Invasive *Spartina* Project: Balancing Endangered Species Recovery and the Eradication of an Invasive Ecosystem Engineer

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Native Pacific Cordgrass
*Spartina foliosa*
Non-Native Hybrid Cordgrass
*Spartina alterniflora X foliosa*
Hybrid *Spartina*

- *Spartina alterniflora* introduced 1976 by ACOE
- Spread slowly for years (seeds & vegetatively)
- Hybridization w/ native *S. foliosa* discovered mid-1990’s
- Backcrossing of multiple generations (Introgression of highly fertile hybrid swarm)
- Novel, ecologically distinctive phenotypes emerged
- Transgressive traits = can exploit all marsh niches AND elude detection and treatment (cryptic hybrids)
- ISP does extensive genetic testing each year to confirm hybrids before treatment and preserve native (UCLA lab)
Non-Native Hybrid Cordgrass
*Spartina alterniflora X foliosa*

Hybrid *Spartina* normally characterized by greater:

- Height (allows for establishment at lower tidal elevation)
- Culm density (increasing competition & exclusion of all other native marsh plants)
- Flower size (allows for pollen swamping of adjacent native cordgrass, as well as greater seed production)
Why is invasive Spartina a Problem?

Degrades endangered species habitat
Hybridizes with native Pacific cordgrass
Dominates mudflats (▼ shorebird foraging)
Reduces flood control capacity
Creates mosquito breeding areas
Causes failed restoration projects
San Francisco Estuary Invasive Spartina Project

Created in 2000 by the California Coastal Conservancy and the U.S. Fish and Wildlife Service to coordinate Estuary-wide *Spartina* control

Goal of arresting the spread and eventually eradicating non-native *Spartina* from the San Francisco Estuary

Funding from the Conservancy is directed to grantees positioned around the Estuary that implement Site-Specific *Spartina* Control Plans produced by the ISP

Entering 8th season of full-scale implementation of an Estuary-wide *Spartina* control effort
Eradication of invasive *Spartina* is a key first step in the South Bay Salt Pond Restoration Project, the most ambitious wetland restoration in the West.

16,500 acres of salt ponds purchased from Cargill for $100 million in 2003.
Ecosystem Engineer: *Spartina* marsh built in < 20 years by sediment accretion due to hybrid *Spartina* colonization of mudflats
Hybrid *Spartina* invading the open mud of Middle Bair Island Restoration opened autumn 2008

EVERY tidal marsh project opened in the last 25 years has been invaded and/or dominated by hybrid *Spartina*

Photo taken from airboat during treatment (Sept. 2010)
Alameda Flood Control Channel Pre-treatment (2005)
Adjacent to the original *S. alterniflora* introduction site
Regionally-Coordinated Treatment Program

170 sites within 24 complexes

Annual ISP surveys over 50,000 tidally-influenced acres inform treatment
Helicopter Boom Applications

Essential part of IPM strategy for controlling vast monocultures during the initial years

By 2010, 89% reduction in the number of acres treated by helicopter as compared with 2006

Ground-based methods are now more appropriate AND more effective
Hose from truck with extra long wand attached for greater reach

Backpack application

Argo amphibious tracked vehicle has very low ground pressure. It can go where you can’t even walk
Airboat operations allow access to heavily infested areas where Argos can’t go, and during tides in which an outboard boat can’t operate.

Just a few inches of water on an outgoing tide = max dry time.
Airboats also allow low tide access to remote areas where the applicators can haul out up to 300ft. of hose to treat *Spartina*
Eradication is a high bar: The labor and time-intensive work of treating scattered small infestations in these vast marsh and mudflat systems
ISP biologists accompany crews during control work to ensure thoroughness and assist with clapper rail sensitivity.

ISP staff here are using GPS inventory data collected by helicopter 2 weeks earlier to guide 3 backpack applicators.
**Sarcocornia pacifica** (perennial pickleweed):

- Minimal impact from imazapyr
- Thrives after competitive release from hybrid *Spartina*
- Widespread passive revegetation after *Spartina* treatment
Colma Creek – South San Francisco

2006

2008

2010

Pickleweed

Grindelia
Old Alameda Creek in 2006
Old Alameda Creek in 2011
Greco Island South in 2011
Ravenswood Slough in 2006
Ravenswood Slough in 2011
Major Obstacle to *Spartina* Treatment: Clapper Rail Use of Infested Marshes

This reclusive marsh bird is notoriously hard to accurately detect, making population estimates difficult.

- Successful *Spartina* treatment requires access to clapper rail marshes during the breeding season (before Sept 1)
- USFWS first allowed ISP this timing in 2008 BO
Clapper Rails and Hybrid *Spartina*

- Reduced macroinvertebrates
- Displaced native *S. foliosa*
- Dominated native marshes
- Filled in channels

- Created new tidal marsh
- Provided excellent cover

→ Clapper rail populations expanded and grew

Slide courtesy of Jen McBroom (ISP)
27 sites total

Slide courtesy of Jen McBroom (ISP)
Three Regions Combined

Graph courtesy of Jen McBroom (ISP)
Project Status in Spring 2011

- ISP partners have reduced the infestation by 94% since 2006 peak
- Extensive intact marshes of the South Bay have only small, scattered infestations remaining (i.e. hybrid *Spartina* not critical habitat)
- North Bay is virtually hybrid-free and with increasing rail numbers
- ISP begins to re-introduce *Spartina foliosa* to Central Bay marshes where it had been extirpated
- Clapper rail numbers have stabilized for past 3 years

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ISP Biological Opinion 2011

• BO was issued several months late by USFWS on September 23, 2011

• Compressed the treatment season into a narrow window

• Allowed hybrid seed to be dispersed

• 26 sites (or portions of sites) *not permitted for treatment* in 2011 due to concern over clapper rail numbers

• Many of the permitted sites contained small infestations approaching eradication

• The No Treatment sites represented 60% of remaining acreage and were scattered all around the Bay

• USFWS inserted a revegetation requirement to offset loss of hybrid *Spartina* refugia (continues to be negotiated)
2012 Biological Opinion

- Expected to be issued by late June
- Up to 9 sites will not be permitted for treatment in 2012
- Seed suppression (using a dilute solution) on these sites would maintain control but is not going to be permitted
- Entry to numerous clapper rail sites after Sept 1 (when some hybrids will already have set seed)
- With a stable baywide clapper rail population, further delays simply jeopardize *Spartina* eradication and can elevate future take numbers
• Most active revegetation efforts have been on hold until ISP gained sufficient control over the hybrid *Spartina*
  – Planting native *S. foliosa* was not an option (with pollen swamping it would become an agent for hybrid seed)
  – Robust hybrid would engulf neighboring plants
  – Plantings could be destroyed during future herbicide treatment

• Imazapyr herbicide has little effect on pickleweed = many sites have experienced *extensive* passive revegetation
ISP Clapper Rail Habitat Enhancement Revegetation Program

- Focus on marshes where the invasion had a major impact on plant community
- Selection of planting areas and palette focused on clapper rail refugia and nesting substrate
- *Grindelia stricta* lining channel banks (nesting and high tide refugia)
- *Spartina foliosa* reintroduced where extirpated by hybrid swarm (foraging cover within channels; nesting substrate for clapper rail)

- 29,200 plants over winter 2011-2012
- Goal of 70,000 plants winter 2012-2013
Greco Island – planted 2900 *Grindelia stricta* along higher order channels
Spartina foliosa propagation beds at the Watershed Nursery
• reduces marsh impacts from large-scale direct transplants
North Creek Marsh – 2130 plants

Reintroduction of native *Spartina foliosa*

Includes larger palette of ecotone plants installed on eroded levees
ISP: Built on Partnerships
Can I get a hand?