

Climate Smart Adaptation Case Study Template

Case Study Name: Kent Island Restoration Project

Lead Agency/Organization and Partners:

Lead Agency: Marin County Parks (primary landowner)

Partnering agencies: U.S. Army Corps of Engineers, Audubon Canyon Ranch, Gulf of the Farallones National Marine Sanctuary, Farallones Marine Sanctuary Association

Project Description:

Kent Island is a 29-acre natural dune-capped flood tidal delta located in West Marin at Bolinas Lagoon north of its tidal inlet. The island is owned by the County of Marin and the Audubon Canyon Ranch. Most of the native terrestrial vegetation on Kent Island has been overwhelmed by weedy non-native vegetation. The proposed project seeks to restore Kent Island through removing non-native vegetation from the island and facilitating the natural regeneration of native vegetation, with only limited planting. Removal of invasive vegetation will be accomplished primarily through salt-water irrigation and manual removal techniques. The initial restoration phase of the proposed project began in the spring of 2013. This phase will be followed by five years of monitoring and subsequent removal and native replanting in areas where invasives recolonize.

The purpose of the project is to remove non-native invasive plants located within 8 vegetation management units (see map) from Kent Island. Kent Island has been colonized by non-native vegetation—in particular invasive beachgrass, acacia, iceplant, and pine—that displaces native plant communities and both stabilizes and enlarges the island. The invasion of European beachgrass at Kent Island in the 20th century changed its ecology and elevated the island above the reach of most storm flooding that, with seawater and sand, allowed colonization by iceplant, acacia and pines. This converts the island's vegetation to one that is less well-adapted to natural disturbance cycles, and maturation of the island's vegetation will further reduce its ability to recover from inevitable natural coastal disturbances to maintain a high diversity of natural habitats and native species. The converted island is therefore less able to adapt to impacts caused by as storm surges, flooding, and erosion, all future potential climate change impacts that will be compounded by sea level rise.

The dominant non-native vegetation also displaces suitable habitat for special-status species, such as North Coast pink sand-verbena, salt marsh owl's-clover, northern salt marsh bird's beak, and coastal marsh milk-vetch. The proposed action is necessary to restore and maintain adaptive, dynamic physical coastal processes that will also benefit hydrological function throughout the lagoon, and topography of the flood tidal delta and its natural diversity of native plant and wildlife communities. The project will help the area absorb future disturbances and increase ecosystem resilience, namely the island's ability to recover ecologically from inevitable infrequent extreme disturbance events and adapt to accelerated sea level without becoming unstable and converting to another state that persists or undergoes degradation. Vegetation management goals at Kent Island are based on general conservation biology principles, which may change with ecological theory and practice. One of these is closely related to the basic goal

of ecological resilience and self-assembly of dynamic native vegetation following natural disturbance cycles.

Approach to Vulnerability Assessment:

Throughout the IS/EA process and development of the Project Design and Monitoring Plans, several studies and assessments were conducted. Many of these were compared with previous, roughly decadal, bathymetric surveys conducted of the lagoon in 1968, 1988 and 1998. The IS/EA contains additional information about surveys and research conducted.

Adaptation Actions: Rather than having certain adaptation actions, the entire purpose of this project is adaptation. The project is rehabilitating the ecosystem's resilience to climate-driven (natural) disturbances and trends by replacing the less resilient, non-native vegetation (ice plant and marram) with native vegetation that supports geomorphic and ecological resilience to climatic disturbances such as sea level rise. The native vegetation to be planted is tolerant to salt and sand overwash and thus is more well adapted to expected changes from sea level rise.

Implementation:

An initial study/environmental assessment was written for the project as well as a Project Design Plan and a Monitoring Plan. The project entirety spans 10 years, for which 5 years of funding have been secured. The first year of field work of plant removal and salt water irrigation began in the spring and summer of 2013 and includes an important volunteer component. In this first year 149 volunteers expended a total of 596 volunteer hours over 11 community restoration days removing invasive plants. Another 608 staff hours were expended in effort to remove invasives. Eight volunteers and two staff members spent 132 hours on salt-water irrigation.

Monitoring and Management:

Some ongoing low-intensity maintenance will inevitably be needed as propagules of non-native species rain down on the island from nearby sources, even if on-site sources of weed propagules are successfully minimized or extirpated. Low-level maintenance in this case means frequent surveys (combined annual monitoring and management) to detect and remove pioneer founders of weed populations before they establish seed-bearing populations. Maintenance would follow major initial vegetation restoration and rehabilitation efforts and would be assessed annually as needs change.

The monitoring plan includes establishment of survey plots in representative plant communities and habitats on Kent Island in areas where vegetation has been removed and in control plots where invasive plants have not been removed. Trend analysis will be used to assess changes in cover of invasive and native plants and open sand in treated and untreated plots. The completed monitoring plan includes a section on adaptive management. It is expected that a major part of adaptive management will consist of invasive plant removal and planting of native species. The results of monitoring will inform what areas require actions spelled out in the Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) Plan to be approved by the San Francisco District prior to the completion of project construction.

Lessons Learned:

Being that we are entering our second year of plant removal in spring, 2014, we will use lessons learned to improve removal/irrigation effectiveness. Some changes will be made to the recruiting, organizing, and transporting of volunteers to and from the island. Additional assessments of plant species, management unit locations, and timing for removal will be determined after the 2014 winter months when project managers can assess and determine which processes were most effective and if any adjustments will need to be made in the coming removal season.

For Further Information:

For more information on the project please visit the Marin County website:

<http://www.marincountyparks.org/depts/pk/our-work/os-main-projects/bolinas>

and the Gulf of the Farallones National Marine Sanctuary website:

<http://farallones.noaa.gov/eco/bolinas/updates.html>

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- Map Units**
- 1: West Shore Fringe Salt Marsh
 - 2: Western Conifer Woodland
 - 3: Central Foredune Terrace
 - 4: Central Beach-Salt Marsh Ecotone
 - 5: Central Terrestrial Grassland
 - 6: Backbarrier Salt Marsh Ecotone
 - 7: Eastern Grassland Terrace
 - 8: Southeastern Beach-Salt Marsh Ecotone

500 Feet

