

San Francisco Estuary

Invasive *Spartina* Project

Preserving Native Wetlands

# Invasive *Spartina* Project Monitoring Program

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Coastal  
Program

# ISP Inventory & Treatment Monitoring

## Presentation Goal:

- Describe the current inventory & treatment efficacy monitoring protocols.
  1. Field based monitoring
  2. GIS based-Photo interpretation monitoring



# San Francisco Estuary: 1 native and 4 non-native species of *Spartina*

Native *Spartina foliosa*: California cordgrass

*Spartina densiflora*: Dense flowered cordgrass

*Spartina alterniflora*: Smooth cordgrass & hybrids

& NEW *S. densiflora-foliosa* hybrid



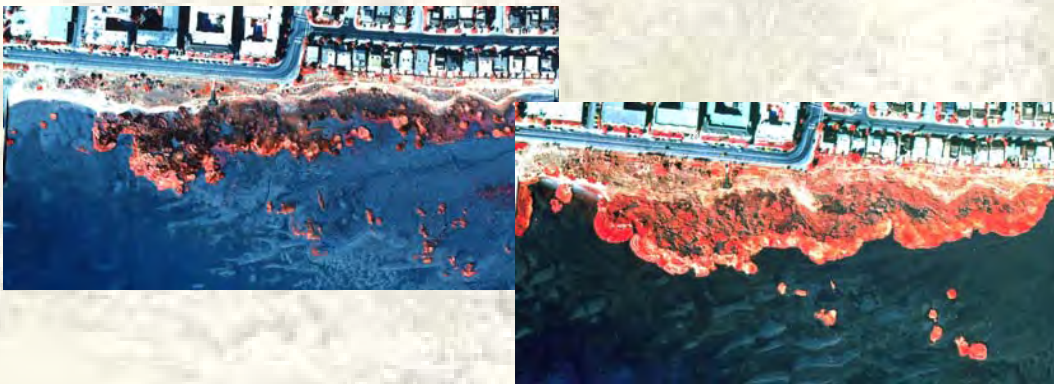
*Spartina patens* : Salt-meadow cordgrass

*Spartina anglica* : English cordgrass



## Inventory Monitoring Goals:

1. Determine annual abundance and distribution of non-native *Spartina* in the San Francisco Estuary and outer coast marshes.
2. Determine annual change in area (rate of spread, and eventually reduction) across all species.
3. Determine influence of Bay Region, sediment, elevation and site type on change in area.



# Inventory Methods:

## Inventory Monitoring

- Annual estuary-wide survey (census) of entire shoreline and marsh habitat for non-native *Spartina*.
- Two Inventory Monitoring components:
  1. Field based monitoring
    - Marsh/shoreline relatively accessible by foot, boat, kayak, bike, etc.
    - Monitoring during the peak growing season (June-October).
  2. Aerial photo interpretation based monitoring
    - Larger, less accessible marsh sites invaded.
    - Color IR photos flown in later summer, rectified, analyzed/digitized after peak field season (December-April).

# Inventory Methods:

## Field-based Monitoring

- Trimble GeoXT
- *Spartina* Monitoring Data Dictionary
- *Spartina* mapped as point, line, or polygon
  - diameter, width, cover, etc.
- *Spartina* species identified using plant morphology
  - Culm color, height, density, growth form, etc.
  - Genetic testing is used to confirm
    1. field identified *Spartina* species
    2. questionable species





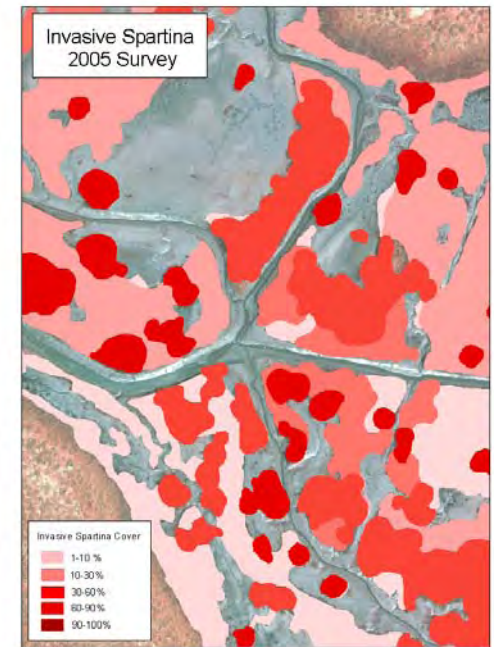
# Inventory Methods:

## Aerial Photo Interpretation Methods

- Color IR aerial photos
  - 1:6000 feet
  - low tide
  - peak of growing season (August)
  - scanned (1200 dpi)
  - orthorectified by sub-contractors
  - *Spartina* patches are mapped using heads up digitization
    - 1:500 scale
    - digitized as polygons
    - given percent cover class
  - *Can not distinguish S. alterniflora/hybrids from S. foliosa using color IR photography*
  - Species determination based on field survey data and genetic sample data to confirm species



# Inventory Methods:

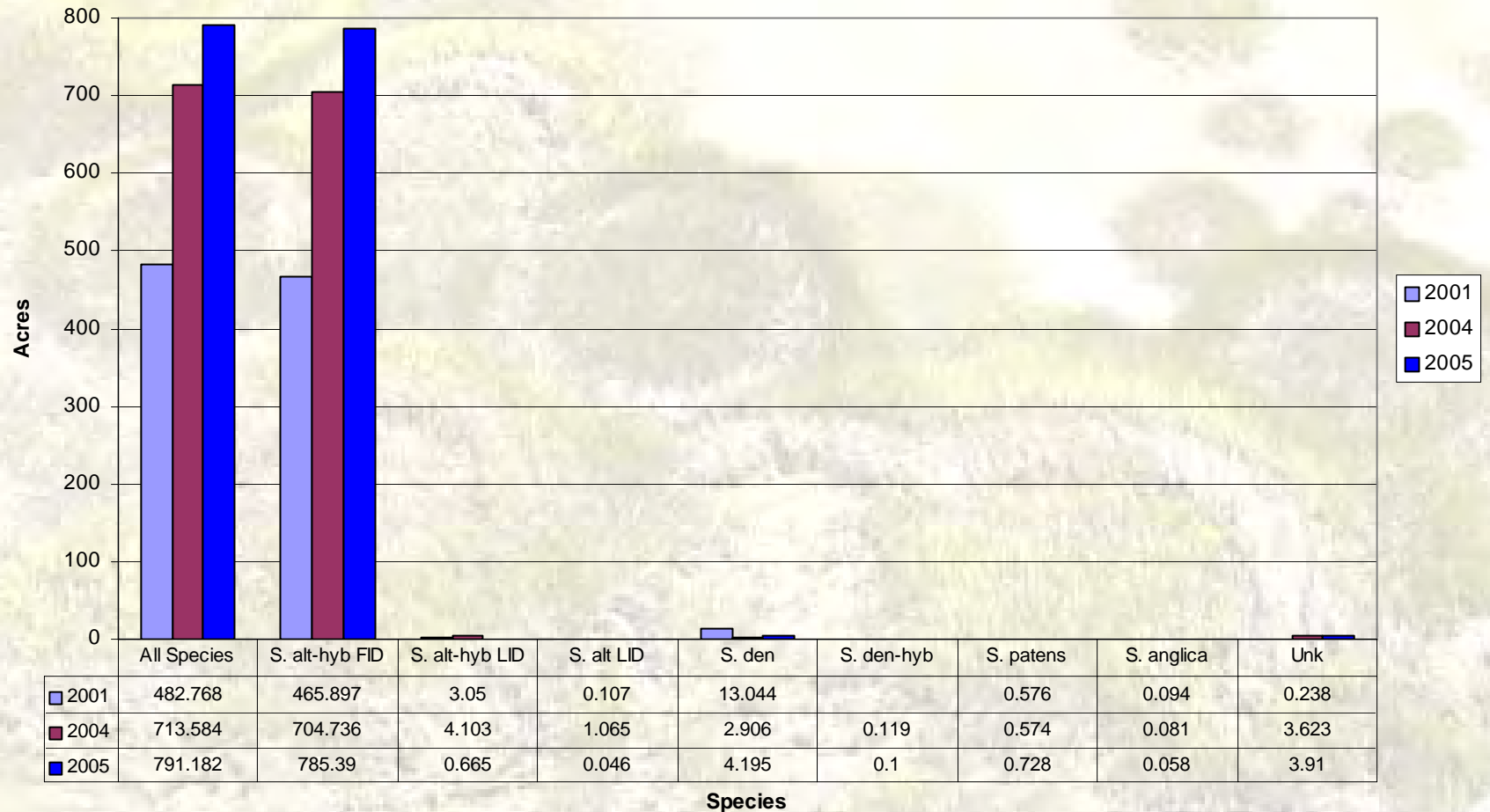




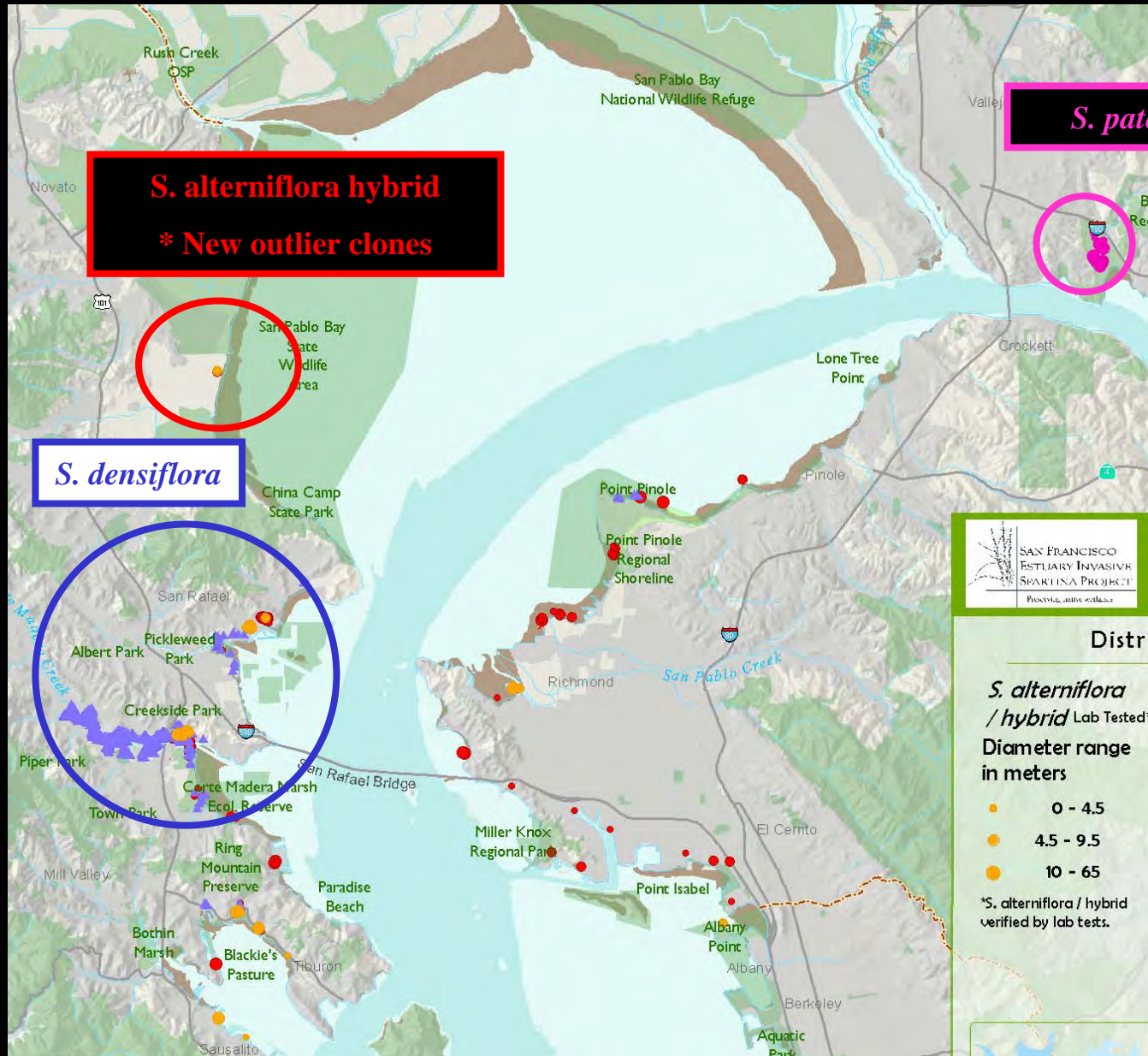
# 2001-2004-2005 Inventory Results:

(2005 Draft)

Non-native *Spartina*  
San Francisco Estuary  
Annual Species Abundance

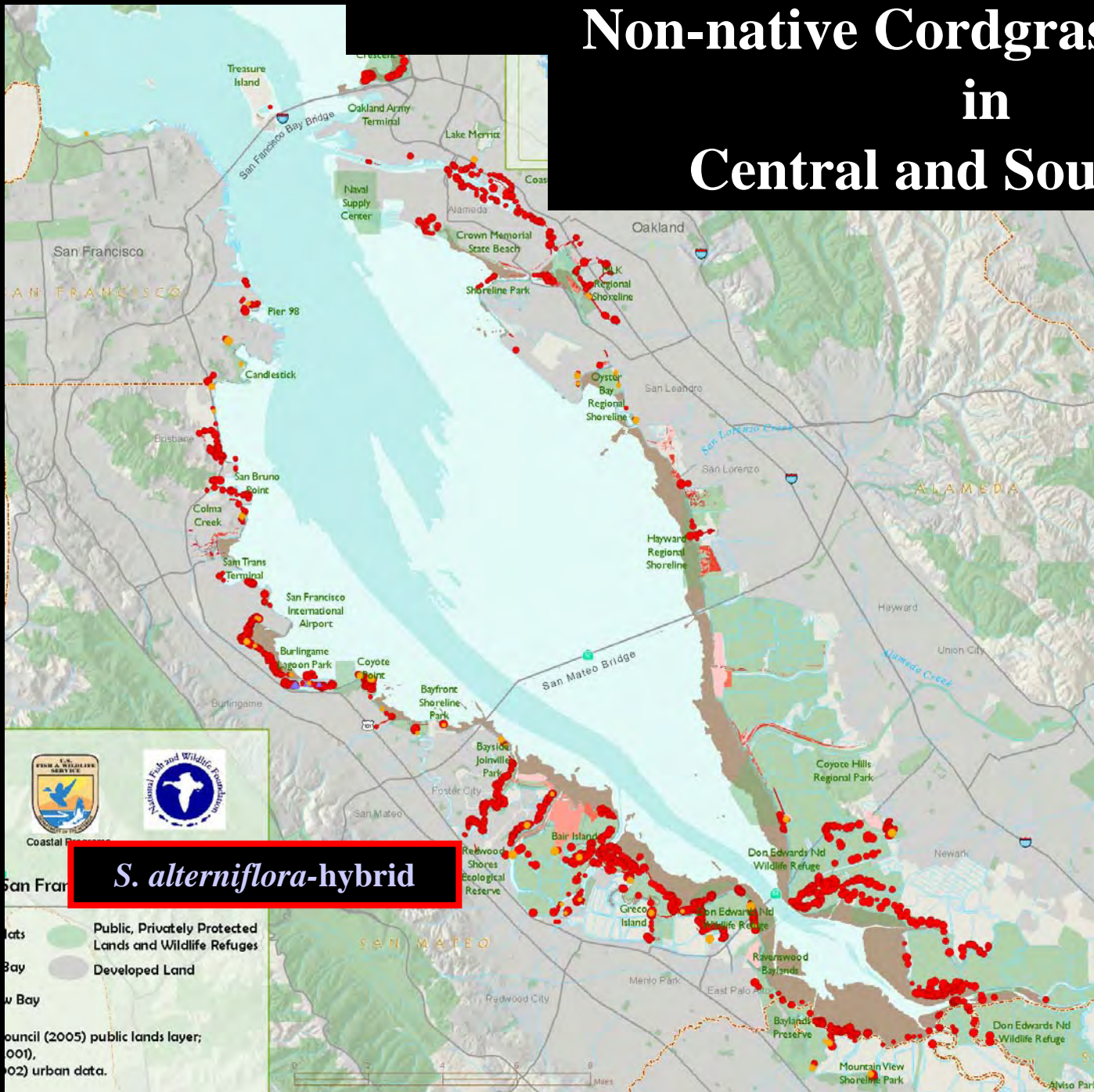


# Non-native Cordgrass Locations in North Bay and Suisun





# Non-native Cordgrass Locations in Central and South Bays



<i>S. alterniflora</i> / hybrid Lab Tested*	<i>S. alterniflora</i> / hybrid Field ID
Diameter range in meters	Diameter range in meters
● 0 - 4.5	● 0 - 4.5
● 4.5 - 9.5	● 5 - 9.5
● 10 - 65	● 10 - 65
* <i>S. alterniflora</i> / hybrid verified by lab tests.	Width of line in meters
<ul style="list-style-type: none"> <li>Points represent individual <i>Spartina</i> clones or small clusters of clones.</li> <li>Lines represent continuous linear patches of plants.</li> <li>Areas represent areal patches of plants characterized by varying percentage of cover.</li> </ul>	<ul style="list-style-type: none"> <li>1m - 10m</li> <li>11m - 50m</li> <li>&gt; 50m</li> </ul>
	Percent cover
	<ul style="list-style-type: none"> <li>&lt;1%</li> <li>1-10%</li> <li>10-30%</li> <li>30-60%</li> <li>60-90%</li> <li>90-100%</li> </ul>

***S. alterniflora*-hybrid**

Public, Privately Protected Lands and Wildlife Refuges  
 Developed Land  
 Council (2005) public lands layer; (001), (002) urban data.



# Treatment Monitoring Goals:

1. Determine efficacy of manual, mechanical and chemical treatment methods on non-native *Spartina*.
  - Determine most effective treatment for each species.
2. Determine influence of Bay Region, sediment, elevation, site type and season on treatment efficacy.
  - Determine most effective treatment in different environmental conditions.



# Treatment Monitoring Methods:

## 2004-2005 Pre-Post Treatment Monitoring Sites

- 32 Monitoring sites out of 37 Treatment Sites (44/78 in 2005, 51/134 in 2006).
- Monitoring sites:
  - Across estuary-wide distribution (each Bay Region).
    - Central and Northern South Bay Regions.
  - Across all treatment types
    - Herbicide is the treatment most common.
  - Across all Site Types I-IV (Marsh, Mudflat/Beach, Channel/Slough and Urbanized rip-rap/marina, etc.).
- 30 plots per site (unless fewer plants exist).
- Plots set at random points along transect.
- Monitor Summer-Fall (peak of growing season, or just prior to treatment).
  - Pre-Treatment GPS plot location.
    - Trimble GeoXTs with sub-meter accuracy.
  - Post-treatment using GPS to navigate to plot location.

**Site Type I:**

**Tidal/Backbarrier/Former Diked Marsh**



**Site Type II:**

**Fringing Tidal Marsh/Mudflats/Estuarine Beaches**



**Site Type III:**

**Major/Minor Tidal Sloughs/Channels/Creeks**



**Site Type IV:**

**Urbanized marsh/rock, rip-rap, docks, marinas, etc.**





# Treatment Monitoring Methods:

- ISP Control Program provides the site specific treatments  
(join tables in GIS – Access)
- Treatment parameters include:
  1. Treatment method (Herbicide, Dig, Cover, Mow, etc.)
  2. Treatment date
  3. Contractor/applicator
  4. If applicable,
    1. Herbicide type
    2. Herbicide rate
    3. Surfactant type
    4. Surfactant Rate
    5. Herbicide delivery mechanism (Backpack, Truck, Boat, Aerial, etc.)



# *Acknowledgements*

## **Monitoring Assistance**

- Aimee Good
- Tripp McCandlish
- Johanna Good
- Jen McBroom
- Alison Nelson
- Lisa Porcella, SCVWD
- Erik Grijalva
- Drew Kerr
- EBRPD, DENWR, PRNS,...
- Friends of Corte Madera Creek,  
Marin Rowing Assoc., Marin Audubon,  
Audubon Canyon Ranch, ...

## **UCD Spartina Lab**

- Debra Ayres
- Alex Lee
- Heather McGray
- Others...

## **Office/Administrative Support**

- Peggy Olofson
- Maxene Spellman
- Oliver Burke
- Stephanie Ericson

*THANK YOU !!!!*

