



## Frequency, Distribution and Ecological Impact of Cryptic Hybrid Invaders: Management Tools for Eradication of Invasive Spartina

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### BACKGROUND

Four species of nonindigenous *Spartina* cordgrass have been introduced to San Francisco Bay. One of them, *Spartina alterniflora*, from the East Coast, has hybridized with the native *S. foliosa* and become highly invasive. These hybrids and their backcrosses are problematic to conservation objectives as they colonize nearly every ecological niche of a marsh – high and low marsh elevations, and across a range of salinities and sediment types. Where established, the hybrids inevitably pollen swap with native *Spartina*, creating yet more hybrids. With time, rare wetlands can be converted into uniform expanses of grass. Efforts to eradicate invasive *Spartina* have been based largely on visually identifying the most threatening, biggest, tallest and thickest, red-stemmed, big-flowered cordgrass plants and spraying these with herbicide. The strategy has been highly successful in reducing the invasion's size – from about 800 net acres in 2005 to about 50 net acres in 2011. But, it also appears to have selected for “cryptic” hybrids – cordgrass plants that resemble native *Spartina* but contain exotic genes.

### PROJECT

This project investigates whether cordgrass plants that have evaded or survived herbicide control could be resurgent and stage another invasion. Of particular interest is to address whether plants that look native have the same ecology as native cordgrasses. A closely related goal is to examine whether microsatellite markers can be used to predict a plant's phenotype and ability to become invasive in the future. These topics are being addressed through a common garden experiment and genetics study.

In the garden experiment, 150 cordgrass plants (genets) of known genetic composition were transplanted to a salt marsh at Point Pinole Regional Shoreline in the East Bay Regional Park District, Richmond and planted across five marsh zones below, within and above the native *Spartina* meadow. Plant growth was monitored from the spring of 2010 to the fall of 2011, along with several environmental parameters, including inundation time, sulfide concentrations, soil oxidation/reduction potential and soil pore-water salinity.



Hybrid *Spartina* thriving below the lower limit of native *Spartina*. Credit: L. Feinstein

For the genetics study, the Delta Science fellow tested the resolution and accuracy of a panel of 18 genetic markers, which researchers have been using to find hybrid *Spartina*, and then isolated an optimal sub-panel of 5 loci that can more expeditiously detect the presence of exotic genes. In ongoing work, these markers are being used to study *Spartina*'s population structure in the bay.

### RESULTS

The work to date validates what has been observed in the field and concluded in other research. The cordgrass hybrids found growing in the San Francisco Estuary appear to be effective invaders because they grow faster than, and colonize habitats beyond the range of, native *Spartina*.

Of the environmental variables monitored in this experiment, soil salinities appear to be the most predictive of cordgrass survivorship. In particular, very saline conditions (observed in autumn) were lethal to all of the transplanted genets, except for some plants in the lower elevations of the tidal mudflat. A year later, these plants were still growing and filling in the mudflat. Genetic testing will confirm whether or not some of these survivors are cryptic hybrids.

