Reports to Blueprint Actions designed to protect native aquatic flora and fauna.

The Sensitive Species section details how the recommendations in this Blueprint benefit selected threatened and endangered fish, birds, mammals, and plants of critical management concern. The Appendix also ties the Blueprint's habitat and watershed approach to central concepts in species protection, including habitat protection and recovery, protection of essential migration routes, resilience to climate change, and reduction of negative impacts from invasive species.

The San Francisco Estuary Partnership recognizes the numerous individuals and organizations working tirelessly to protect the species that make both San Francisco Bay and the Delta special, and has developed a whole-habitat mindset for the 2022 Estuary Blueprint that supports their efforts and strengthens collaboration on sensitive species issues across the entire Estuary.

Photo: Ben Botkin

Report Production Credits

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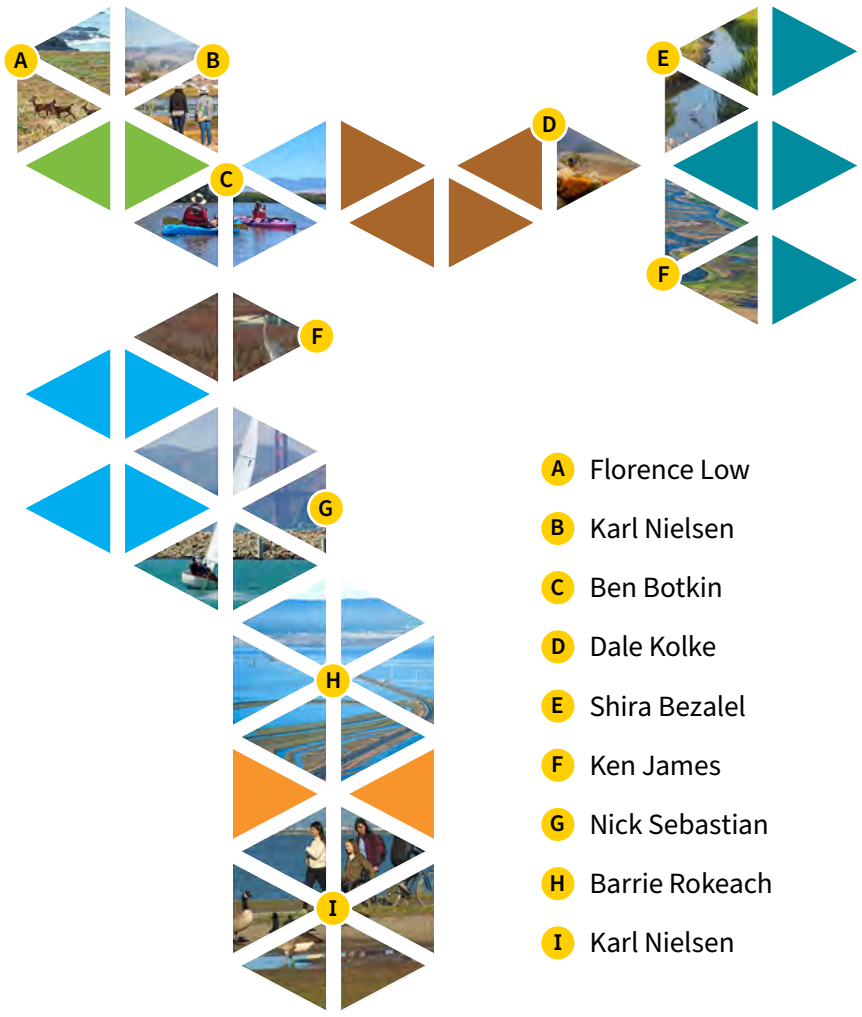

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G Nick Sebastian
H Barrie Rokeach
I Karl Nielsen

Partnership in Action

Living Resources

Resilience

Water

Stewardship