

THE
Baylands
AND
Climate Change

WHAT WE CAN DO

BAYLANDS ECOSYSTEM HABITAT GOALS
SCIENCE UPDATE 2015





Ensuring a Healthier Bay Shore

RESTORE WETLANDS TODAY, FOR THE FUTURE

The wetlands at the shore of the San Francisco Bay are an integral part of the region's iconic beauty, and they provide numerous benefits for our economy and quality of life. These baylands support abundant wildlife, clean water, open space for recreation, and flood protection. More than 100 scientists who study the bay, its wetlands, and watersheds have concluded that now is the time to ensure that these ecosystems continue to provide such benefits. Sea-level rise and climatic and other changes have brought about a critical moment. The extensive bay marshes and mudflats can be sustained for decades to come, but it will require a bold approach to restoring their natural processes. Meanwhile, we must also accelerate the concerted action of the past two decades to restore tidal habitats.



This page, from top: marshland near San Pablo Bay, a young volunteer. Facing page: endangered salt marsh harvest mouse; a stream channel wall; cities around San Francisco Bay.

Much progress has been made on restoring San Francisco Bay's tidal wetlands since the *Baylands Ecosystem Habitat Goals* report was released in 1999. This science update to that report provides guidance for sustaining a healthy and vibrant shore. Carrying out its recommendations will help meet state and federal objectives for the conservation of endangered and threatened species. And it will implement federal strategies (*Tidal Marsh Ecosystem Recovery*) and state plans (*Safeguarding California*) to withstand the impacts of climate change.



A BAY SURROUNDED BY WALLS AND CONCRETE?

Projections show that if we don't act, rising seas and greater erosion will cause the baylands to shrink. We would lose the protection these wetlands provide to our shoreline by buffering storm waves, and the cost-effectiveness of a natural infrastructure that adjusts as sea levels rise. The bay would fundamentally change, with hardened edges and little vegetation.

Eventually, this damage would be irreversible. The region would be obliged to construct and maintain more sea walls and levees, and larger ones. (In places where wetlands are not naturally sustainable, other forms of sea level rise adaptation will be required in any case.) The baylands would eventually retract to narrow strips at the base of these structures or disappear altogether. Water quality could degrade as the baylands would no longer absorb excess nutrients from wastewater or filter contaminants. The diversity and abundance of native animals and plants would be drastically reduced. Several endangered species found only in San Francisco Bay could go extinct, and millions of migratory waterbirds would lose critical feeding and wintering grounds.



"This report tells us what we need to do today to ensure a healthy San Francisco Bay into our future. If we have the courage to act now and follow scientific recommendations, we can secure much of what is most precious about living in the Bay Area, and ensure the gratitude of our grandchildren."

Sam Schuchat, Executive Officer,
California Coastal Conservancy;
Chair, Baylands Ecosystem Habitat Goals
Update Steering Committee





HOW DID WE GET TO THIS POINT?

The forces that control the balance of land and water in San Francisco Bay are changing. The sea level is rising, weather patterns are shifting, and the sediment supply that has helped nourish the baylands since the Gold Rush appears to have been exhausted. Without enough sediment to sustain bay wetlands as sea levels rise—especially coupled with a greater frequency of extreme storms, flooding, droughts, and heat waves—most of the marshes are projected to be damaged or destroyed by 2100 unless we intervene now.

Our response to these events will be fundamental to the fate of wildlife populations. We will either choose to actively support population recovery after a disaster or exacerbate the harm with inappropriate responses. Higher average temperatures, a greater intrusion of seawater into the bay, and new invasions by exotic species will also affect natural communities.

This pivotal moment comes after nearly two centuries of habitat loss and degradation as well as the modification of key natural processes such as freshwater flows, tidal exchange, flood-plain productivity, and invasion by nonnative species. Our levees, flood-control channels, roads, railways, storm drains, garbage dumps, and sewage treatment systems have all been built at the edge of the bay. This alteration of the shore has left a legacy of fragmented habitats with small and stressed native wildlife populations and fixed, inflexible systems for controlling water and sediment flows. Neither our critical human-built infrastructure nor the remaining natural habitats are expected to be resilient to coming changes without significant new investment in adaptation and resilience strategies.



“Rising sea level, more extreme weather events, and other impacts of climate change are already altering our region’s ecosystems, and this will accelerate in coming decades. By using our new scientific understanding to highlight important actions for visionary management, this document provides a vital basis for sustaining the iconic beauty and valuable services of our remarkable baylands for future Bay Area residents.”

Carl Wilcox, California Department of Fish and Wildlife, project co-chair and contributing author of *Baylands Ecosystem Habitat Goals* report (1999)

This page, from top: bicyclists on a levee; assessing health of baby tern. Facing page, top: volunteers put in marsh plants.

NEW APPROACHES, NEW POLICIES

To arrive at a future with functioning, dynamic baylands, we must act immediately. Resilience to sea-level rise depends on natural processes that work over years and decades. We need to adjust our policies to encourage the rapid restoration and enhancement of the natural infrastructure that cost-effectively protects people and property while also supporting native plants and animals.

STRATEGIES FOR A HEALTHY SHORE

The scientists that developed this report suggest regional strategies to maintain healthy baylands and the benefits they provide. These strategies are summarized below and listed in full in the second chapter of the report.

Restore complete baylands systems.

To achieve and maintain the Baylands Goals (100,000 acres of tidal marsh and the targets for other habitat types), we should maximize baylands resilience. This means restoring complete wetland systems with their many interconnected habitat types, along with the physical processes that sustain them. Reconnecting the baylands to nearby open lands is also crucial to provide wildlife with refuge during high-water events and for



Below: Artist's conceptual rendering shows a future Bay Area shoreline that has successfully accommodated significant sea-level rise through the restoration of baylands and the processes that sustain them. Reconnected waterways provide adequate sediment and freshwater to sustain marshes, while diverse connected marsh habitats allow wildlife to flourish and migrate near urban areas. Gradually sloping undeveloped areas also provide space for marshes to move inland as the sea level rises. These restored baylands enhance the lives of millions of people, protect built infrastructure, return wildlife to our communities, and improve water quality.





the baylands to move landward as sea levels rise. Diverse, connected baylands habitats will foster diverse wildlife populations that can survive extreme conditions, move where they need to go, and evolve with the changing environment. Management techniques can be refined to prevent further subsidence, increase organic matter accumulation, reduce greenhouse gas emissions, and sequester more carbon. Even though they are not naturally resilient systems, artificially managed ponds are a valuable component of future baylands ecosystems to support waterbirds and compensate for the extreme loss of wetlands across California.

Accelerate restoration of complete baylands systems by 2030.

Restore tidal flows to strategic areas and manage sediment to establish tidal marsh ecosystems. Tidal marshes that are established by 2030 are more likely to flourish and provide ongoing benefits when the sea-level rise accelerates in the middle of this century. To achieve this goal, the planning, permitting, and construction of restoration projects on currently available lands must be accelerated.

Plan ahead for the dynamic future.

Create regional policies for the shore that anticipate change over time, using projections of sea-level rise and expected shifts in habitat types, locations, and connectivity. Baylands can better sustain themselves as sea levels rise if they can migrate landward. We should prepare for this migration by conserving the transition zone between the baylands and adjacent lands.

Develop and implement a comprehensive regional plan to reuse suitable dredged, excavated, or naturally occurring

“These updated Goals provide an urgently needed roadmap to secure the future of the San Francisco Bay region during this time of rapid change. Produced by leading scientists, managers, and decision makers, these practical, climate-smart recommendations will guide habitat restoration and management to sustain wildlife and people for decades to come.”

Ellie Cohen, President and CEO,
Point Blue Conservation Science;
co-founder, Bay Area Ecosystems
Climate Change Consortium

This page, from top: salt ponds in the south bay; scientist prepares a native oyster restoration experiment. Facing page: volunteers plant willows; children study the bay.



sediment. This sediment could come from the bay, local rivers and streams, flood control channels, reservoirs, and other sources.

Prepare for the likely increases in extreme weather events such as floods and drought. Extreme events will inevitably cause damage, but they will also provide opportunities to rebuild more-resilient shores. We can buffer wildlife populations against extreme events and prevent extinctions by monitoring them and taking protective action at strategic moments.

Increase regional coordination.

Creating a resilient and healthy shore will be more successful if the responsible agencies and interested stakeholders collaborate to build consensus, identify barriers to action, solve problems, and promote shared learning and aligned benefits from individual projects. Regionally coordinated research, monitoring, and implementation are critical for rapid innovation and large-scale, complex restoration. This approach will foster the adoption of the most promising techniques for restoration and management, build understanding for and support of necessary new policies, and establish coalitions to obtain the public funding required for a healthy future shore.

THE SUCCESS we have already achieved with baylands restoration provides us with the opportunity to continue this work. But this opportunity is available only if we act now. Restoring the baylands is a necessary part of creating a resilient and healthy shore that supports our economy and maintains the remarkable natural heritage of the Bay Area.



“The recommendations provided by over 100 of the region’s leading scientists are invaluable for helping managers, scientists and decision-makers continue to make progress in restoring our valuable wetlands. We now know we must accelerate our restoration efforts, and adopt new watershed and in-bay management practices to ensure there is sufficient sediment for the baylands to continue to provide a multitude of beneficial functions with our rising seas.”

Michael Monroe, lead author and project co-chair for the *Bayland Ecosystem Habitat Goals* report (1999)





ABOUT THIS SCIENCE UPDATE

This report is an update to the 1999 *Baylands Ecosystem Habitat Goals* that for the first time set comprehensive restoration goals for the San Francisco Bay estuary. It synthesizes the latest science— particularly advances in the understanding of climate change and sediment supply— and incorporates projected changes through 2100 to generate new recommendations for achieving healthy baylands ecosystems.

The habitat acreage goals set in 1999 remain the same. Recommendations have been updated—and many new restoration approaches are suggested—for the region, its major subregions, and local shorelines. These actions must be integrated with civic and economic planning to arrive at appropriate implementation strategies. This report provides technical information that policy makers and others can use in deciding how to maximize ecosystem health.

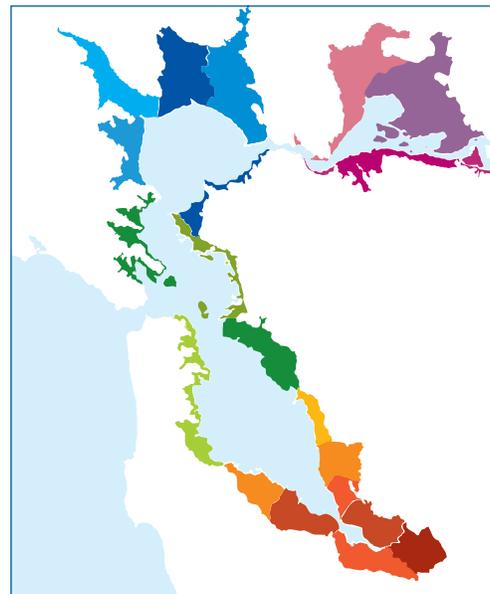
TO OBTAIN THE REPORT

Access the full Science Update at www.baylandsgoals.org.

Available on the website are PDFs of the full report, maps, and appendices, as well as Science Foundation chapters that provide the technical background to the report.

For inquiries, please contact info@baylandsgoals.org.

Cover: © Russell Lowgren, Ducks Unlimited. Page ii, top: © Russell Lowgren, Ducks Unlimited; bottom: Judy Irving © Pelican Media. Page iii, top: Judy Irving © Pelican Media; middle: Naomi Schiff; bottom: © Jitze Couperus. Page iv, top: © Ron Horii, middle; Judy Irving © Pelican Media. Page v, top: Eco-Oakland; bottom: Nate Kauffman, Landscape Architect + Founder of LEAP: Live Edge Adaptation Project, n8kauffman.com. Page vi, top: © Jitze Couperus; bottom: © Stephanie Kiriakopoulos. Page vii, top: Pearson-Arastradero Preserve; bottom: © Charlotte Fiorito/CompassPhotographers.com. Page viii, top: © Russell Lowgren, Ducks Unlimited; bottom: © Alan Hopkins.



The report provides updated recommendations for the region, its major subregions, and local shorelines.



Top: Mud Slough; above: endangered Ridgway's rail