

# Defending the rarest of the rare: Habitat Restoration and Research in support of *Chorizanthe orcuttiana* at Naval Base Point Loma



# Soil Ecology and Restoration Group, San Diego State University Research Foundation



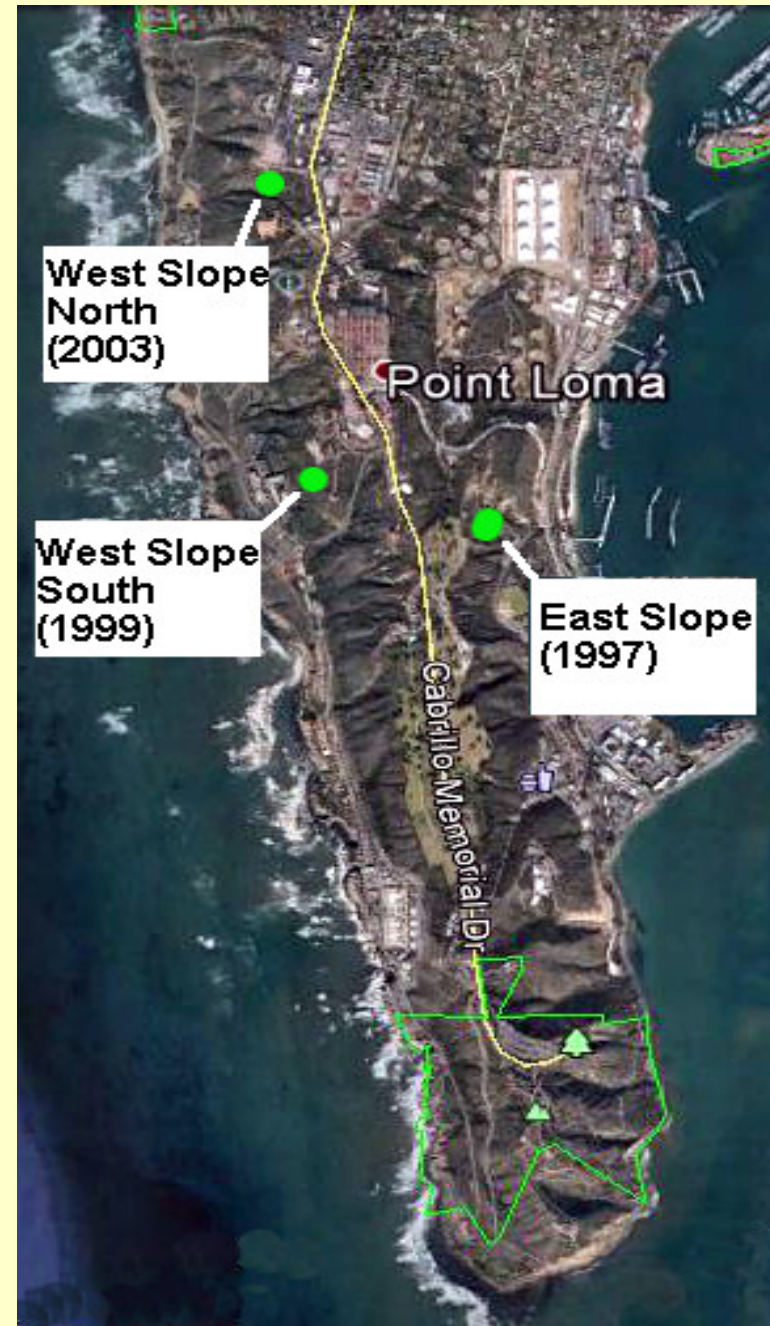
*Chorizanthe  
orcuttiana*  
(Orcutt's spineflower)

- Inconspicuous annual  
Polygonaceae
- Life cycle November-May
- Basal rosette of oblanceolate  
leaves
- Tiny, white, 6-parted, 1-2mm  
flowers
- Distinguished by a persistent  
involucre with three  
retroscly-barbed awns
- Plants are generally 2-5cm
- Occurs in flat, sandy openings  
in coastal chaparral
- Endemic to coastal San Diego  
County (all historical and  
current occurrences within  
5km of the ocean)



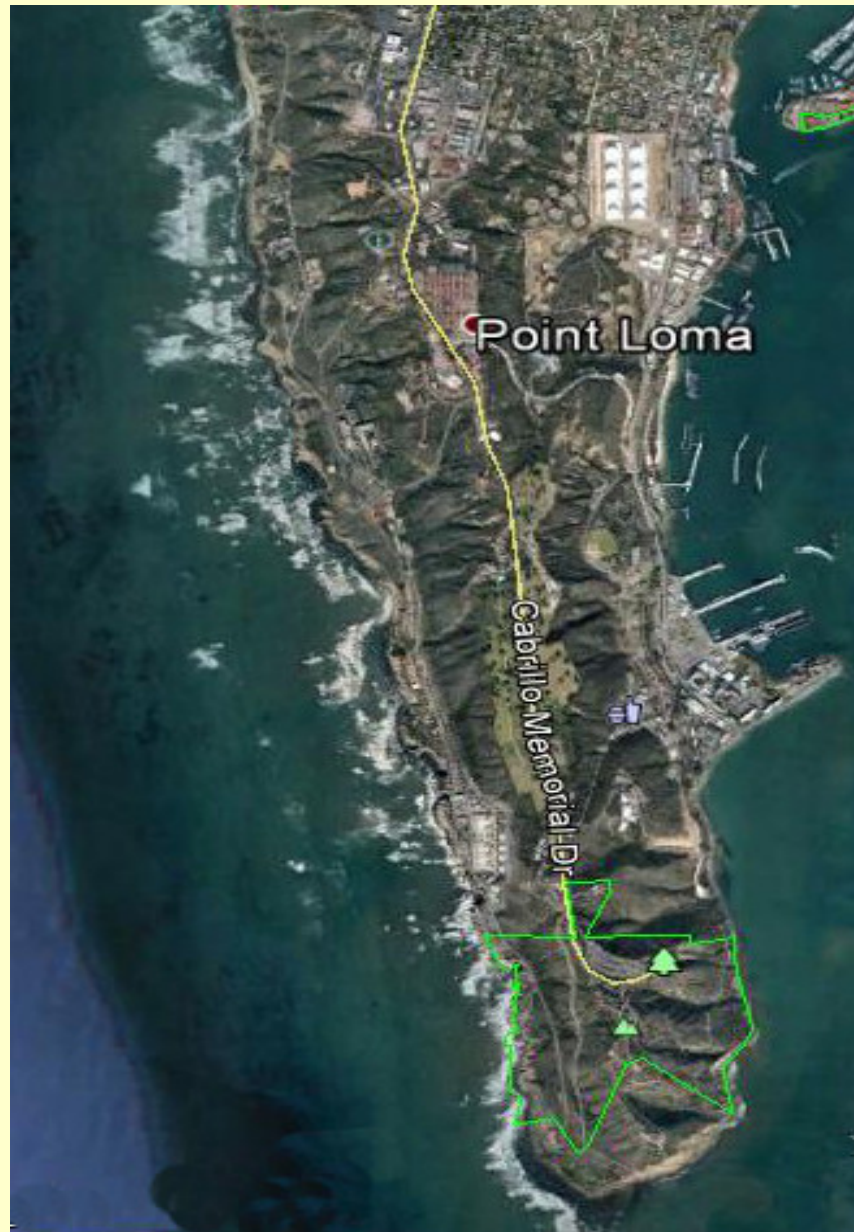
## Recent history of *Chorizanthe orcuttiana*

- Assumed extinct for several years
- Rediscovered in Encinitas in 1991
- Populations at Naval Base Point Loma discovered in 1997, 1999, and 2003
- Rediscovered in the extension area of Torrey Pines State Reserve in 2008



# Naval Base Point Loma (NBPL)

- Four mile peninsula at the entrance to San Diego Bay
- Land ownership includes:
  - City of San Diego
  - National Park Service  
Cabrillo National Monument
  - Military
    - Department of Veteran's Affairs
    - U.S. Coast Guard
    - U.S. Navy
    - Multiple commands



# Habitat Enhancement

## Non-Native Removal



## Erosion Control Installation



## Native Planting



**Discovery and restoration of sites has increased habitat from approximately 1.6 acres in 1998 to approximately 3.7 acres in 2011**

# West Slope South before and after restoration



# West Slope North before and after restoration





# West Slope North before and after iceplant removal



# West Slope North before and after acacia removal

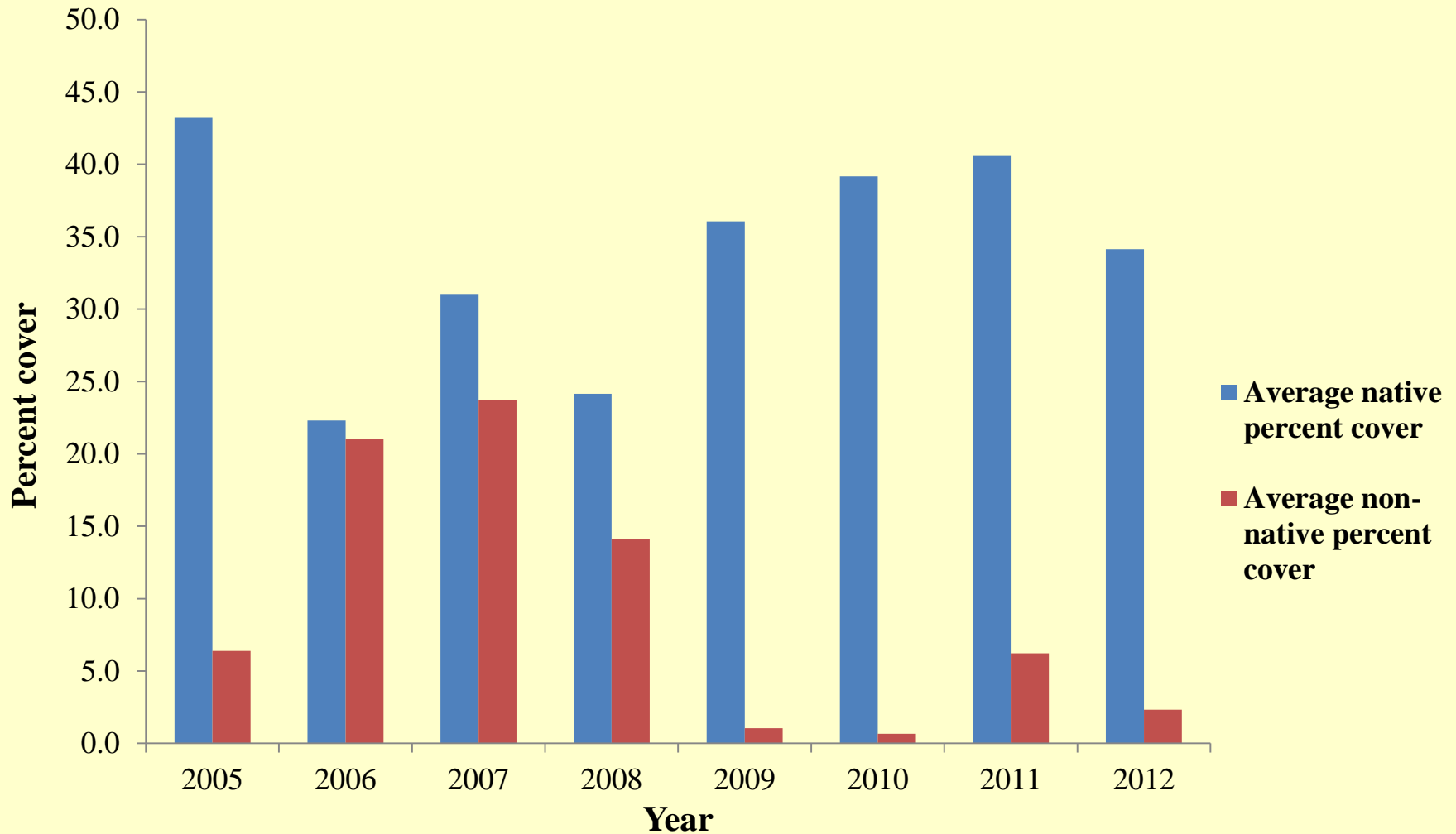


# Monitoring

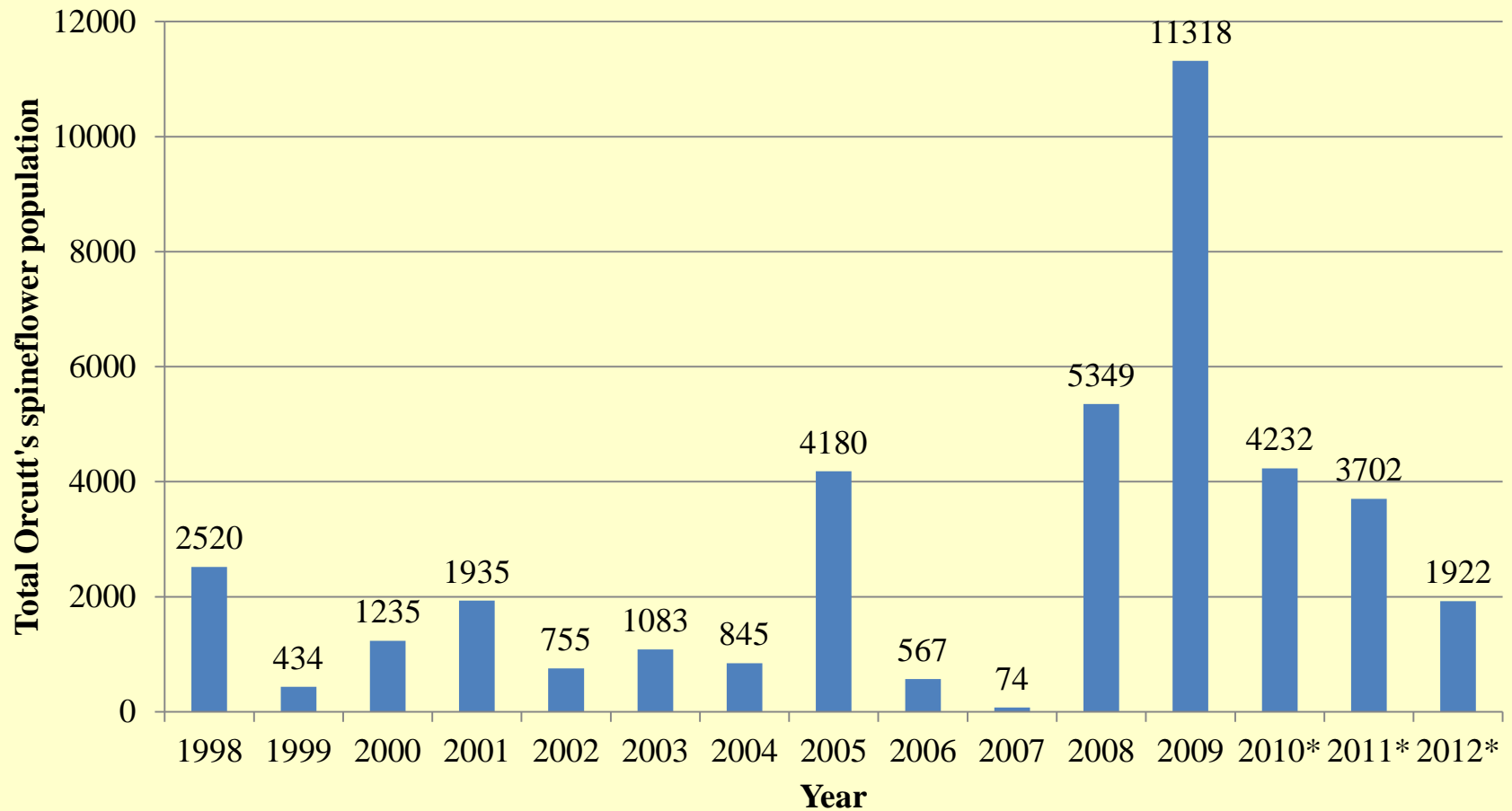
- *Chorizanthe orcuttiana* population monitoring
- Vegetation monitoring of enhancement sites
  - Native and non-native percent cover
  - Ground cover (bare, litter, herbaceous)
  - Species richness
- Erosion monitoring
- Photomonitoring



# Native and non-native cover

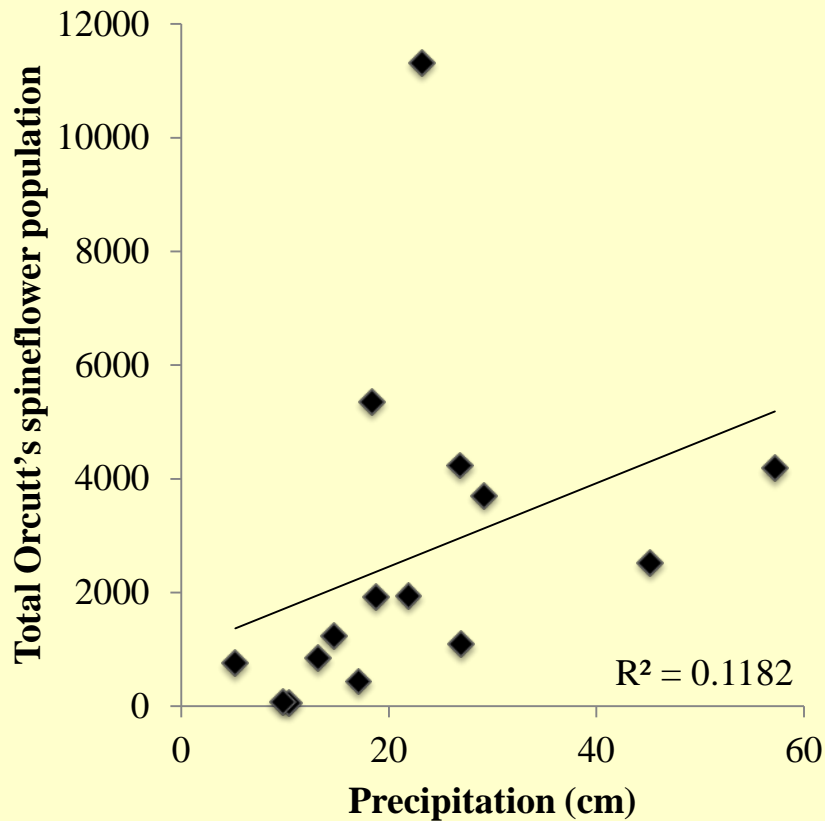


# *Chorizanthe orcuttiana* populations 1998-2012

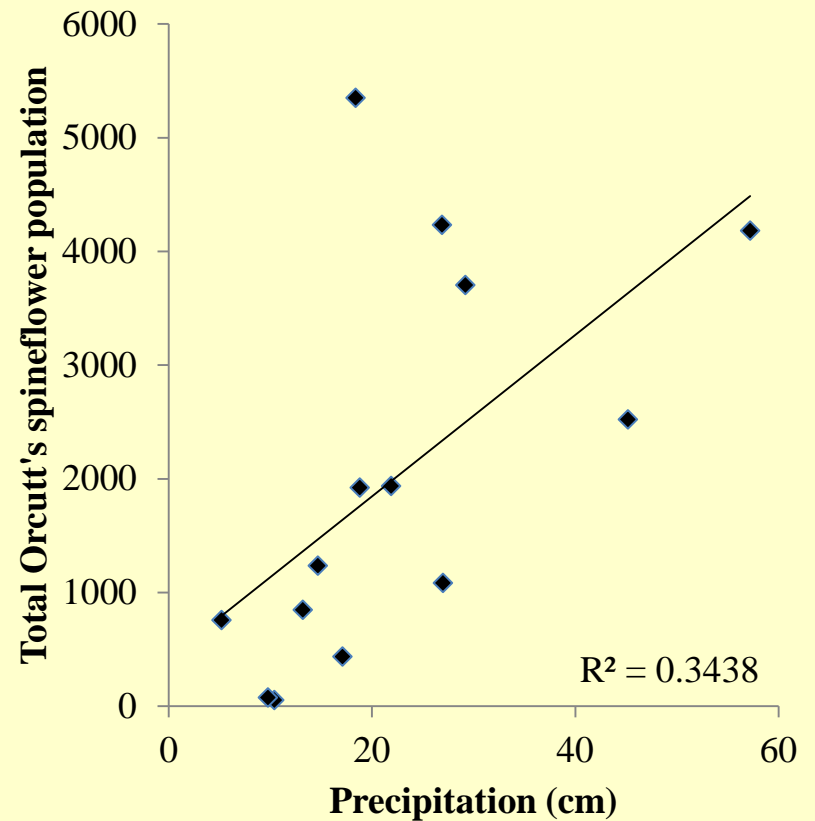


# *Chorizanthe orcuttiana* population vs. rainfall

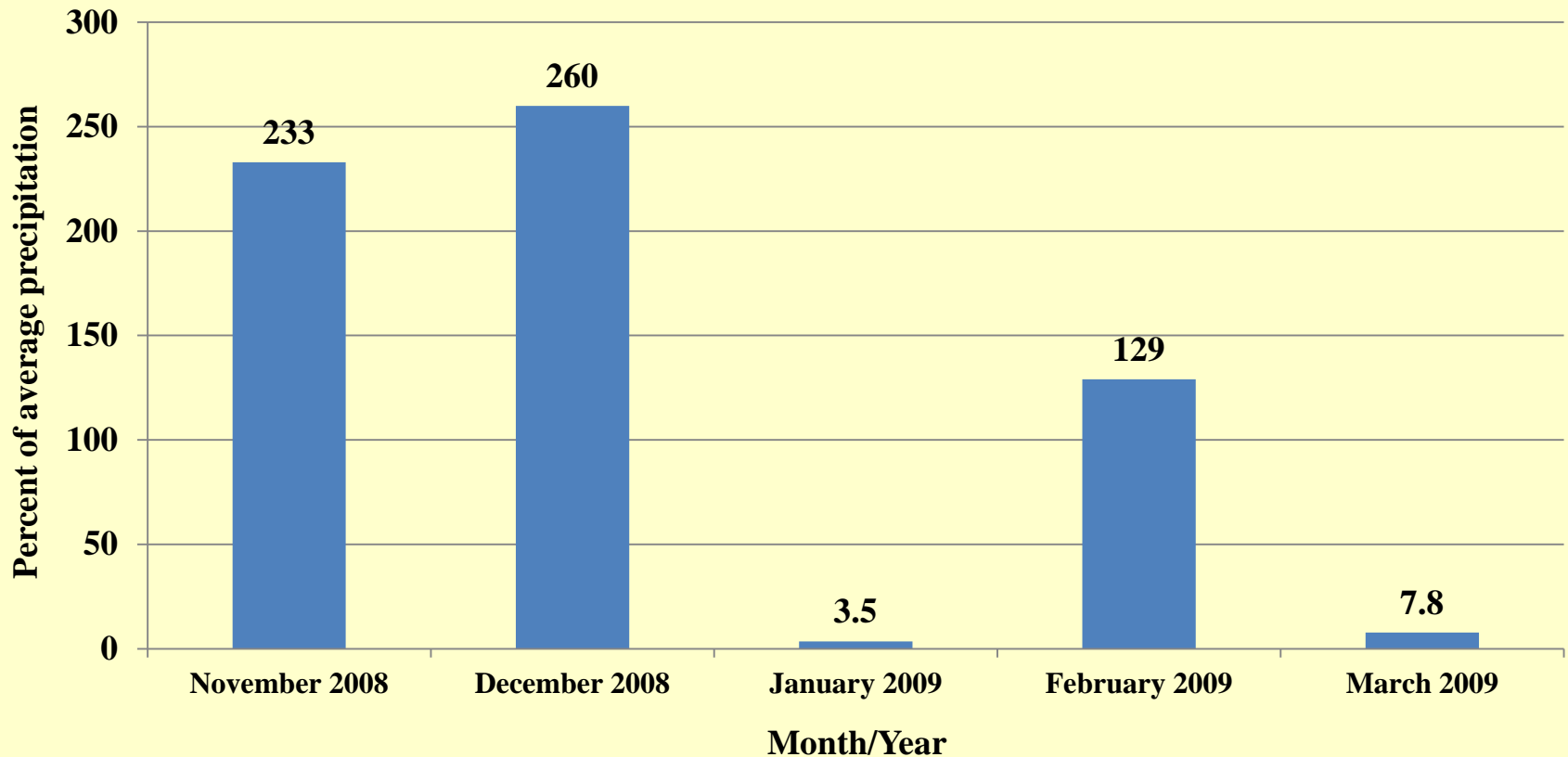
1998-2012



Removing 2009 outlier



# What happened in winter 2008/2009?



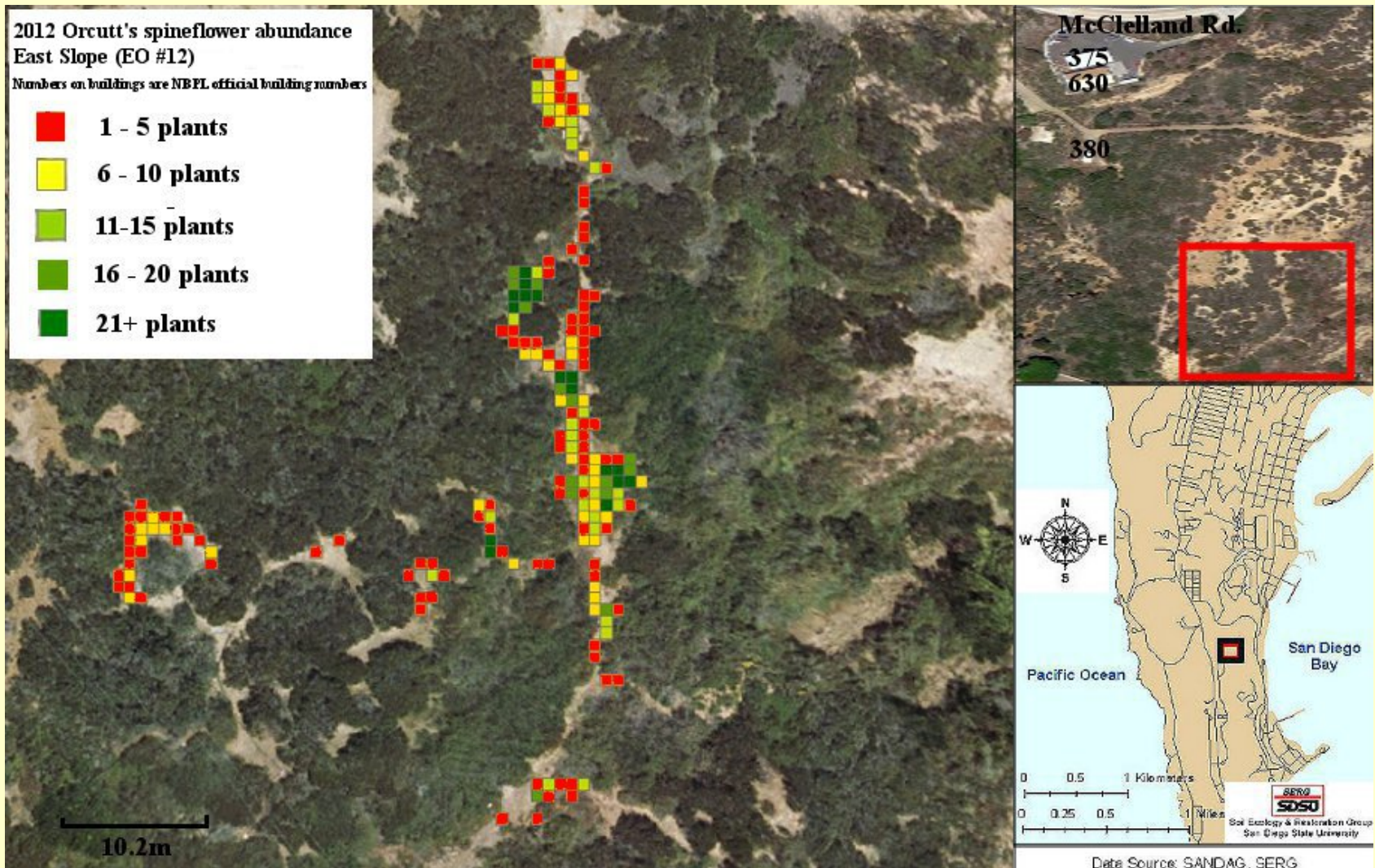
Amount of rainfall is very important, but timing and temperature are also key!

# Recent research

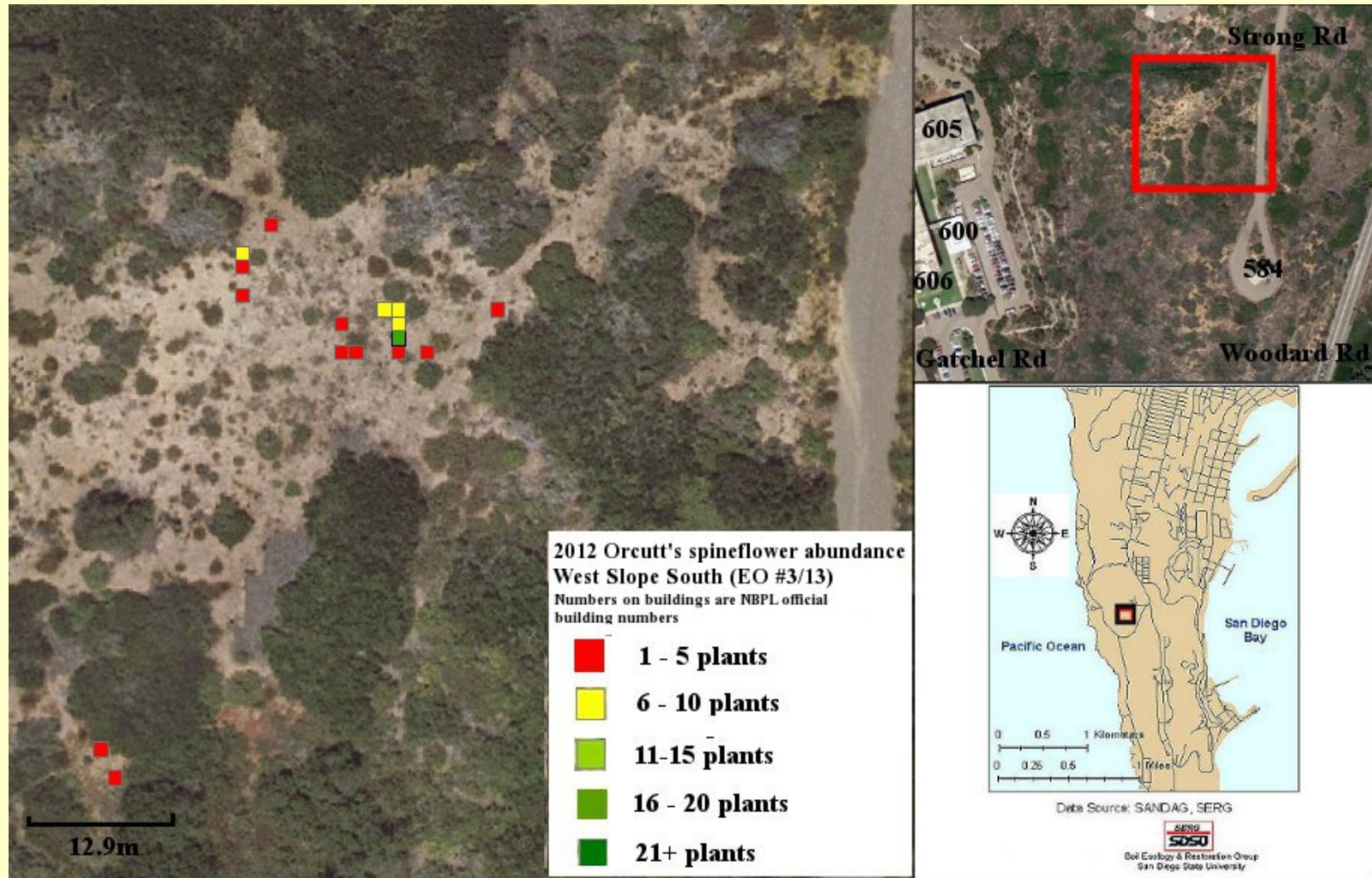
- Mapping & potential expansion areas
  - Creation of grid maps for mapping populations
  - Determination of potential expansion areas
- Pollination
  - Pollinator observation and collection
  - Caging plants and determining seed viability



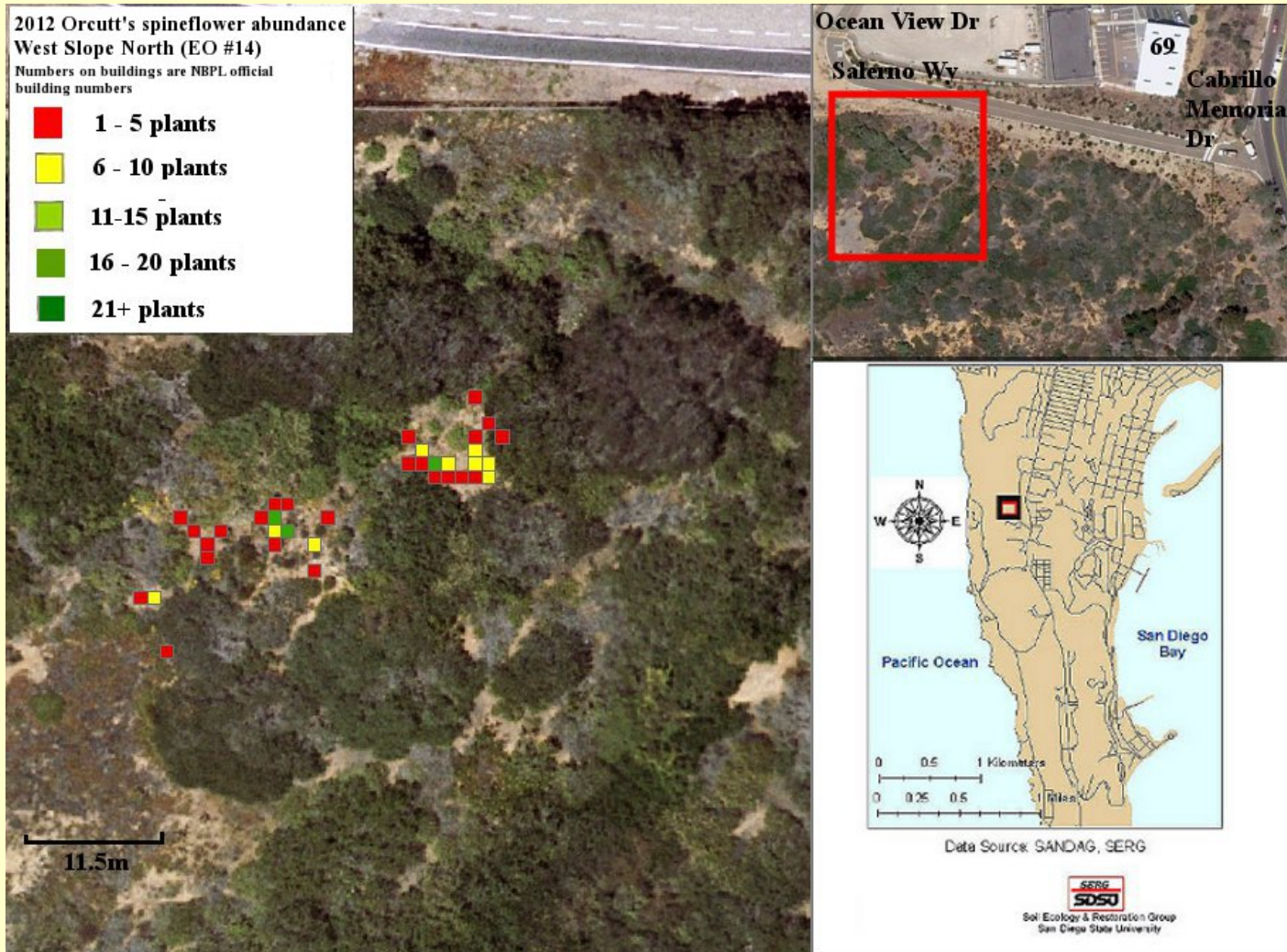
# Abundance map: East Slope 2012



# Abundance map: West Slope South 2012

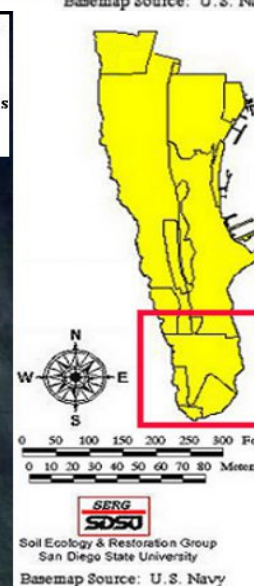
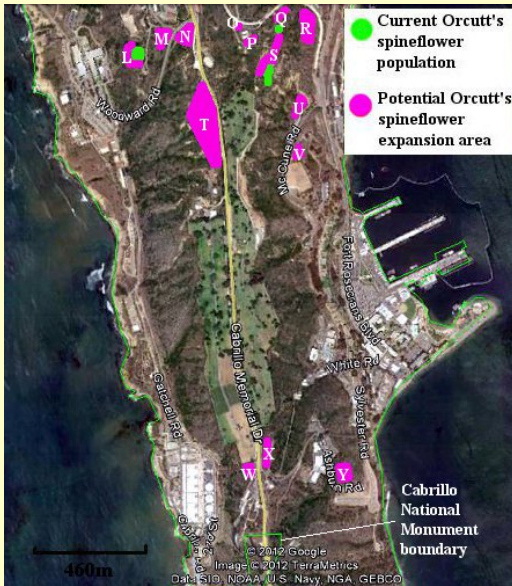
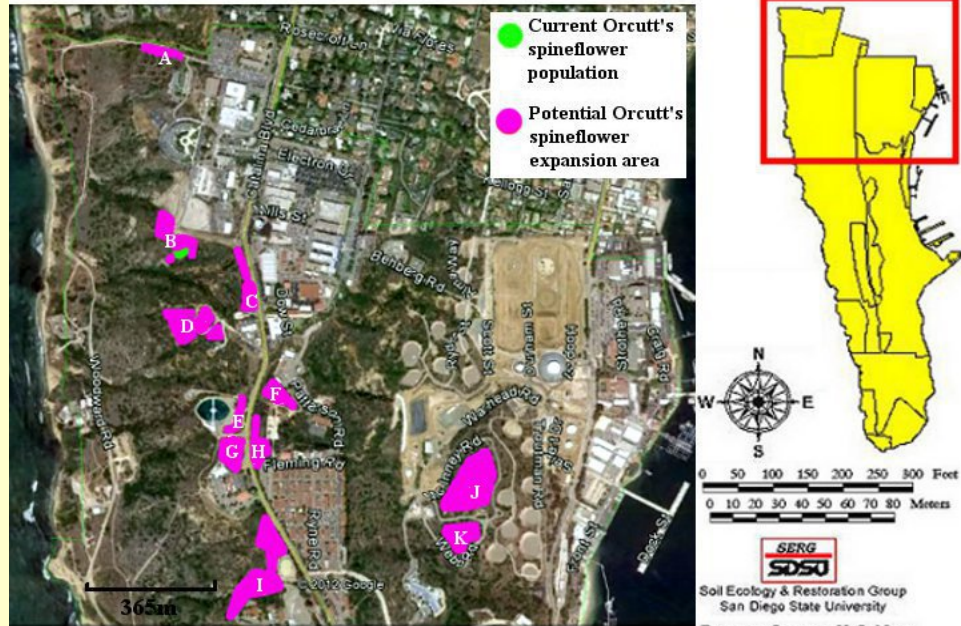


# Abundance map: West Slope North 2012



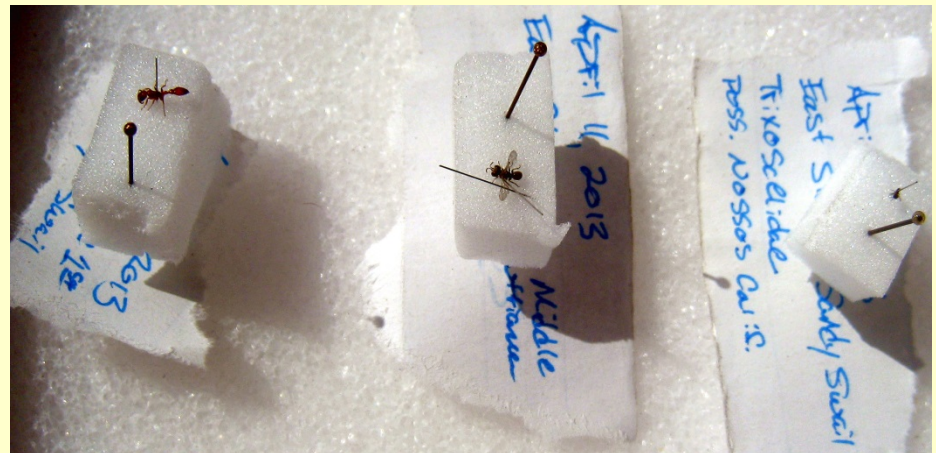
# Potential Expansion Areas

- Soil type
- Slope
- Highlighted undeveloped areas of overlap between proper soil types and slope

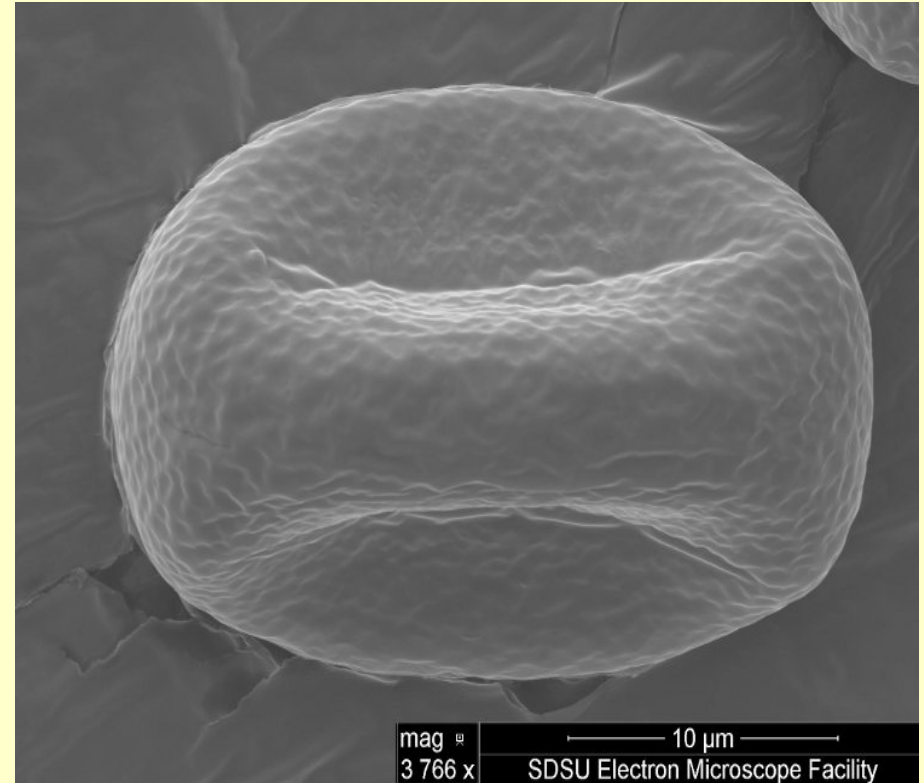
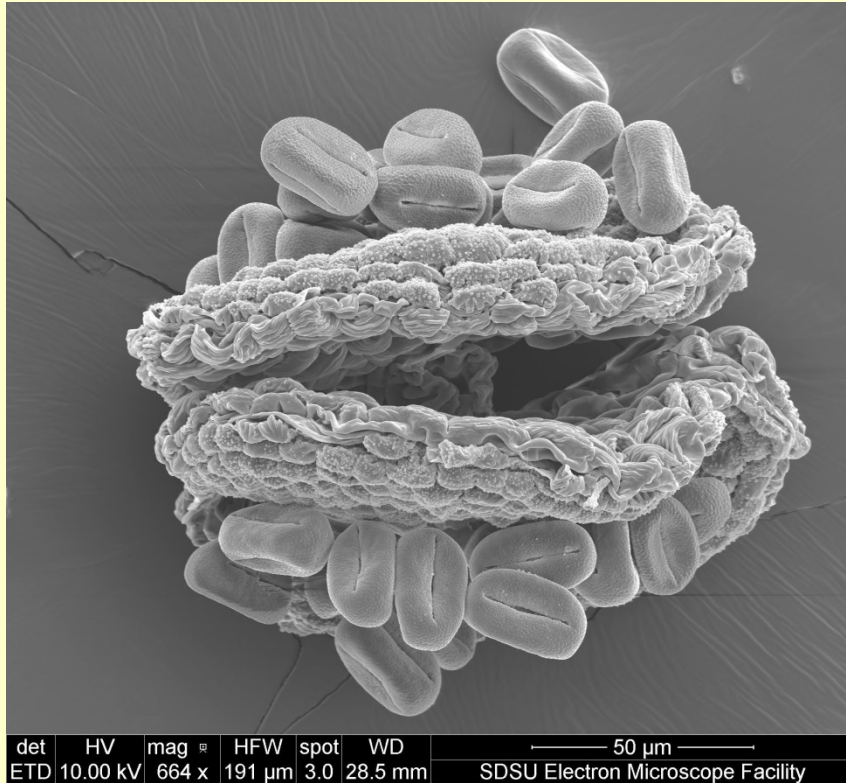


# Pollination

- **Potential pollinators**
  - **Observations**
  - **Photography**
  - **Collection & Identification**
  - **Scanning Electron Microscopy**
- **Seed viability analysis**
  - **Caged plants prior to flowering**
  - **Caged plants observed to be visited by potential pollinators**
  - **Comparison of seed viability between visited and non-visited plants**
  - **Issues & Improvements**

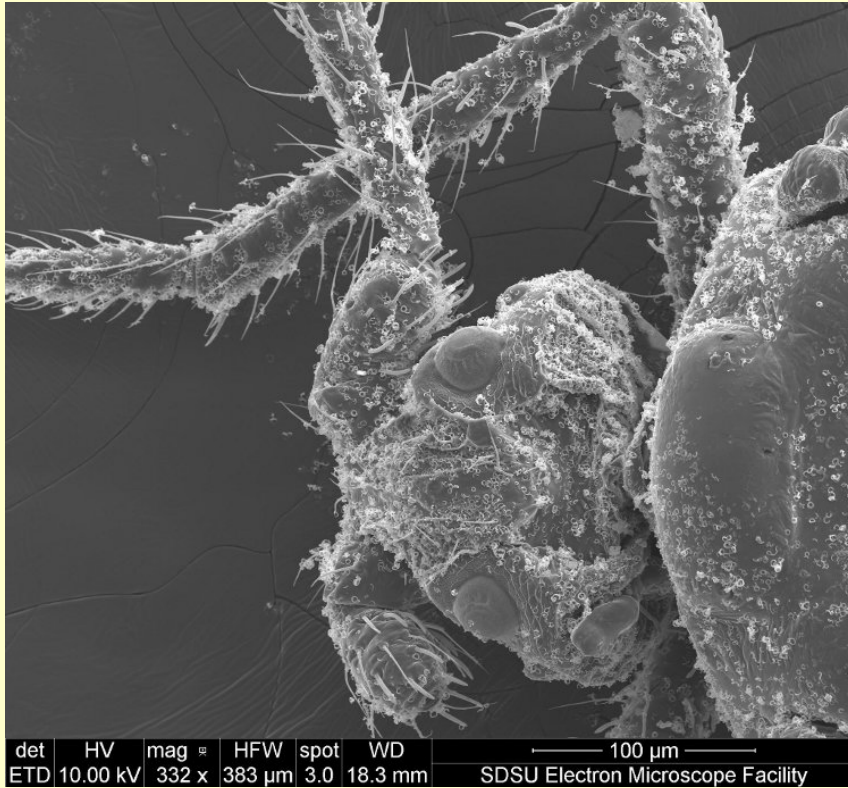


# Scanning Electron Microscopy: Pollen



- Pollen grains average 28 x 17 microns
- No specialized structures for attachment to pollinators
- Rounded shape may assist in wind-dispersal across sandy patches

# Scanning Electron Microscopy: Insects



- Insects collected had hairs of the proper size to capture pollen
- No pollen observed on insects

# Future research: short-term

- Study herbivory pressure/sources, preferably with wildlife cameras
- Improve/repeat seed viability analyses
- Visit and re-visit best potential expansion sites, particularly areas adjacent to current populations
- Simplify the vegetation monitoring protocol (exception for West Slope North, which is the most recently-cleared of non-natives and is still recovering)
- Modify *Chorizanthe orcuttiana* population monitoring protocol: (add more abundance classes or return to doing complete census)



# Future research: long-term

- Germination trials
- Propagation
- Outplanting
- Will require substantial, multi-agency efforts for proper permitting

# Acknowledgements

- This work was funded by the Department of the Navy on behalf of the Naval Base Point Loma
- U.S. Fish and Wildlife Service
- Cabrillo National Monument
- San Diego State University Research Foundation
- Soil Ecology and Restoration Group