

Salt Marsh Vegetation Lessons Learned and Adaptive Management



San Dieguito Wetlands
March 2016

- Vegetation development is critically important to the ability of the San Dieguito Wetlands Restoration Project to meet the requirements for successful mitigation.
- As a result, we would like to review some lessons learned from the performance monitoring and opportunities for adaptive management as it pertains to vegetation development in the restoration project.

Salt Marsh Vegetation - Cordgrass Lessons Learned



**San Dieguito Wetlands
March 2015**

- Taking a look at lessons learned from the performance monitoring of cordgrass.
- Cordgrass is important nesting habitat for the Federally listed endangered Ridgeway's Rail formerly known as the Light-footed Clapper Rail.

Planting Locations of Cordgrass in San Dieguito Wetlands

+ Cordgrass planted November 2008, April 2009, November 2011



- Cordgrass, about 20,000 plants, were planted widely throughout the restoration site with the latest and largest planting in November 2011.
- This slide shows planting locations, indicated by the yellow crosses in the portion of the wetland on the east side of freeway where most of the planting occurred.

Distribution of Cordgrass in San Dieguito Wetlands

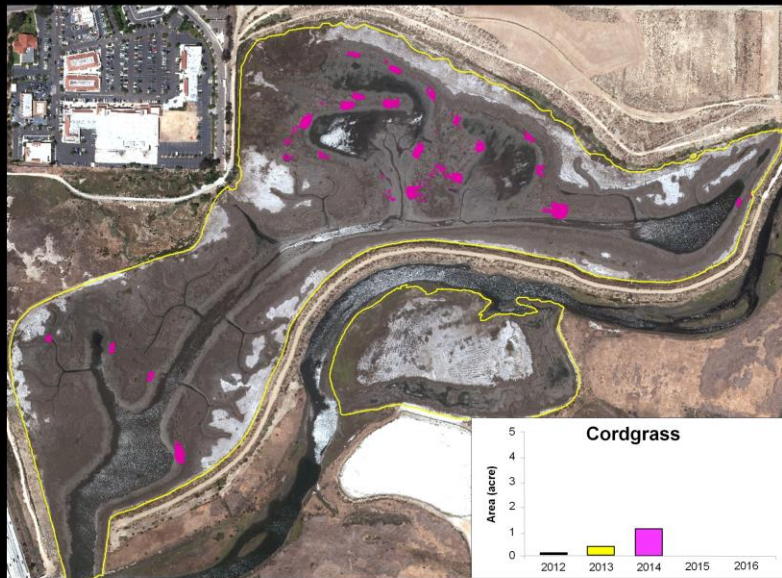
■ Cordgrass patches 2013



- For the first couple of years following planting, cordgrass performed poorly.
- You can see the distribution and size of cordgrass patches that became established, scattered in the portion of the restoration site on the east side of the freeway in 2013.
- The total area of cordgrass in 2013 was less than 0.5 acre 2 years after the last planting.


Distribution of Cordgrass in San Dieguito Wetlands

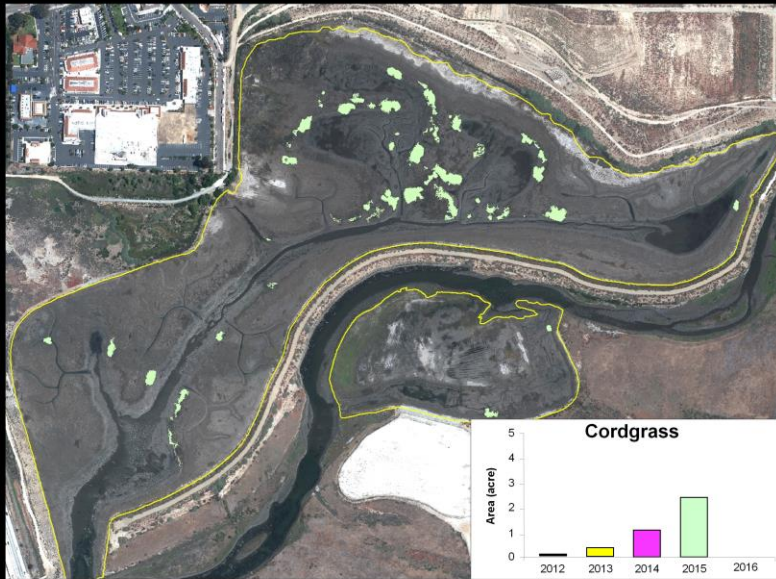
■ Cordgrass patches 2014



- However, cordgrass establishment become more promising in 2014.
- This shows that the distribution and size of cordgrass patches had expanded in 2014 to encompass about 1.2 acres for the restored site.

Distribution of Cordgrass in San Dieguito Wetlands

 Cordgrass patches 2015

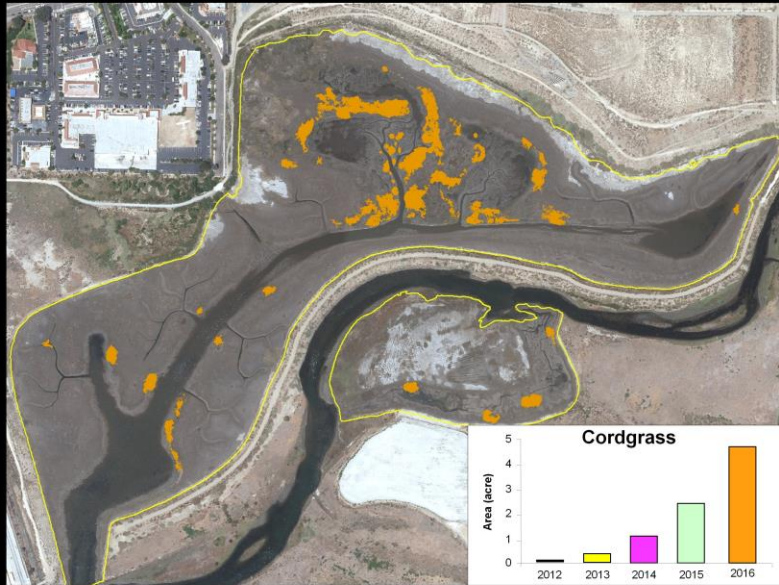


- The area of cordgrass continued to expand and encompassed about 2.5 acres for the restored site in 2015 .

Distribution of Cordgrass in San Dieguito Wetlands

+ Planted cordgrass

■ Cordgrass patches 2016



- Currently, monitoring this past year revealed that the area of cordgrass is nearly 5 acres for the restored site.
- It's currently expanding into area that was planned mudflat in the Final Restoration Plan.
- Although there was initial concern that the plantings might not lead to cordgrass establishment, and we were worried about rabbit and insect grazing, one lesson learned is that may take time, > 2-3 years for it to become visibly established following planting.

Distribution of Cordgrass in San Dieguito Wetlands

+ Planted cordgrass

■ Cordgrass patches 2016



- This slide shows the location of current patches relative to the original planting sites.
- You can see that the cordgrass has spread away from the original planting sites, but that it also has recruited to a few sites that were not planted.
- This is worth noting because the natural recruitment of *Spartina* by seed is generally thought to be rare.

Distribution of Cordgrass in San Dieguito Wetlands

+ Planted cordgrass

■ Cordgrass patches 2016



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Salt Marsh Vegetation – Middle & High Marsh Lessons Learned & Adaptive Management

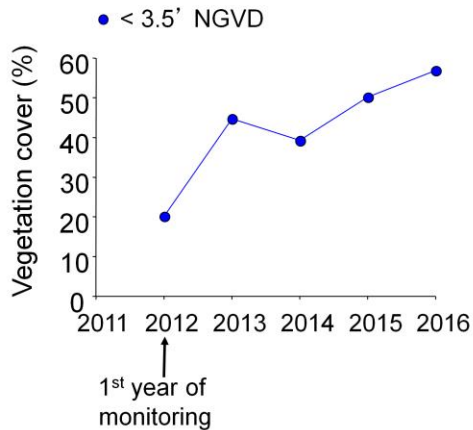


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- Moving to lessons learned and on-going adaptive management opportunities for vegetation of the middle and high marsh.

Elevation, Drainage, and Time Important to Vegetation Establishment

Vegetation cover vs. year at lower elevations

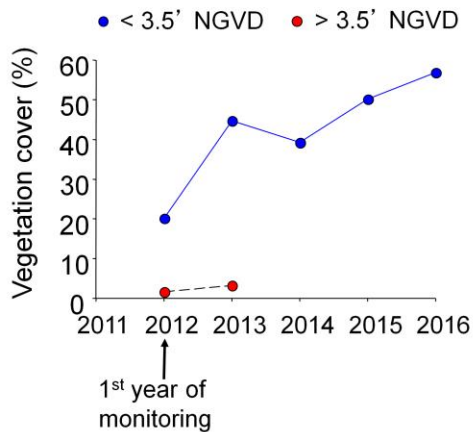


Construction grading of W2/3 low areas completed in 2008-2010

- Performance monitoring has revealed that elevation, drainage and time are important to vegetation establishment in SDW.
- Construction grading of module W2/3 on the west side of the freeway was completed in 2008 – 2010.
- Performance monitoring of the San Dieguito Wetlands Restoration Project began in 2012.
- The cover of vegetation at lower elevations of < 3.5' has increased steadily over time.
- Photo shows vegetation cover at lower elevations as it appeared in 2013.

Elevation, Drainage, and Time Important to Vegetation Establishment.

Vegetation cover vs. year at lower and higher elevations



March 2013

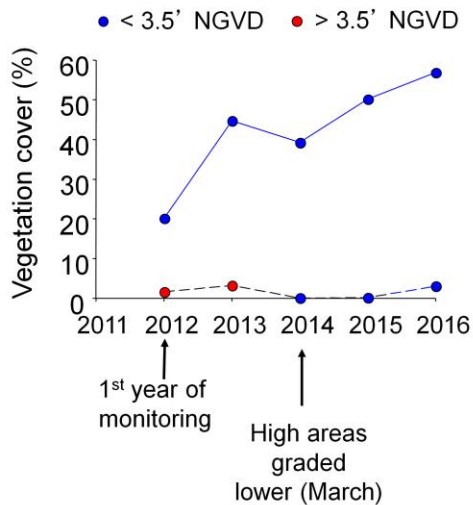


Construction grading of W2/3 low areas completed in 2008-2010

- However, vegetation was much slower to develop in the first two years of monitoring, indicated by the red dots, at elevations initially graded higher than ~3.5' and that were relatively flat.
- This area of sparse vegetation is very evident in the 2013 photograph.

Elevation, Drainage, and Time Important to Vegetation Establishment

Vegetation cover vs. year at lower and higher elevations



March 2013 (prior to re-grading)

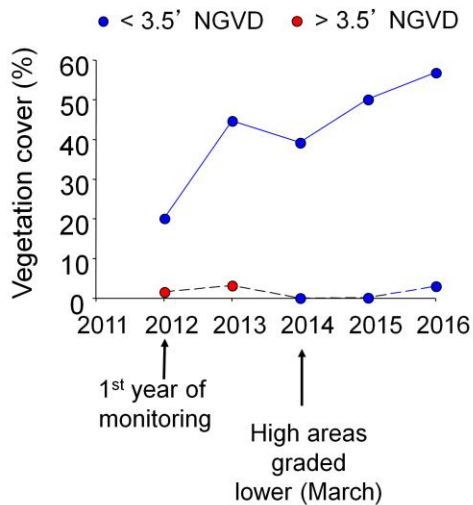


March 2016



- SCE was aware of the problem and much of the higher elevations in this module were re-graded to lower elevations, indicated by the blue dots, with more slope in March 2014.
- Some seedlings were present in 2015, and some vegetation was present in the re-graded areas in 2016, but cover generally remained sparse in 2016.

Elevation, Drainage, and Time Important to Vegetation Establishment



- Good news, vegetation is coming in as evident in the recent photo taken last month.
- So, the lesson learned here is that even after grading lower, it takes time, it will have been > 3 years for the vegetation to start filling in.
- In the foreground, you can see an area that was not re-graded, and the sparse vegetation in comparison with the 2013 photo.
- It is possible that the 4 years of drought in combination with the high elevation had a negative effect on vegetation cover at this location.

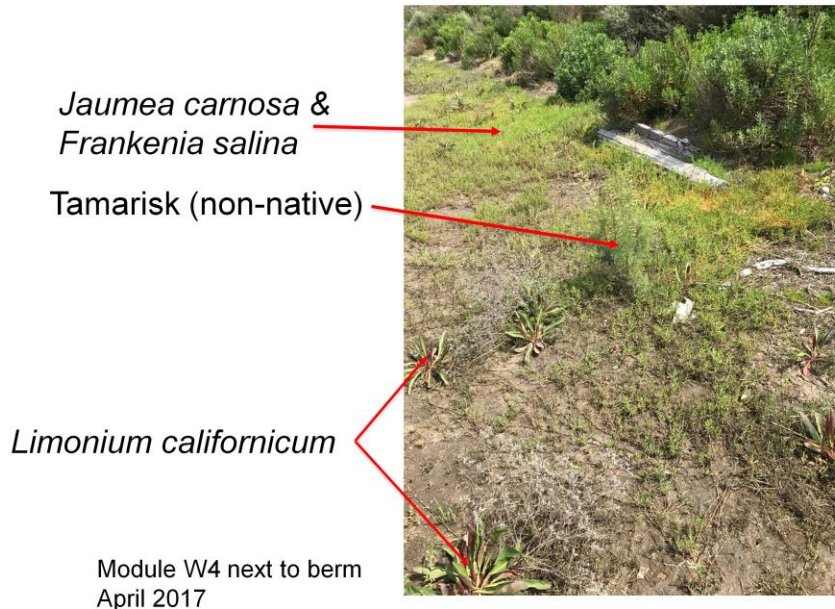
Habitat Heterogeneity and Vegetation Establishment



Vegetation cover highest in furrows created during construction

- It is interesting to point out, that smaller scale heterogeneity has influenced vegetation development, even at lower elevations.
- Not as evident from just walking around the marsh in this area.
- In this google earth image from 2016 furrows created during construction are more vegetated than adjacent areas.
- Could be that the furrows retain moisture or trap seeds.
- This is something to consider during construction or re-grading.

Recruitment of Species Other Than *Salicornia*



- Finally, plant species other than pickleweed will recruit to higher elevations in the restored site as evidenced by this photo taken next to the berm in a module on the east side of the freeway.
- Here you can see a mix of species, including the native sea lavender, *Limonium californicum*, considered regionally rare in some areas.
- Also see a tamarisk plant, an exotic species that recruited—have to be vigilant.
- The soil was moist in this photo—maybe due to local groundwater inputs.

On-going Adaptive Management - Vegetation

San Dieguito Lagoon Supplemental Planting & Monitoring Plan
San Diego County, California

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Southern California Edison

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Date:
October 25, 2016



- Adaptive management is on-going.
- To facilitate vegetation establishment at higher elevations and increase plant diversity, SCE is undertaking a planting program in areas that are sparsely vegetated.
- These plantings will likely require watering until they become established.

Summary

- Planted *Spartina* may take years following planting to increase appreciably in abundance.
- *Spartina* will spread through natural recruitment to areas not planted.
- Elevations above approximately 3.5' NGVD with poor drainage were slow to develop vegetation via natural recruitment.
- Grading to elevations < 3.5' NGVD with sloping topography will increase colonization by native pickleweed.
- Planting and watering may be required at higher elevations to achieve vegetation establishment and increase diversity.

- To summarize, planted *Spartina* may take years following planting to increase appreciably in abundance.
- *Spartina* will spread through natural recruitment to areas not planted.
- Elevations above approximately 3.5' NGVD with poor drainage were slow to develop vegetation via natural recruitment.
- Grading to elevations < 3.5' NGVD with sloping topography will increase colonization by native pickleweed.
- Planting and watering may be required at higher elevations to achieve vegetation establishment and increase diversity.

“Restoration efforts will always be based on incomplete knowledge of the physical and biological conditions and processes of emergent marshes. We are on a steep learning curve, both because restoration is a relatively new management tool and because so few attempts have been carefully studied.”

Zedler, J. B. 1996. Tidal Wetland Restoration: A Scientific Perspective and Southern California Focus.

- Thoughts from Joy Zedler’s 1996 publication on restoration of southern California wetlands that hold today.