



Audubon CALIFORNIA

Richardson Bay Conservation Action Plan

Richardson Bay is considered one of the most pristine estuaries on the Pacific Coast in spite of its urbanized periphery, since it supports the second largest extant eelgrass bed in San Francisco Bay with plants that have high genetic diversity and sizable undisturbed intertidal habitats. It is a feeding and resting area for a large diversity of estuarine and pelagic birds, including over 40,000 diving ducks and other water birds. The bay's associated marshes and littoral zones support a variety of animal and plant life. Richardson Bay has been designated as an Important Bird Area, based upon its large number of annual bird visitors and residents, presence of California clapper rail and its strategic location in the flyway. The bay's waters are subject to a "no discharge" rule to protect the elaborate and fragile ecosystems present, including a complex Herring fishery, diverse assemblages of benthic species and marine mammals such as the harbor seal.

Audubon California manages a 911 acre sanctuary, including 900 acres of subtidal habitat extending well out into Richardson Bay and operates a nature center that reaches over 4,000 children and adults annually.

To promote high quality conservation science in Richardson Bay, Audubon California uses an ecosystem approach to restoration, conservation and education. We are dedicated to the conservation and restoration of functioning ecosystems that will benefit species ranging from birds that utilize the bay as a food source to benthic marine species and habitats that play a major role in ecosystem health. We envision the eelgrass beds and mudflats of Richardson Bay serving as reference sites for restoration, estuarine research and education throughout San Francisco Bay.

The Richardson Bay Audubon Center & Sanctuary recently completed a conservation plan for Richardson Bay in partnership with the National Oceanic and Atmospheric Administration, the Romberg Tiburon Center for Environmental Studies, the San Francisco Estuarine Research Reserve, Marin Audubon Society, the U.S. Geologic Survey and the California Department of Fish and Game to guide conservation, environmental education and policy action to protect and restore Richardson Bay.

The plan highlights the top conservation priorities, threats and strategies necessary to secure the bay's long-term health. Audubon has developed a series of goals and

objectives to implement the plan which for the first time aligns the Audubon’s Center and Sanctuary’s work on the conservation of Richardson Bay. Six conservation targets were identified: eelgrass, native oysters, sand and mud flats, diving ducks and piscivorous (fish-eating) birds, salt marsh and upland habitat. Table 1 outlines our conservation targets, as well as threats and biological limitations to the targets.

Table 1. Threats and Biological Limitations in Richardson Bay

Threats Across System or Biological Limitations	Eelgrass	Native Oyster	Sand and Mud Flats	Diving Ducks and Piscivorous Birds	Salt Marsh	Oak Woodland and Grassland
Substrate Limitation		Very High			High	
Invasive species	Low	Low	High	High	High	High
Boat Traffic	Low			High		
Low Dispersal	High					
Erosion and habitat loss from boat docks	Low	Low	Low	Low	High	
Anchor Outs (benthic impacts from boats)	Medium	Medium	Low			
Existing Water Quality	Medium	Medium	Medium	Medium	Medium	
Historical contaminants (mercury, creosote pilings, etc.)	Low	Low	Medium	Medium	Low	

Targets, Objectives and Action Steps

Overall Goals

Objective I: Build Public Support for Richardson Bay Conservation

Action Steps

1. Integrate all of Center's public education programs with Bay conservation message and stewardship action components
2. Ensure that all education and outreach programs are based on rigorous and supportable science.
3. Develop an outreach brochure explaining the case for the conservation of Richardson Bay
4. Conduct a public opinion poll to understand public perception of Richardson Bay and messages needed to influence public understanding of the bay
5. Work with local media to help the public understand restoration and Richardson Bay's ecological importance
6. Consider issuing a "state of the bay" report every other year
7. Present in local forums and events to educate general public
8. Build a corps of active volunteers working on bay restoration

Objective II: Focus Center's Education Program on Promoting Understanding of Bay Ecosystem and Conservation

Action Steps

1. Integrate all education programs with conservation, restoration and stewardship components related to the bay and its watershed
2. Test relevance and update annually
3. Integrate students and other community members into restoration and monitoring work
4. Partner with similar local providers to maintain integrity of program and not duplicate efforts

Objective III: Conduct Rigorous and Applied Science to Help Restore the Health of Richardson Bay's Natural Communities and Species

Action Step

1. Work with partners to identify optimal restoration and conservation goals by habitat type
2. Partner with the Smithsonian Environmental Research Center, NOAA,

San Francisco State University, the National Estuarine Research Reserve, US Geologic Survey, CA Department of Fish and Game and other research organizations on prioritizing and developing long-term research and monitoring protocols for the marine species and habitats in Richardson Bay

3. Take an ecosystem-based approach to all restoration efforts by developing protocols to look at the long-term ecosystem effects of restoration
4. With partners, develop conservation, restoration and research timelines and strategies

Target 1. Native Oyster

Objective I: Understand Oyster Distribution and Limitations in Richardson Bay

Action Steps

1. Survey native adult distribution in all habitat types
2. Survey larval distribution
3. Monitor the presence of invasive oysters
4. Map benthic habitat types

Objective II: Design Restoration Strategies

Action Steps

1. Create designed study to determine if mud substrate is suitable for oyster recruitment and survival
2. Create designed study to determine if hard substrate is suitable for oyster recruitment and survival
3. Investigate other suitable settlement/recruitment substrate types
4. Implement restoration work
5. Monitor recruitment and survival across studies (above)
6. Monitor ecosystem changes due to oyster restoration
7. Research the synergies between eelgrass and oysters

Target 2. Eelgrass

Objective I: Increase recruitment through seeding and vegetative shoot transplants

Action Steps

1. Trial seeding and vegetative transplant methodologies
2. Create and implement a monitoring plan for the different restoration methods

3. Once suitable methods have been established begin to scale-up restoration efforts
4. Develop an eelgrass grow-out facility for restoration work (to decrease potential impact to donor beds)
5. Monitor ecosystem changes due to eelgrass restoration
6. Research the synergies between eelgrass and oysters

Objective II: Increase acreage of eelgrass beds

Action Steps

1. Map current extent of eelgrass beds, and monitor changes in bed distribution yearly (flights)
2. Develop plan for long-term vision of acreage in eelgrass
3. Develop large-scale restoration goals
4. Stop ongoing loss of eelgrass bed (due to anthropogenic disturbance)
5. Map benthic habitat types

Target 3. Diving Ducks & Piscivorous Birds

Objective I: Increase number and diversity of waterbirds without impacting current populations

Action Steps

1. Increase eelgrass area (as in target II)
2. Monitor bird species richness and abundance, through time, before, during, and after eelgrass and oyster restoration
3. Monitor bird populations in different habitat types (sand, mud flat, eelgrass beds, salt marsh)

Objective II: Reduce boat disturbance to birds

Action Step

1. Maintain boat exclusion area
2. Monitor current level of impact in entire project area. Develop a good research monitoring protocol in order to carry this out
3. Determine whether current restrictions are effective
4. Develop and implement a more active outreach and communication strategy to all boaters (motorboats, kayaks, etc.) and local residents about the birds and the closure
5. Monitor bird population inside and outside the sanctuary

Objective III: Understand how birds utilize Richardson Bay

Action Step

1. Design a study to monitor bird behaviors and diet

Target 4. Salt Marsh

Objective I: Determine restoration need and feasibility

Action Step

1. Map existing salt marsh habitat
2. Map areas that are suitable for restoration
3. Develop and implement restoration plan, including acreage objectives and desired locations
4. Map benthic habitat types

Objective II: Eliminate invasive plant species from existing salt marsh.

Action Step

1. Monitor extent of invasives
2. Identify and prioritize invasive plant removal

Objective III: Conserve/Protect Existing Salt Marsh

Action Steps:

1. Determine rate of erosion

Objective IV: Monitor Invasive Invertebrates

Action Steps:

1. Design monitoring plan

Target 5. Sand and Mud Flat

Objective 1: Determine current extent and monitor status

Action Steps

1. Map benthic habitat types
2. Monitor spatial area for changes in size

Objective II: Determine status of invertebrate communities

Action Steps

1. Sample invertebrates yearly to determine species richness, composition, and abundance

Target 6. Oak Woodland and Grassland

Objective I: Improve native/non-native plant ratio on site**Action Steps**

1. Design and implement plan for removal of non-natives
2. Begin propagation of local native stock for revegetation efforts
3. Increase/restore native species on site
4. Monitor effectiveness of restoration efforts
5. Secure funding for continued restoration and monitoring

Objective II: Monitor avian populations**Action Steps**

1. Establish MAPS banding station to begin operation May 2007
2. Perform nest searches and point counts throughout breeding season
3. Winter monitoring using MAWS banding, other surveys.
4. Integrate lessons on non-native vegetation and restoration
5. Demonstration of MAPS protocol and techniques with students