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

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Coastal Conservancy

San Francisco Estuary Invasive Spartina Project
Preserving native wetlands

National Fish and Wildlife Foundation

CALFED Bay-Delta Program

U.S. Fish & Wildlife Service

WCB State of California Wildlife Conservation Board

San Francisco Bay Joint Venture

United States Environmental Protection Agency

Recovery.gov

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

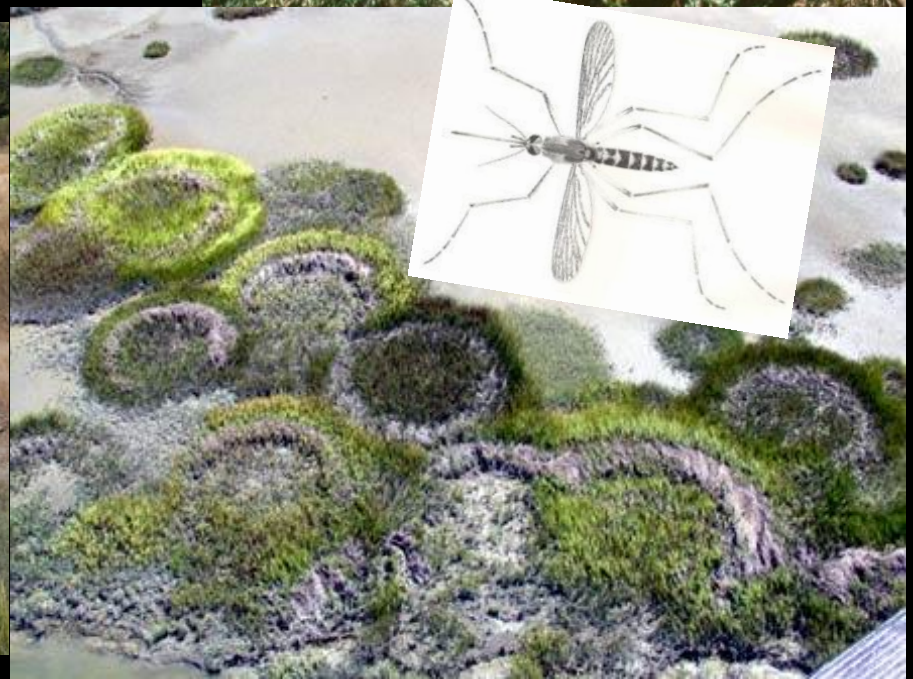
Hybridizes with native Pacific cordgrass

Dominates mudflats (▼shorebird foraging)

Reduces flood control capacity

Creates mosquito breeding areas

Causes failed restoration projects



San Francisco Estuary Invasive *Spartina* Project

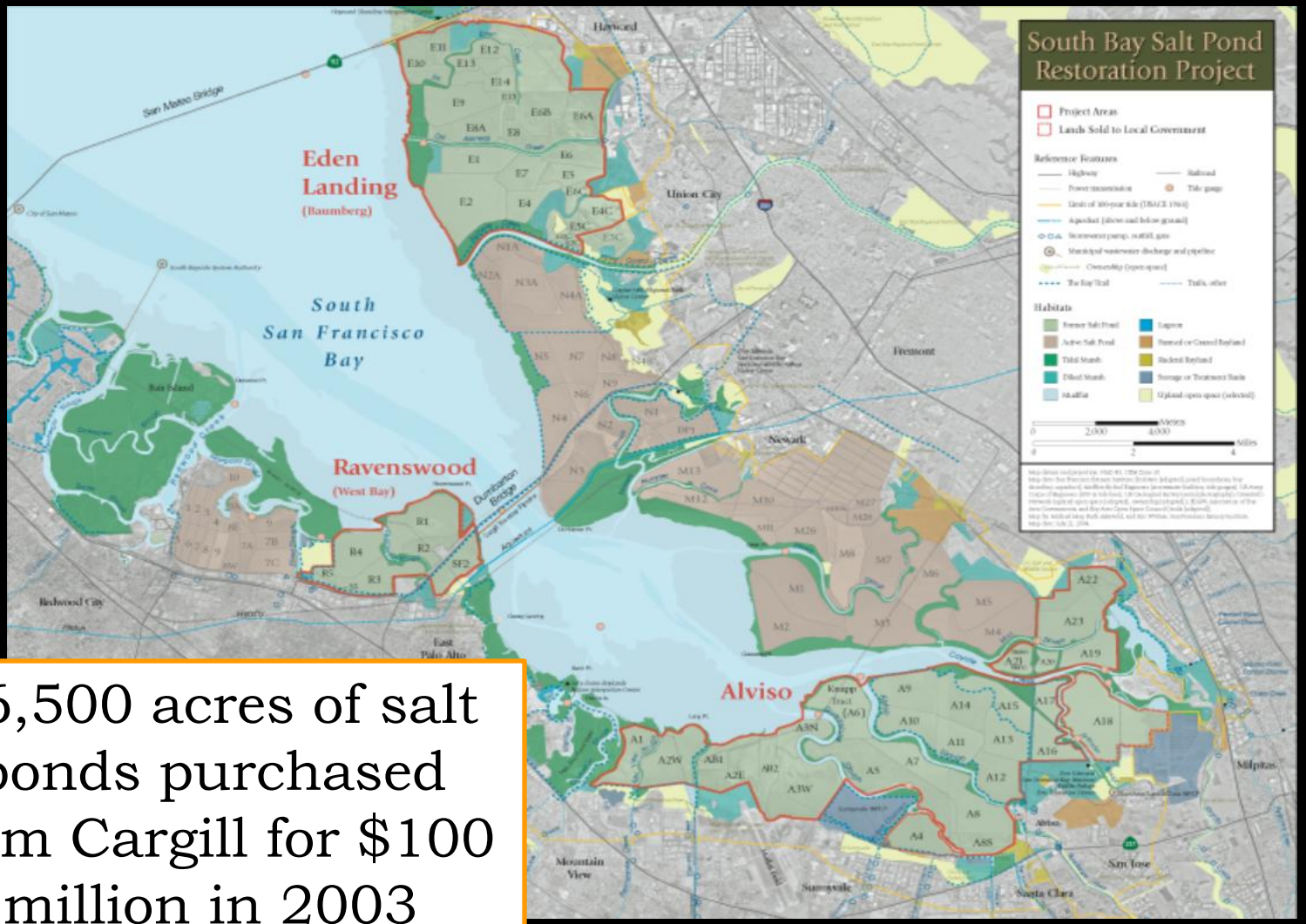
Created in 2000 by the California Coastal Conservancy and the U.S. Fish and Wildlife Service to coordinate Estuary-wide *Spartina* control

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

Robert's Landing, San Leandro Shoreline

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

2011-2015 ISP Site-Specific *Spartina* Control Plans

San Francisco Estuary Invasive Spartina Project
Preserving native wetlands

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

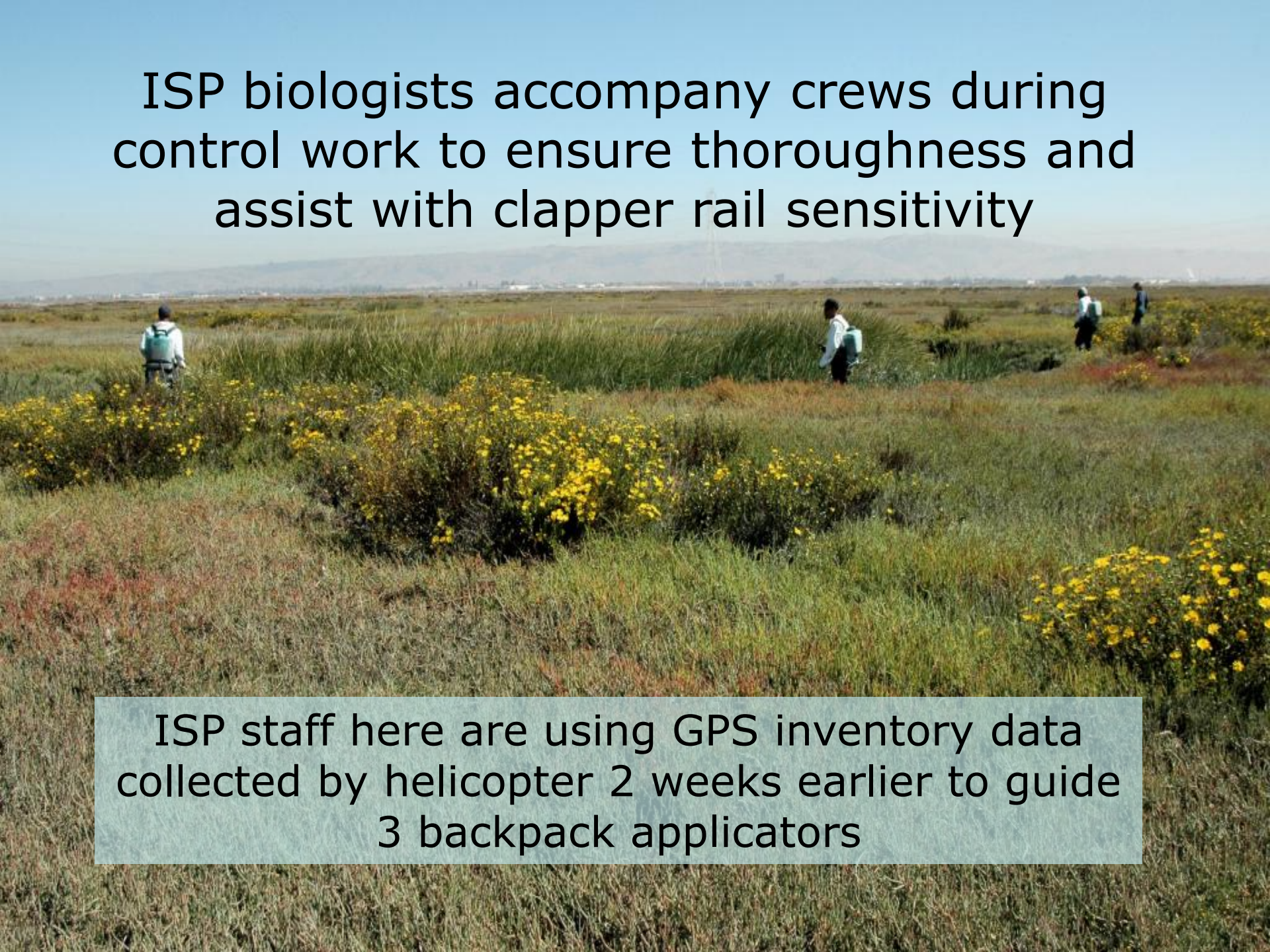
Backpack application

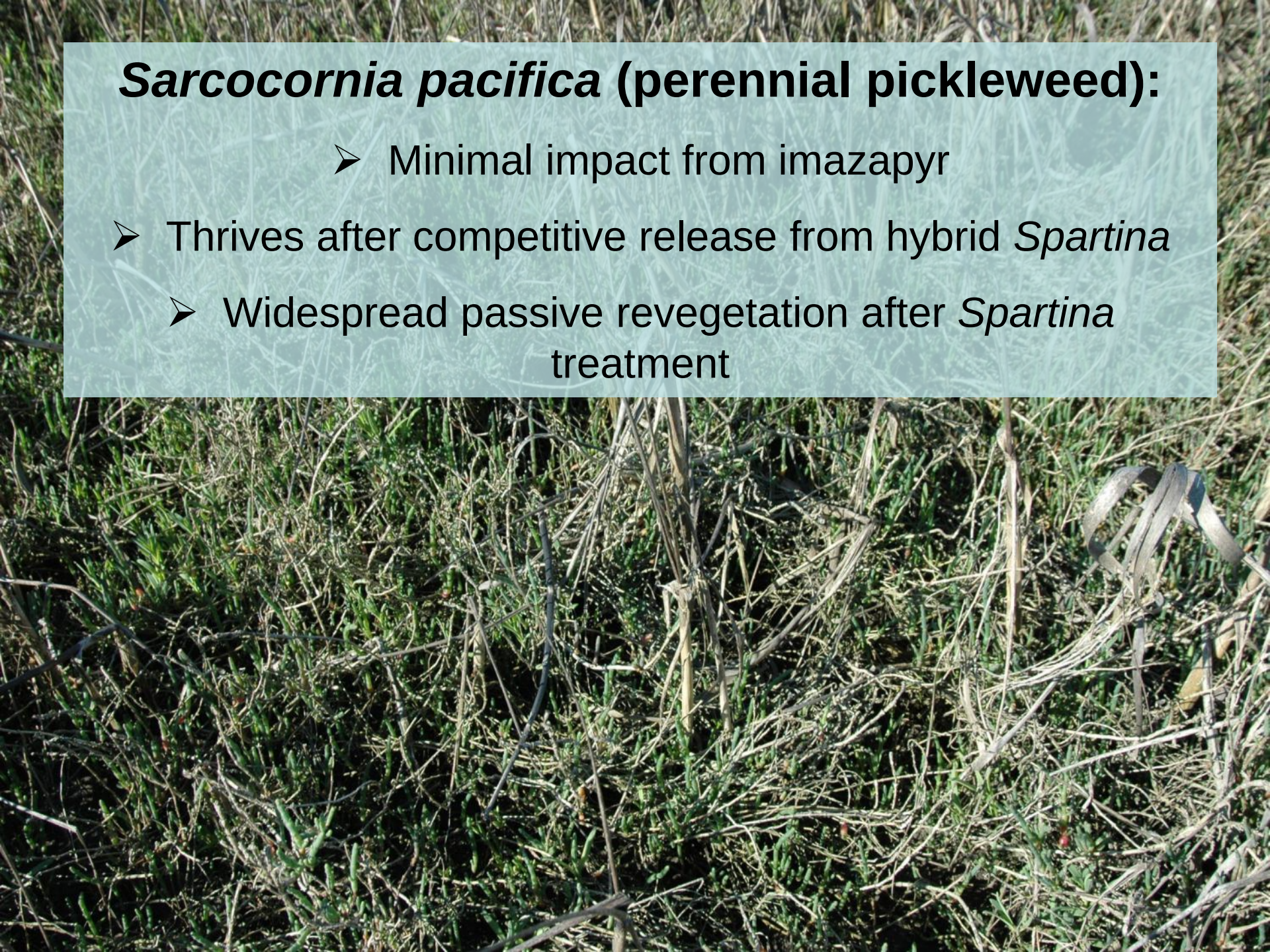
Argo amphibious tracked vehicle has very low ground pressure. It can go where you can't even walk

Airboat operations allow access to heavily infested areas where Argos can't go, and during tides in which an outboard boat can't operate

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

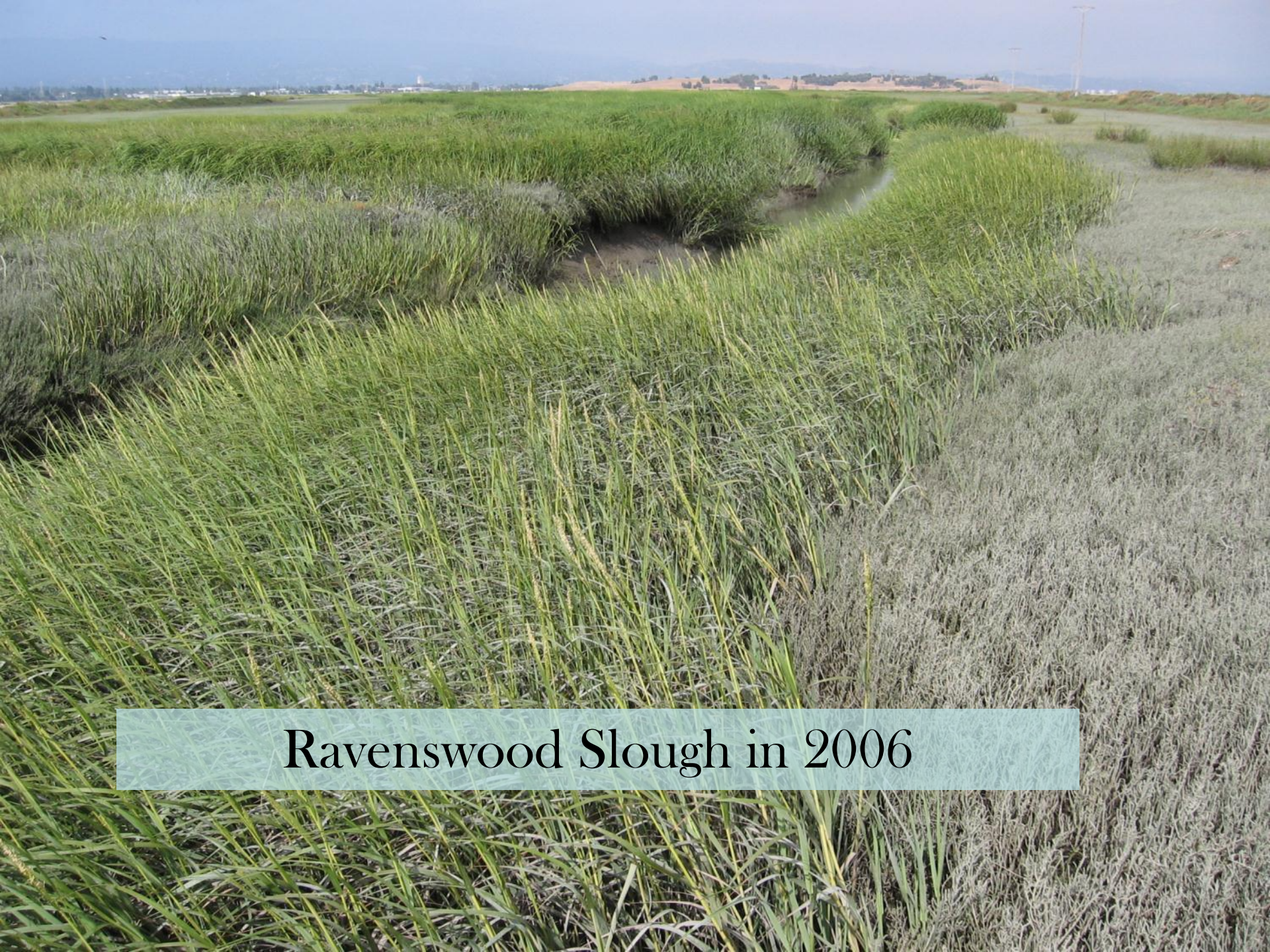

Colma Creek – South San Francisco
2006
2008
2010
Pickleweed
Grindelia

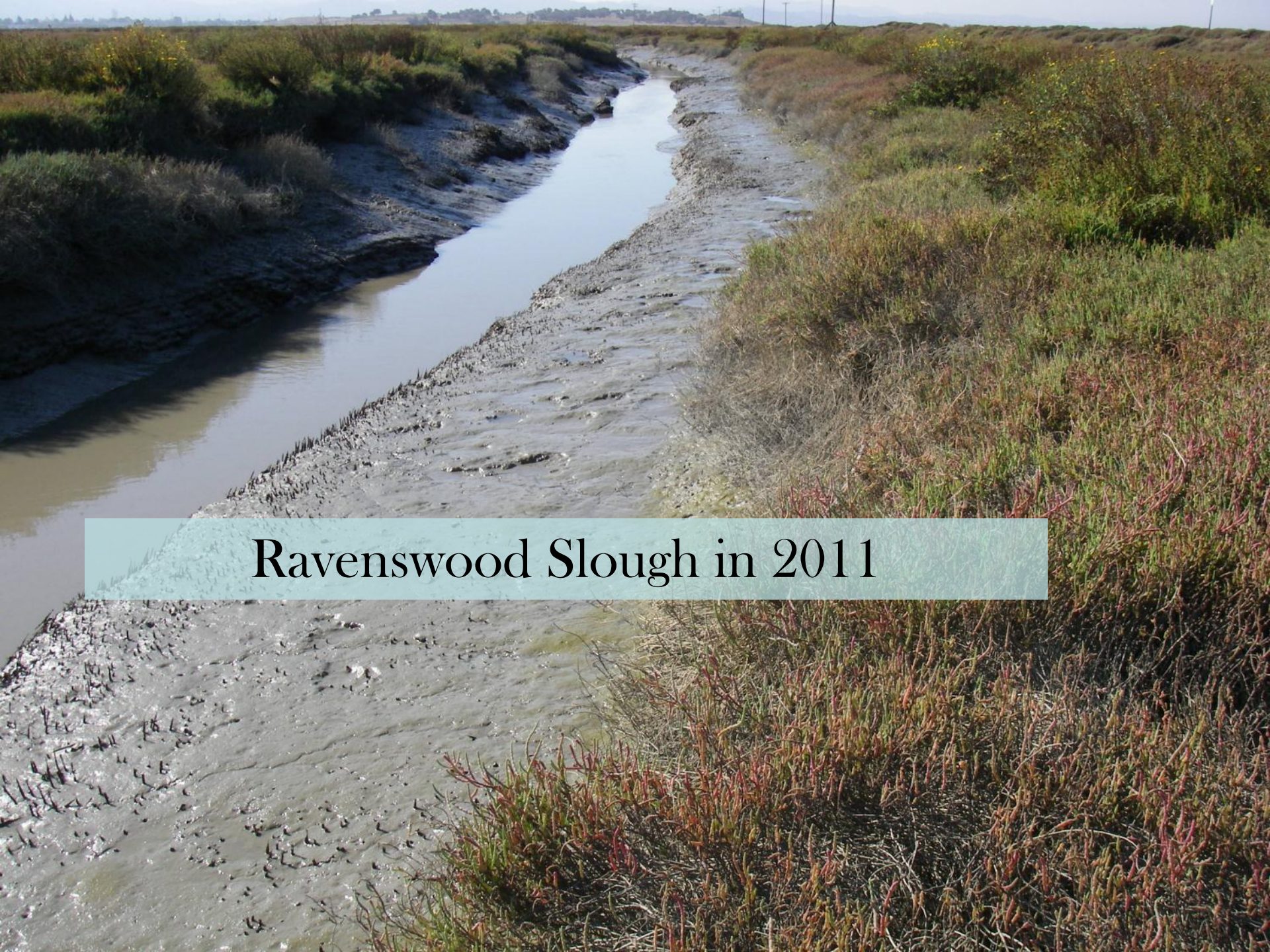

Old Alameda Creek in 2006


Old Alameda Creek in 2011

Greco Island South in 2006

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

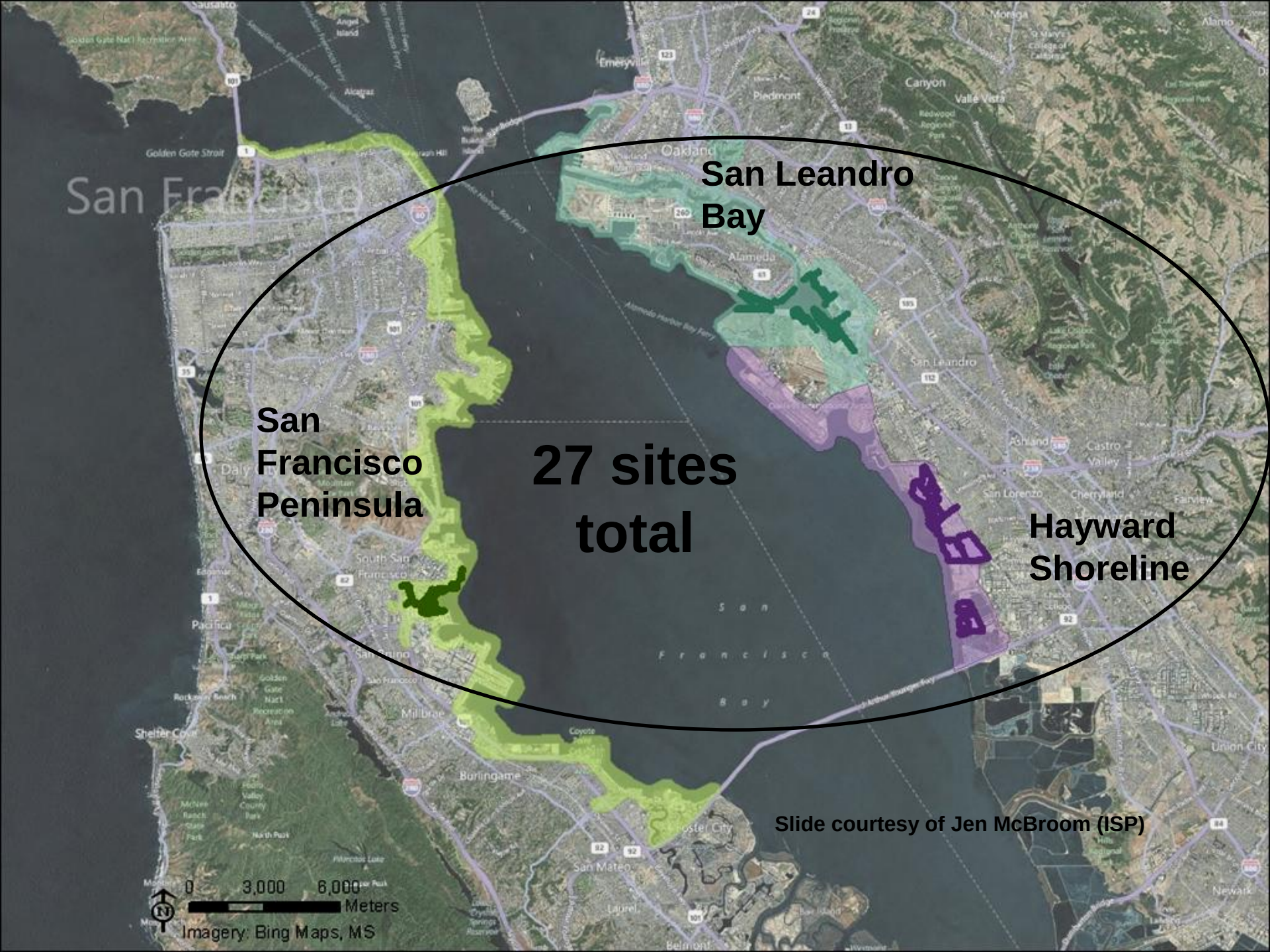
Clapper Rails and Hybrid *Spartina*

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

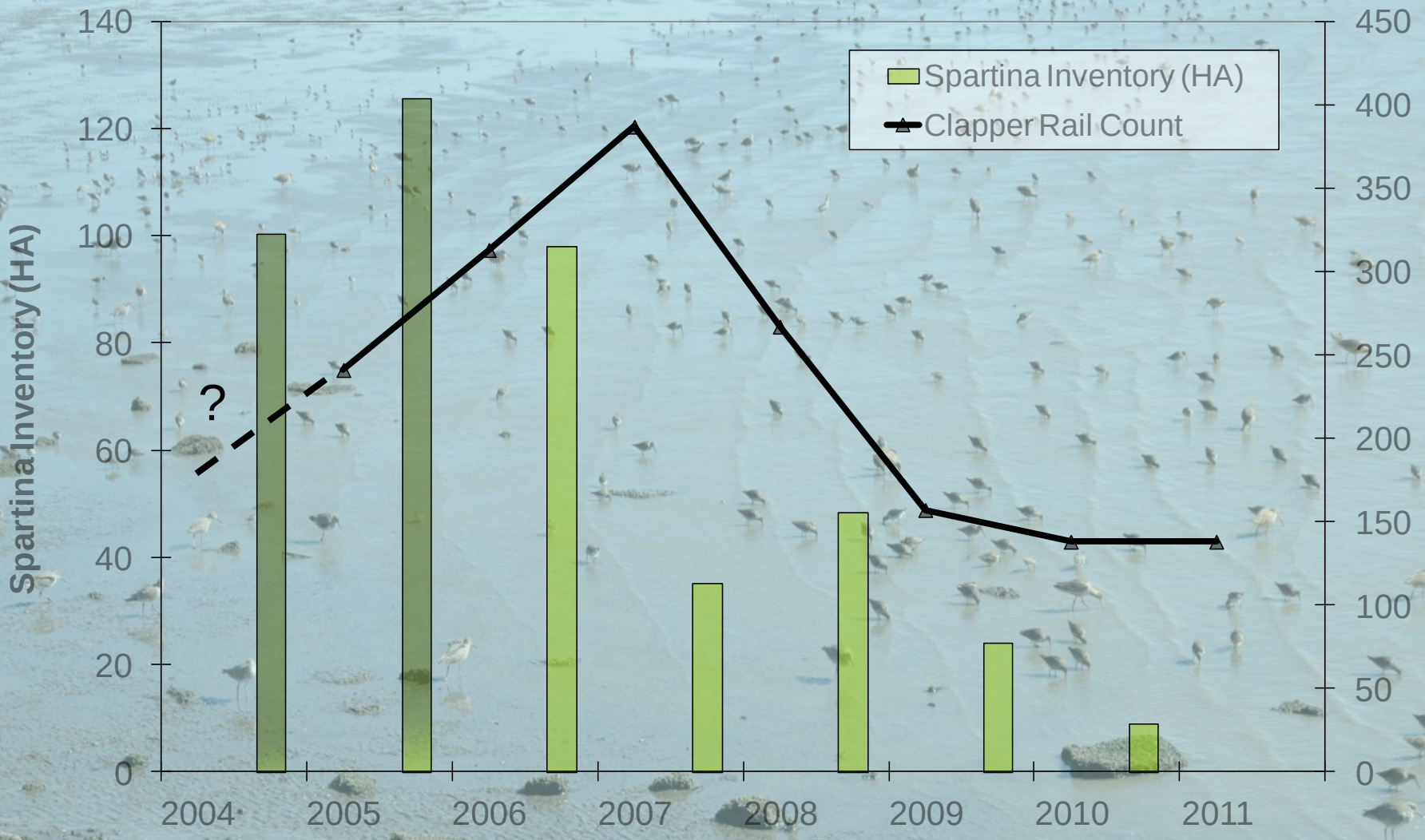
- Created new tidal marsh
- Provided excellent cover

→ Clapper rail populations expanded and grew

Slide courtesy of Jen McBroom (ISP)


San Leandro Bay
San Francisco Peninsula
27 sites total
Hayward Shoreline
Slide courtesy of Jen McBroom (ISP)
0 3,000 6,000
Meters
Imagery: Bing Maps, MS

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

# of ISP Sites	2009 detections	2010 detections	2011 detections	2012 detections	Trend
134	306- 414	327- 426	305- 409	315- 410	→

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

ISP Revegetation Work

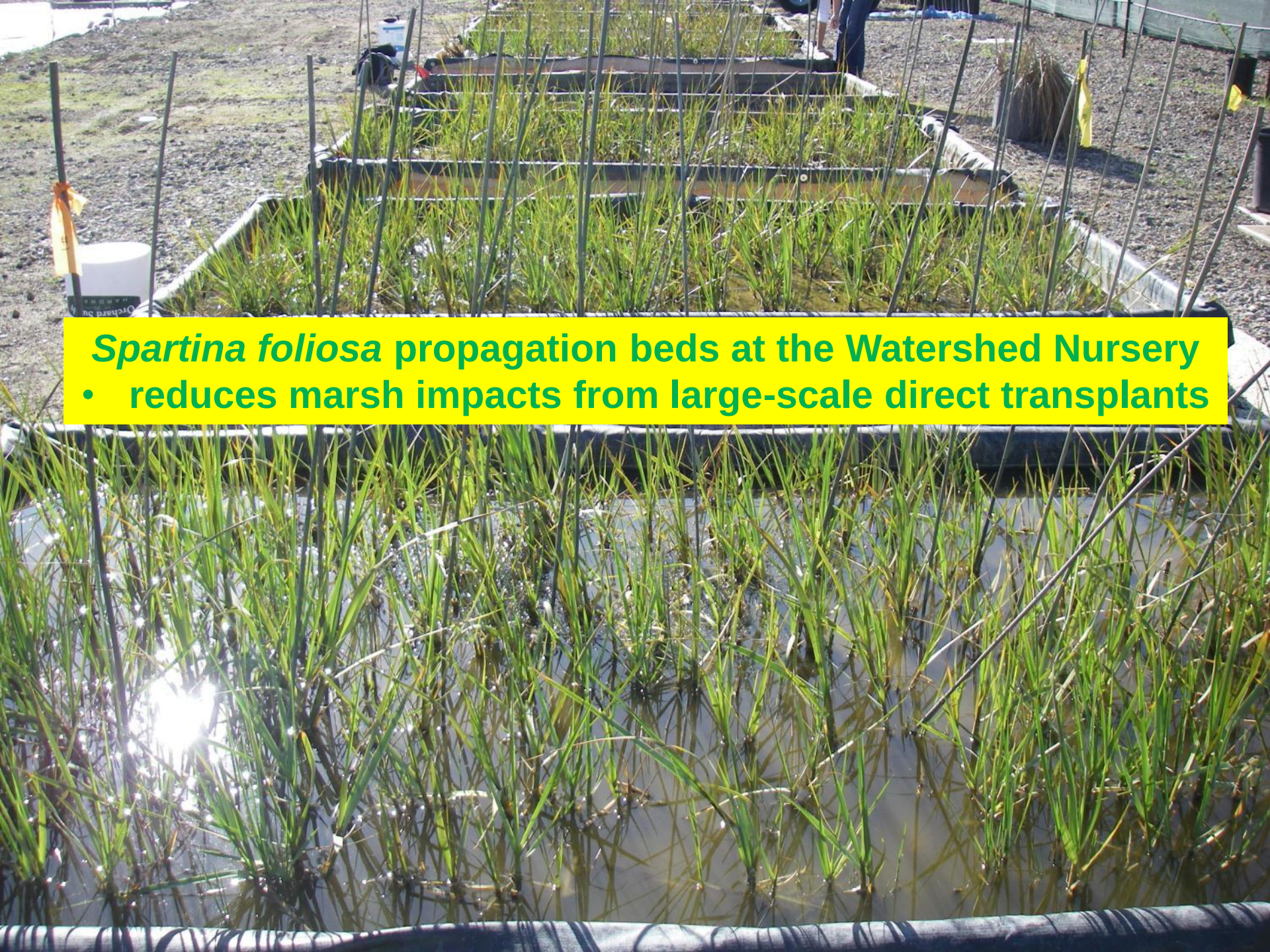
- Most active revegetation efforts have been on hold until ISP gained sufficient control over the hybrid *Spartina*
  - Planting native *S. foliosa* was not an option (with pollen swamping it would become an agent for hybrid seed)
  - Robust hybrid would engulf neighboring plants
  - Plantings could 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

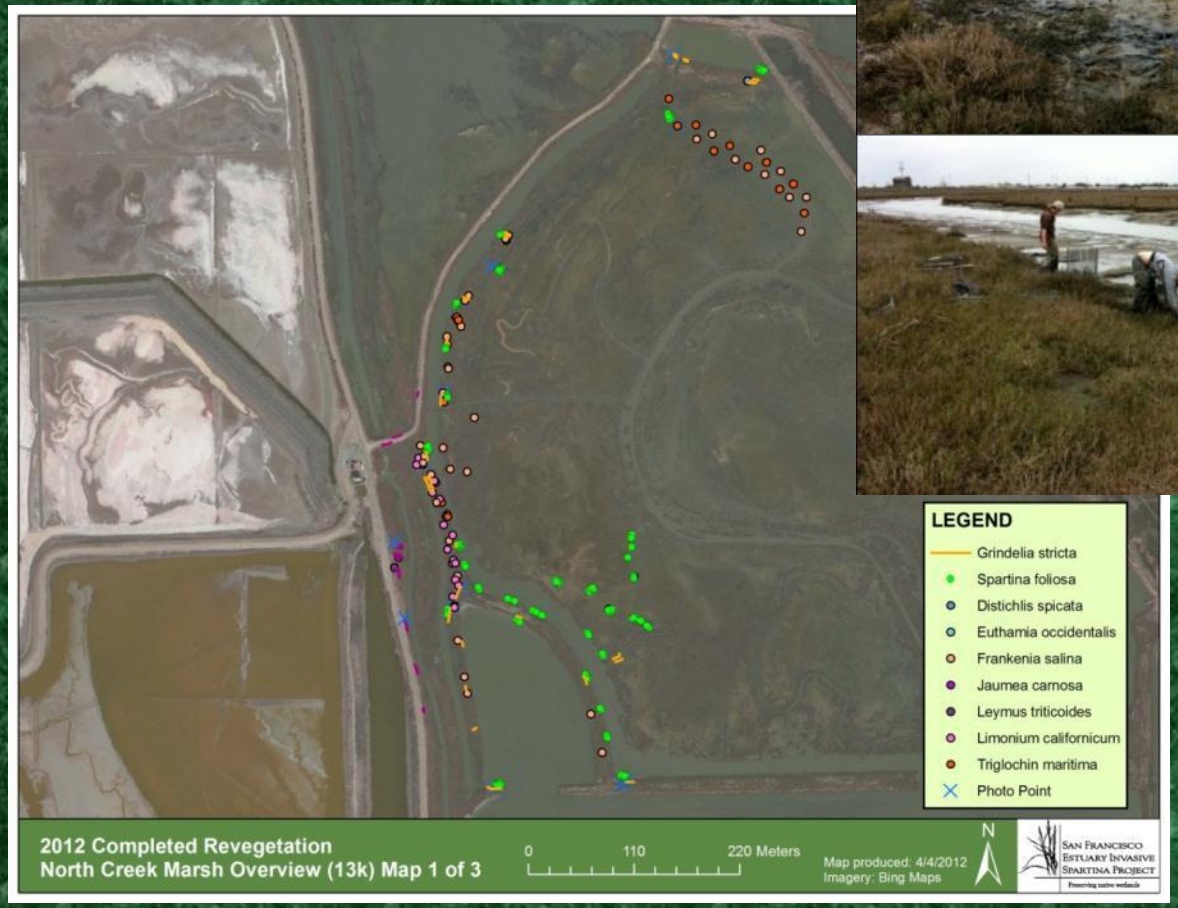


***Spartina foliosa* propagation beds at the Watershed Nursery**

- **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?