Climate Smart Adaptation Case Study

Case Study Name: Giacomini Wetland Restoration Project

Lead Agency/Organization and Partners: The National Park Service, which acquired the Giacomini Ranch in 2000, is the principal project proponent. The project is located in the northern district of the Golden Gate National Recreation Area, and is managed by Point Reyes National Seashore. A portion of Lagunitas Creek and some tidal lands are owned and managed by the California State Lands Commission. Adjacent public lands also include Gulf of the Farallones National Marine Sanctuary and Audubon Canyon Ranch. Funding was secured to meet wetland mitigation obligations from several sources including congressional appropriations, California Department of Transportation, Point Reyes National Seashore Association, Gordon and Betty Moore Foundation, California Coastal Conservancy, Cape Mohican Oil Spill Mitigation Fund, National Fish and Wildlife Foundation, Kingfisher Foundation, State Water Resources Control Board, and Wildlife Conservation.

Project Description: The Giacomini Wetland Restoration Project is located in the southern portion of the Tomales Bay watershed north of San Francisco Bay. During the 1860s, most of the area was tidal salt marsh with intertidal mudflats and subtidal areas, but sedimentation from logging and agriculture greatly altered the wetland landscape. In 1946, Waldo Giacomini converted the marsh to pasture lands and constructed more than 2.5 miles of levee to keep tidal and flood waters out of what became a large dairy ranch. These levees, as well as tidegates and other agricultural infrastructure and practices, greatly reduced the condition and functionality of these wetlands, which converted to freshwater habitats. The marsh was disconnected from Lagunitas Creek, which provides 66% of the freshwater inflow to Tomales Bay, and therefore, could not filter pollutants and sediment from stormwater flow or reduce flood levels. In 2000, the National Park Service bought the ranch and, in 2007 and 2008, restored more than 613 acres there and at an adjacent marsh. While the ranch lands had not greatly subsided in elevation, the restored wetland is still vulnerable to sea level rise and impacts of increased salinization of waters. The restored wetland supports several listed species that are adapted to freshwater or brackish conditions and would, therefore, be impacted by changes in habitat or salinity conditions.

Restoration of wetland habitat that had been converted to agriculture precipitated the project; this project restored 12% of outer coastal wetlands in central California and also promoted restoration of species and native species diversity, water quality and quantity, and ecological health of Tomales Bay. As the project developed, climate change issues arose regarding sea level rise, migration of habitat into upland areas, salt water intrusion into drinking water, and flooding of roads and homes.

Approach to Vulnerability Assessment: The project planning process started in 2001 with initiation of baseline studies designed to assess existing and historical conditions and resource values of the Giacomini Ranch. These studies included topography, hydrology, wildlife, plants, vegetation communities such as wetlands and riparian habitat, water quality, sediment contaminants, and cultural resources.

Rather than relying on a static or "garden"-based approach to restoration, in which wetland habitats are carefully designed to be built within specific portions of project areas, the National Park Service and the California State Lands Commission embraced a project purpose that recognized the inherent variability of estuarine transitional systems – an approach that was infinitely better suited to addressing the vulnerabilities associated with a changing climate. The project proponents focused on restoring hydrologic and ecological processes and functions such as increasing floodplains or reintroducing tidal flow, and modeled potential changes to habitat, species. and water quality and quantity under different sea level rise scenarios. The theory put into practice was to restore a functioning wetland by restoring hydrologic function and natural processes.

Adaptation Actions: Climate Smart adaptation actions taken as part of this project included: (1) incorporating climate change into specific policies, plans, actions and regulations associated with the project, (2) enhancing estuarine and terrestrial connectivity, migration corridors, and areas under protection external to the park unit, (3) ongoing monitoring of climate change impacts and adaptation efficacy with plans to modify restoration where appropriate, (4) reducing local climate or related change (*e.g.*, deforestation, maintain and enhance native vegetation cover), (5) reducing non-climate stressors (*e.g.,* destructive fishing practices, human disturbance), and (6) preparation of a management plan that anticipates climate change.

Implementation: An EIS/EIR was completed for the project in 2007. Information that went into the EIS/EIR included inventories of species (threatened/endangered species, keystone), habitats, and hydrologic and hydrodynamic modeling of saltwater intrusion and flooding under several scenarios.

Ecological restoration goals included promoting ecological diversity by maximizing contiguous salt/brackish/fresh marshland transitions, channel and floodplain interaction, surface and groundwater interaction, and ecological value of freshwater sources.

Geomorphic restoration goals included restoring natural geomorphic processes and functions by designing for and anticipating channel and floodplain evolution, using subtle design features to promote natural formation of desired habitats, and creating a mosaic of riparian, wetland, transitional and upland habitats.

The restoration occurred in two phases. There was a period of little more than a year—from early 2007 through summer 2008—in which the cattle had been removed from the restoration site, but the levee removal activities had not commenced. This "*passive restoration*" phase caused noticeable changes to the plant and animal communities at the site, but did not occur as a result of direct restoration activities. "*Full restoration*" occurred in summer through fall 2008 and included the removal of the levees bordering Lagunitas Creek, the reconnection of Tomasini Creek (a smaller creek which used to flow through the Project Area, but was routed to a channel on the Project Area perimeter) into a reconstructed channel following one of its historical alignments, and the removal of ranch roads, fences, and other infrastructure. This caused much of the restoration Project Area to become subject to regular flooding by the tides, and the entire Project Area to be subject to upstream flooding from the Lagunitas, Tomasini, and Fish Hatchery Creeks during larger storm events.

Giacomini Wetland following removal of the levees and reconnection of Tomasini Creek.
Photo by Robert Campbell

Monitoring and Management: The project incorporates a pre- and post-restoration monitoring program for hydrology, topography, sedimentation, water quality and quantity, zooplankton, benthic invertebrates, fisheries, vegetation, and birds.

At project year five (2013), restoration results include increases in wintering ducks and shorebirds and several breeding bird species relative to previous years, sightings of bald eagles and river otters, and establishment by Tidewater goby, a federally endangered species. The plant community is also rapidly changing to a salt marsh, and rare plants are spreading rapidly into the new marsh habitat.

Proposed management actions for the future include—should funding become available—continued monitoring of physical and biological parameters, and adaptive actions, as appropriate in response to climate effects such as extreme flooding or salt water intrusion.

Lessons Learned: Acquiring funding for this project was difficult, and funding was obtained from a number of sources, almost all of which were non-Park Service sources. The planning process involved a very interactive discussion with the local community, particularly about public access issues. Another planning constraint was that a number of listed species were present in the project area prior to restoration, so it was difficult to maximize habitat for new target species, while mitigating for listed species present while it was a dairy. An important component of any restoration project is monitoring, but it is often hard to convince funding agencies that monitoring is worthy of funding, even though they do appear to understand the value of monitoring results.

For Further Information:

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http://www.nps.gov/pore/parkmgmt/planning_giacomini_wrp.htm
http://www.nps.gov/pore/parkmgmt/planning_giacomini_wrp_eiseir_final_2007.htm
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