

Progress Toward Eradicating Invasive Spartina from the San Francisco Estuary – 2005-2016

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The State Coastal Conservancy and the U.S. Fish and Wildlife Service undertook the San Francisco Estuary Invasive Spartina Project in 2000 in response to the rapid spread of non-native Spartina in tidal marshes of the San Francisco Estuary. In 2005, after five years of planning and permitting, a coordinated regionwide eradication effort was underway. Control in the first several years was effective and dramatic, with a peak baywide net area of 805 acres in 2005 being reduced by 90%, to 84 acres by 2010. The net area has continued to decrease steadily to 27 acres in 2016, despite suspension of treatment at 11 sites in 2011 (see associated California Ridgway's Rail poster).

While the total net area of non-native Spartina declined steadily, local and regional changes were variable. Very rapid progress was made in reducing dense populations in the Central and South bays between 2005 and 2010, and this trend was continued through 2016. Populations of greater than one acre remain only at the 11 sites in this region where treatment was suspended. Over this same period, new non-native Spartina populations established, expanded, were discovered, and were subsequently brought under control in regions of the North Bay, Petaluma River, and in estuaries on the outer coast. In 2017, a new outlier population, totaling about 0.5 net acre, was discovered on several islands in Suisun Bay. Treatment will be initiated on the Suisun population this summer.

Keywords: Spartina, invasive, eradication, Conservancy, Ridgway's rail

Poster Cluster Title: Invasive Spartina Project Updates

California Ridgway's Rail Survey Results at *Spartina*-invaded Marshes from 2010 to 2017 and the Implications for Eradication of Invasive *Spartina* from the SF-Bay Estuary

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The State Coastal Conservancy's Invasive *Spartina* Project (ISP) reduced invasive *Spartina* in the San Francisco Estuary by 95% between 2005 and 2012. During this time, the number of endangered California Ridgway's rails (*Rallus obsoletus obsoletus*), which uses invasive *Spartina* for cover and nesting substrate, declined substantially at these sites. By the end of 2010, most invasive *Spartina* populations in the Bay had been reduced to insignificant levels and no longer provided cover for clapper rails. In fall of 2011, treatment of invasive *Spartina* was suspended at ten marshes in the East Bay, due to concerns over the declines. The ISP and partner agencies determined that greater than 915 rails must be detected for three consecutive years at a set of consistently surveyed sites before consultation and planning for treatment of the ten suspended marshes could be re-initiated.

Between 2012 and 2017, invasive *Spartina* increased in the marshes where treatment was suspended, but it declined bay-wide. During this period, rail numbers increased—in marshes where invasive *Spartina* treatment was suspended, in marshes where invasive *Spartina* persists and is annually treated, in marshes that have little to no infestation impact, and in younger restoration marshes that are maturing with predominantly native vegetation to support the rails. Results from 2017 rail surveys show that the three-year threshold of 915 rails has been met, and more than 1,200 birds were detected at consistently surveyed sites. The ISP will continue to work with partners and regulators to develop treatment plans for these sites in a fashion that achieves the goals of both endangered species management and landscape level invasive plant eradication.

Keywords: Tidal marsh, spartina, invasive, Ridgway's rail, endangered, Rallus obsoletus

Poster Cluster Title: Invasive *Spartina* Project Updates

Designing High Tide Refuge Islands for the California Ridgway's Rail

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Recovery of the endangered California Ridgway's rail (*Rallus obsoletus obsoletus*) is threatened by a deficiency of high tide refuge habitat, and associated increases in predation, in San Francisco Estuary marshes. This problem will worsen with sea level rise. To decrease predation on the rail, the California Coastal Conservancy constructed 63 earthen, high tide refuge islands over four winters (2013–2016). We strategically located the islands in 13 tidal marshes lacking refuge habitat and designed them to mimic natural slough channel berms dominated by gumplant (*Grindelia sticta*). We annually monitored the islands for 4 years (2013–2016) to evaluate habitat establishment and iteratively modify the design. Our key findings from 2016 monitoring are: (1) gumplant canopy established most rapidly when islands were built with tops approaching the upper limit of gumplant's elevational range; (2) island soil derived from marsh sediments remained horticulturally suitable after construction, but gumplant canopy was enhanced by adding terrestrial soil around plantings, which reduced transplant shock; and (3) islands built to elevations of 1.0 foot and 1.3 feet above mean higher high water (MHHW) (in 2013 and 2014, respectively) provided, on average, about 1 vertical foot of gumplant canopy above the highest predicted tides, the minimal cover needed to hide rails from predation during most extreme high tides. By contrast, islands built to 1.7 feet above MHHW (in 2015 and 2016, respectively) had gumplant canopy on average 3 feet above the highest predicted tides and provided high-quality refuge for rails. On most islands, gumplant established rapidly (within 1–3 years of installation), with gumplant canopy cover averaging 52% across all surveyed islands in 2016. The project demonstrates a feasible and cost-effective method of rapidly providing high tide refuge habitat in tidal marshes.

Keywords: Ridgway's rail, refuge, gumplant, island, climate, rise, endangered, recovery, transition

Poster Cluster Title: Invasive Spartina Project Updates

Enhancing Tidal Marsh Habitat to Support California Ridgway's Rail

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This past winter we implemented the sixth year of the Invasive *Spartina* Project's (ISP) program to rapidly enhance habitat for California Ridgway's rail (*Rallus o. obsoletus*) in tidal marshes affected by the invasion and subsequent removal of non-native *Spartina*. After removal of non-native *Spartina*, natural recruitment of some native species has been very successful (e.g., perennial pickleweed, *Salicornia pacifica*). However, two key components of rail habitat, marsh gumplant (*Grindelia stricta*) and native Pacific cordgrass (*Spartina foliosa*), have not recolonized and/or recruited into some sites, especially young restoration sites that lack local propagule sources. To encourage rapid habitat enhancement focusing on these two species, ISP and partners designed and installed plantings aiming to establish dense, strategically-located patches of vegetation that will benefit nesting, foraging, and roosting rails, as well as provide high tide refuge.

During the past six winters, the ISP and partners have installed more than 400,000 plants, primarily marsh gumplant and Pacific cordgrass, at over 40 sites. Marsh gumplant flowering and seed production, and the presence of new seedlings, has been recorded at ISP sites indicating that the plantings are self-sustaining. Planted cordgrass patches are rapidly expanding laterally at sites where, prior to our planting efforts, native cordgrass was absent. In addition, we have recorded the presence of Pacific cordgrass seedling recruits near our plantings indicating successful seed production and recruitment.

The San Francisco Estuary Invasive *Spartina* Project (ISP), led by the State Coastal Conservancy and the U.S. Fish and Wildlife Service, is a collaboration of many partners around San Francisco Bay to eradicate several species of non-native, invasive cordgrass.

Keywords: Tidal Marsh, California Ridgway's Rail, habitat enhancement, marsh gumplant, cordgrass

Poster Cluster Title: Invasive *Spartina* Project Updates