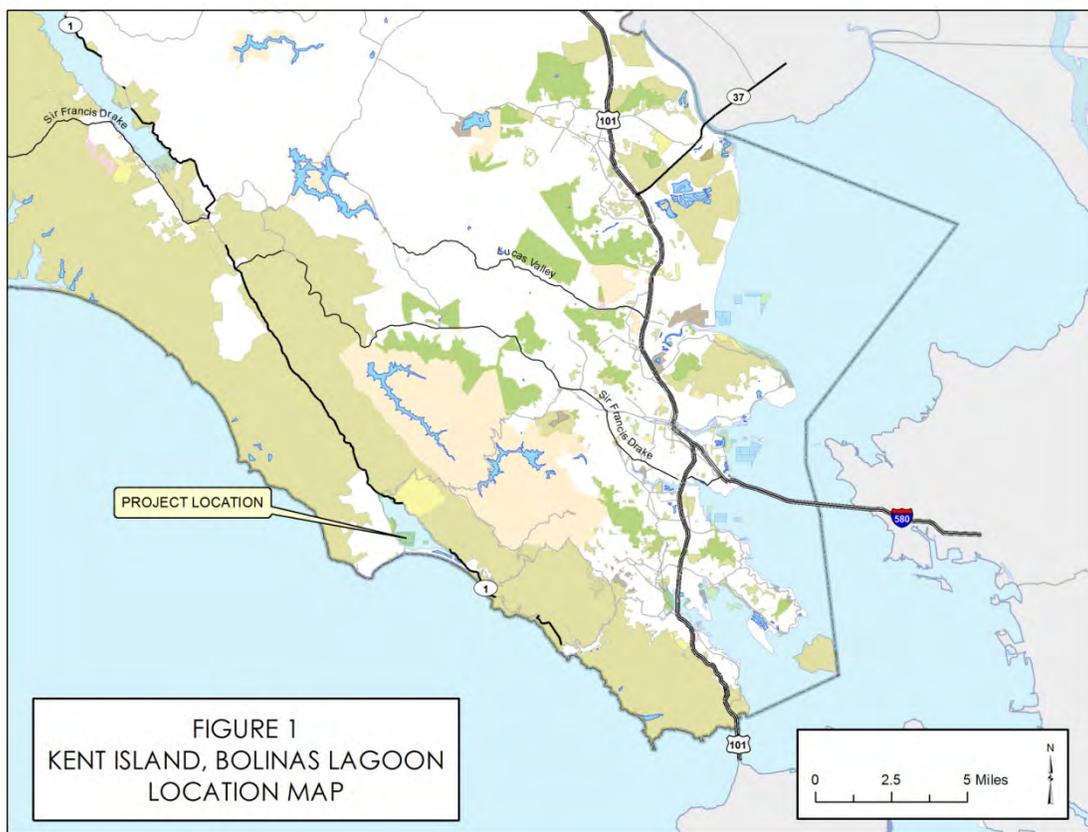


Kent Island project Overview

Introduction

Kent Island is located in Bolinas Lagoon in western Marin County approximately 10 miles northwest of the Golden Gate Bridge (Figure 1). The 29-acre island is north of the lagoon's tidal inlet and across subtidal channels and intertidal shoals from the Stinson Beach spit and Bolinas shoreline. It is a vegetated dune-capped island formed by sand transported by waves, tides, and winds. The island's response to these processes is important to the lagoon's natural dynamics. Native vegetation on the island includes many native grasses (saltgrass, Vancouver wildrye, and beach wildrye) that are capable of regenerating from sand burial and seawater flooding. Other important vegetation includes low-growing spreading forbs, such as beach-bur, California saltbush, beach saltbush, alkali-heath, and pickleweed. The resilience of Kent Island's ecosystem depends on a diversity of beach, salt marsh, and dune plants adapted to recover from erosion, deposition, and flooding.



Non-native vegetation, including invasive beach grass, acacia, iceplant, French broom, cypress, and pine, has colonized the island. This non-native beach grass has caused the island to undergo a shift from flood-tidal delta to an upland island, which has facilitated the establishment of a dense five-acre grove of Monterey pine on the western side of the island. As this conifer grove matures and produces more seed, it will extend across the island. The stabilization and maturation of the non-native vegetation reduces the island's ability to recover from natural disturbances and impair its ability to maintain a high diversity of natural habitats and native species.



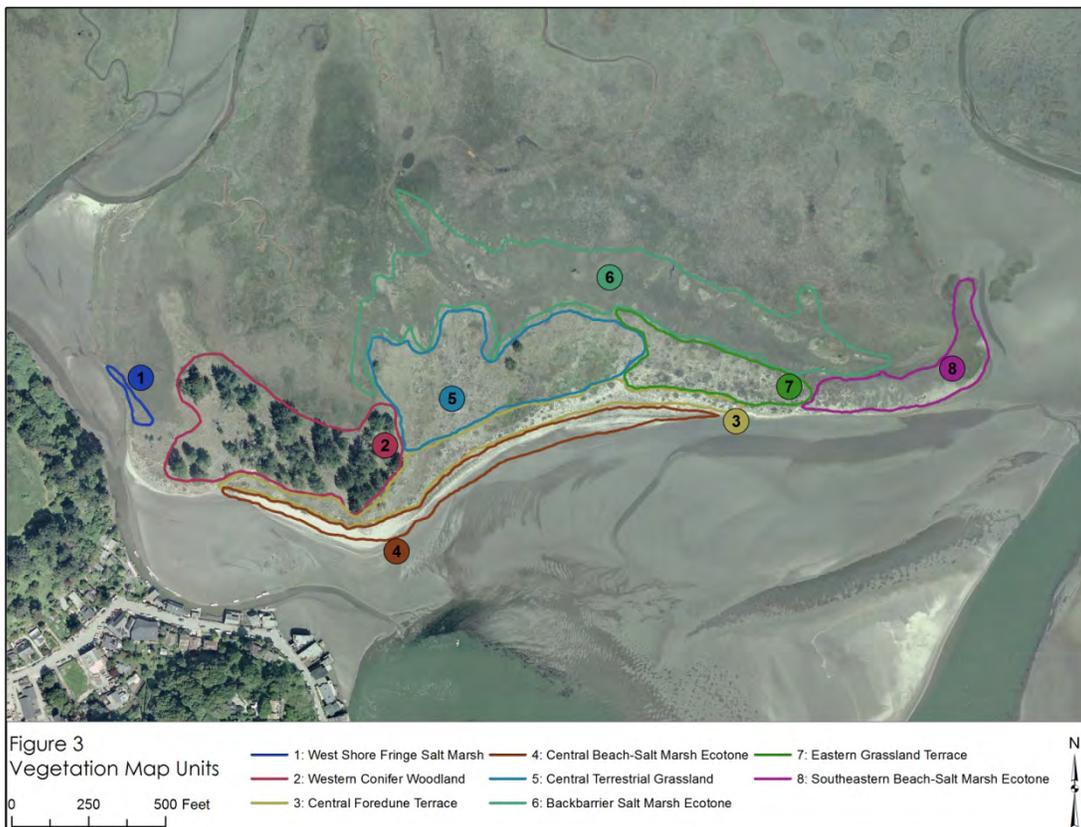
Existing Conditions

The U.S. Fish and Wildlife Service designated Bolinas Lagoon is a wetland of international importance under the Ramsar Convention. The County of Marin owns most of the island with Audubon Canyon Ranch having title to the southwestern portion. The Marin County Open Space District (District) manages the lagoon, including the island, on behalf of the County as an open space preserve. Public access to the island is difficult and must occur at low tide or using small boats. There are no structures or infrastructure on the island.

The island is a mix of native plant communities and invasive non-native vegetation. The project area consists of eight vegetation management units (Figure 3) that reflect the various plant communities, ecological processes, and management considerations.

1. West shore fringing salt marsh (0.2 acres): steep tidal salt marsh banks with extensive infestation of iceplant
2. Western conifer woodland (5.1 acres): dense Monterey pine and cypress forest with a patchy shrub layer (bush lupine, French broom, toyon, and coyote brush) in a historic dune grassland
3. Central foredune terrace (2.3 acres): active dune habitat vegetated by Vancouver ryegrass, saltgrass, red fescue, marram grass, and iceplant

4. Central beach-salt marsh ecotone (1.9 acres): beach terrace dominated by saltgrass and associated native salt marsh forbs transitioning into terrestrial grassland
5. Central terrestrial grassland (5.4 acres): terrestrial grassland dominated by marram grass, iceplant, and conifers, French broom, fennel, and acacia
6. Backbarrier salt marsh ecotone (9.3 acres): gently sloping flats and low sand mounds transitioning into tidal salt marsh along the north shore of the island, with populations of two rare salt marsh annuals (northern salt marsh bird's-beak and salt marsh owl's-clover) and colonies of bird's-foot trefoil
7. Eastern grassland terrace (2.2 acres): stabilized sand terrace on the eastern end of the island dominated by native red fescue with small populations of iceplant
8. Southeastern beach-salt marsh ecotone (1.7 acres): beach-salt marsh ecotone, supporting harbor seal haul-out areas at the extreme east end, with zones of gumplant in the high marsh and iceplant stands, with the potential to support two rare plants, coastal marsh milk vetch and north coast pink sand-verbena.



Sensitive Species

Bolinas Lagoon supports numerous special status species,¹ including coho salmon and steelhead trout, which are listed under the federal Endangered Species Act. The island also supports an egret and heron rookery, a harbor seal haul out area, and several sensitive plant species including northern salt marsh bird's-beak and salt marsh owl's-clover.

Project Goals and Benefits

The primary goals of the project are to: 1) restore native habitats by removing non-native invasive plants and restoring native species; 2) restore natural biological diversity of the island; 3) allow the area to function as a dynamic flood-shoal island; and 4) improve the area's ability to respond to earthquakes, major storms, and sea level rise. The project will also provide habitat for local populations of the regionally rare salt marsh owl's-clover, northern salt marsh bird's-beak, coast marsh milk vetch, and north coast pink sand verbena.

Project Description

The purpose of the project is to reestablish native dune communities and natural ecological processes on the island by removing invasive vegetation and improving habitat conditions for native species. The District is using funds from the National Estuary Restoration Act to implement the proposed project and has entered into a cooperative agreement with the U.S. Army Corps of Engineers (USACE) under the Estuary Habitat Restoration Program. The USACE is providing technical assistance and project oversight. The Gulf of the Farallones National Marine Sanctuary and Audubon Canyon Ranch have also assisted in the design (and will support the implementation) of the project.

The District proposes to begin the project in late summer or early fall 2012 and continue through 2018. The primary methods for vegetation management include treating salt intolerant plants using saltwater irrigation, removing weeds using hand tools, and girdling and felling of larger trees. The project may include minimal wick or brush application of herbicides when necessary to treat plants that will grow back when cut, such as acacia. The project also includes the removal of all tree saplings within the primary grove of Monterey pines and cypress, while maintaining mature trees in the grove to protect nesting habitat for herons and egrets. Although the project relies mostly on natural re-colonization and succession, it includes transplanting of some native species.

The proposed irrigation system includes the follow measures:

- A portable, 160-gallon per minute, gas-powered, pump
- A pump house located on the island that will provide sound attenuating and fuel spills containment
- A PVC pipe system with valves at appropriate locations to allow connection to hoses and a high volume portable sprinkler
- Two intake pipes with the primary site placed in a small side channel that feeds off the slightly larger Bolinas channel and the backup intake site in the channel south of the island (Figure 3).

¹ See Appendix X that provides a list of species found in the USGS Bolinas Quad compiled from the California Natural Diversity Data Base, USFS Species Lists, and from past planning documents from the *Bolinas Lagoon Ecosystem Restoration Project*.

- A 24-inch-diameter perforated culvert pipe wrapped with 3/8 inch mesh fish screen, to house the water intake, hand-dug and set vertically about 2-3 feet into the channel



Irrigation would occur intermittently in autumn, spring, and summer depending on plant phenology, with several irrigation events, consisting of two to four days of irrigation, during the first year of project. The pumping would occur only between 8:00 a.m. and 5:00 p.m. on weekdays. The project will likely require follow-up irrigation in subsequent years to treat re-growth of target species. After eradicating the weeds from the island, the District will remove the irrigation array, including the intake, pump, and irrigation pipe.

The project also includes use of hand tools to injure and fragment marram grass and iceplant to reduce their resistance to the saltwater irrigation and for the cutting, digging, girdling, and removal of other non-native plants. All pine and cypress seedlings will be removed from the island as well as the larger pines and cypress outside the main grove. Stockpiled weeds will be smothered to reduce viability. The District will secure tarps below and above the vegetation debris piles, which will be placed in locations where they will be less visible. If necessary, the project allows for use of saltwater irrigation to prevent re-growth of weeds within the piles. Once there are no viable plants within the debris piles, the District will dispose of the material in pits dug to a sufficient depth to prevent regeneration. This disposal method will avoid need to haul the debris offsite, which could adversely affect resources of the island, lagoon, and community.

After the first year of the project, and continuing for 5 years, the District will monitor the island's vegetation and use irrigation and manual methods to treat re-sprouting weeds. The project provides for continued saltwater irrigation for at least the first two years and hand removal methods over the full 5-year period.

To implement this project, the District will use staff, paid consultants, and volunteers. However, to minimize impacts to the island resources, the project provides for limiting the number of volunteers to 25 or less. The first year of the project will have the highest the number of volunteer days, with the frequency declining in subsequent years. The District will train volunteers to avoid disturbing sensitive resources, identify plants, practice appropriate vegetation removal and revegetation methods, and implement necessary safety precautions.

Due to the biological significance of the area, the project includes following measures to avoid impacts on sensitive resources.

- Fish screening devices, designed with technical assistance from the National Marine Fisheries Service within the National Oceanic and Atmospheric Administration (NOAA Fisheries), to avoid impacts to federally listed coho salmon and steelhead trout
- Preservation of Monterey pine woodlands to protect heron and egret nesting and roosting habitat
- Establishment of an 100-meter buffer around egret and heron nests during the breeding season
- Establishment of an 100-meter buffer adjacent to the harbor seal haul-out area
- Seal monitoring for disturbances from the project
- Provisions for expanding buffer areas if monitoring indicates seal disturbance
- Staff, consultants, and volunteers training to avoid disturbing seals, birds, and sensitive plants
- Establishment of walking routes to avoid affecting sensitive vegetation
- Surveys for nesting birds with seasonal buffers around identified nests

Environmental Compliance

The project is subject to the following state and federal permit requirements.

- California Coastal Commission, coastal development permit pursuant to the California Coastal Act and consistency determination pursuant to the federal Coastal Zone Management Act
- Gulf of the Farallones National Marine Sanctuary, permit pursuant to the National Marine Sanctuaries Act
- California Water Quality Control Board, San Francisco Bay Region, certification pursuant to section 401 of the federal Clean Water Act
- NOAA Fisheries and U.S. Fish and Wildlife Service possible consultation pursuant to the federal Endangered Species Act and Marin Mammal Protection Act
- California Department of Fish and Game, Streambed Alteration Agreement pursuant to Section 1601 of the California Fish and Game Code.