

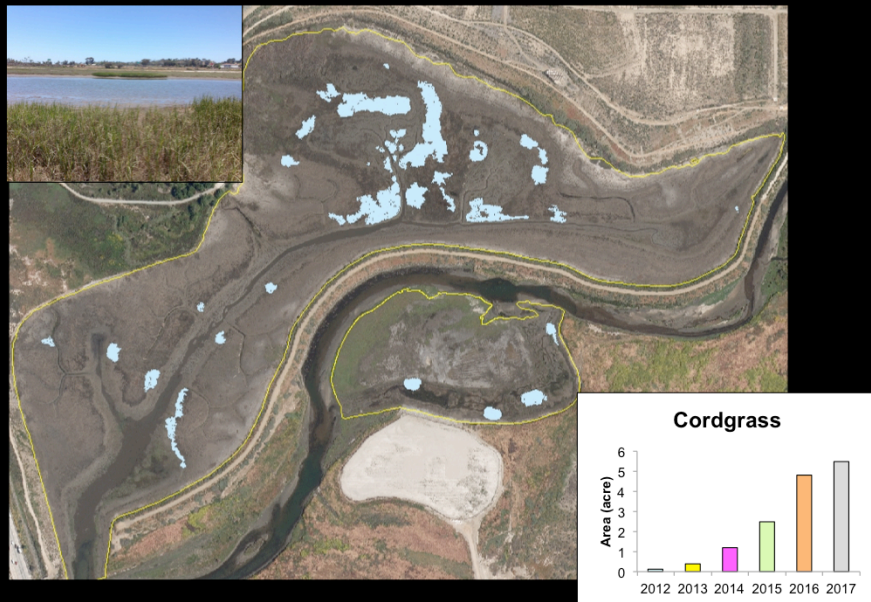
Salt Marsh Vegetation Status Update



**San Dieguito Wetlands
March 2018**

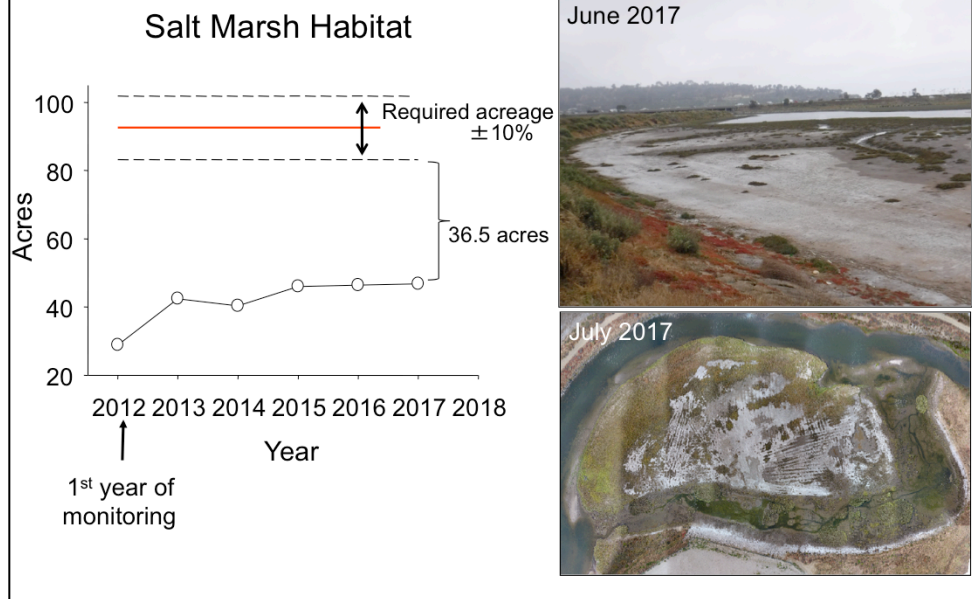
- Vegetation development is critically important to the ability of the San Dieguito Wetlands Restoration Project to meet the requirements for successful mitigation.
- In many areas of the the restoration project, such as that shown here, vegetation is becoming well established.

Distribution of Cordgrass in San Dieguito Wetlands



- This includes areas of low marsh planned for cordgrass, which has increased every year to the present.
- This slide shows the location of cordgrass patches in modules on the east side of the freeway, where most of it occurs.
- After a slow start following the last planting in 2011 and cordgrass now occupies a total of about 5.5 acres of the restored site.

Salt Marsh Habitat is Underperforming



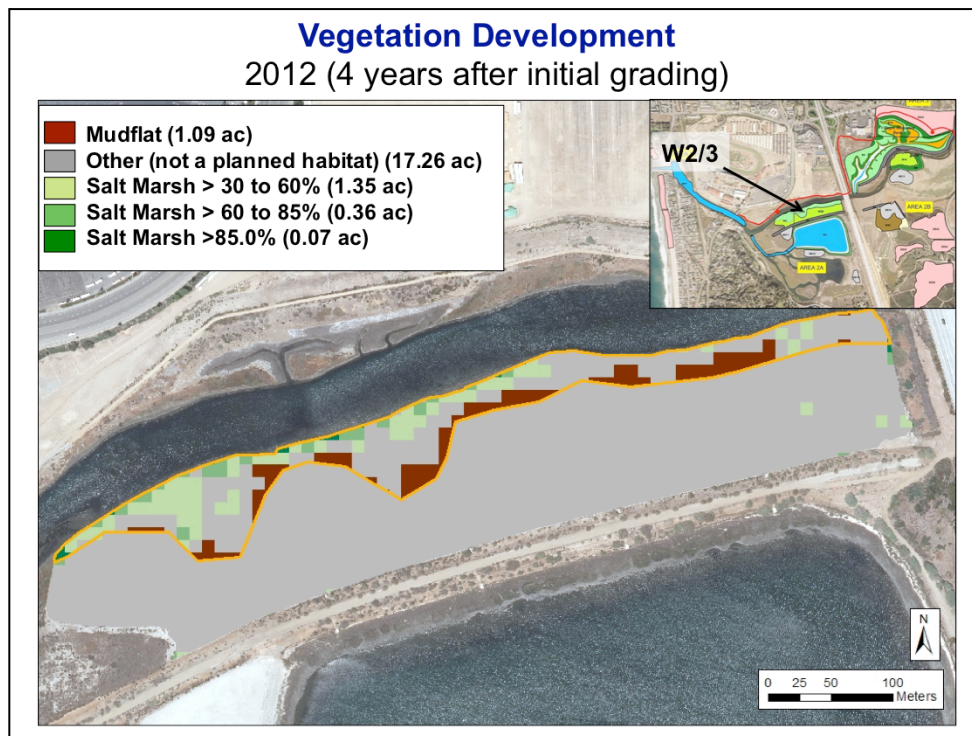
- Despite the promising development of vegetation in some areas, vegetation in other areas of the marsh have under-performed as shown in these photographs that show sparse cover of native plants, particularly at higher tidal elevations.
- As mentioned in the Performance talk, largely because of this San Dieguito Wetlands has yet to met the absolute standard for habitat areas and needs about 36.5 acres of salt marsh, at least 30% cover, to meet the minimum required acreage of this habitat.
- Again, the standard requires that habitat areas, in this case salt marsh, be within 10% of the planned acreages provided in the final Restoration Plan.
- These sparely vegetated higher elevations also tend to be flat leading to poor drainage and the accumulation of salts.

Areas of Poor Drainage

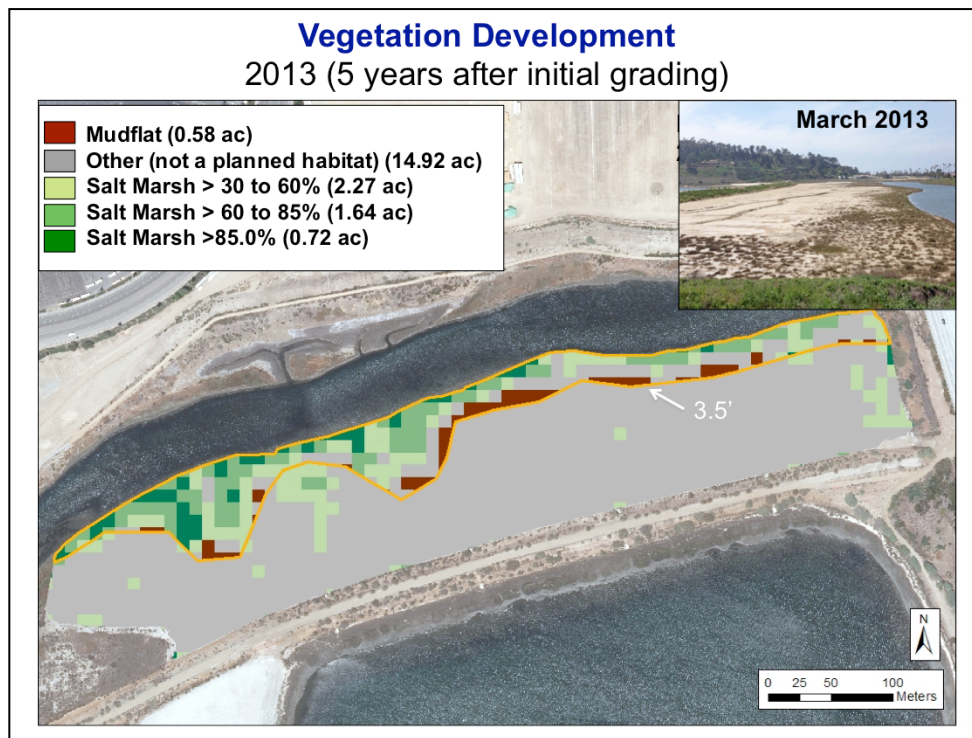


December 2017

- A small amount of acreage (~2 acres) has the opposite problem– these areas are lower in elevation, but remain ponded at low tide, which as inhibited vegetation development.

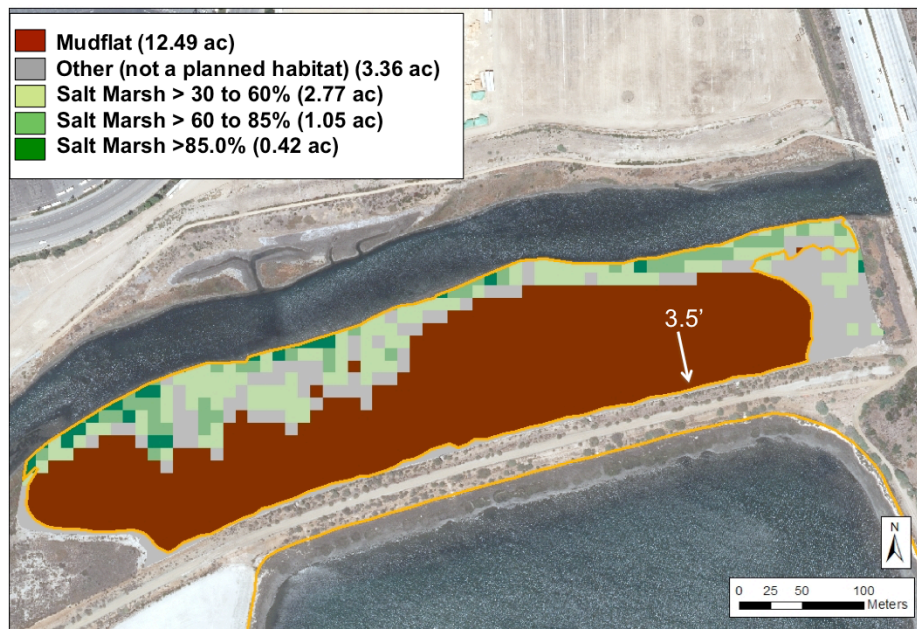


- One option to facilitate plant establishment is to lower the elevation of the marsh plain and improve drainage
- This is illustrated by the pattern of plant development in module W2, located on the west side of the freeway.
- Much of this module was originally graded relatively high and flat in 2008 and re-graded in 2010.
- This slide shows vegetation cover in areas classified as salt marsh, at least 30% cover---dark green >85% cover, green 60-85%, the lightest green is 30-60%, brown-mudflat <5% and below 3.5'.
- The gray shading indicates area that is classified as Other, not one of the planned habitats—too sparsely vegetated and/or too high.
- The 3.5' contour was located close to the river.

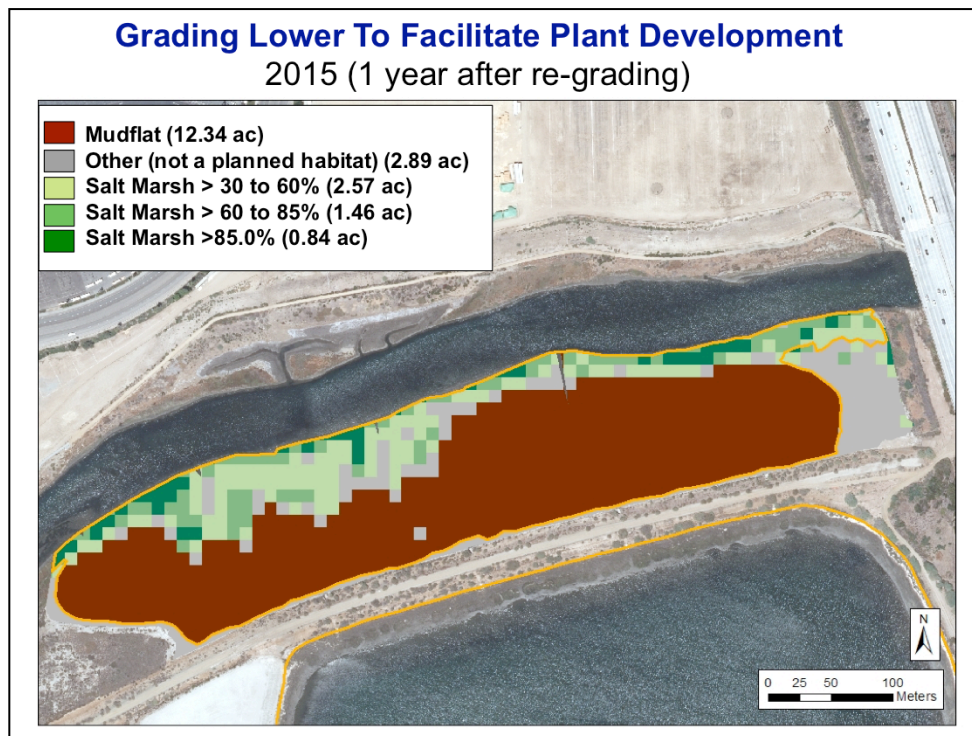


- By 2013, salt marsh had filled in more of the area below the 3.5', whereas areas higher than that remained unvegetated.
- This is clearly evident in the photo taken in March 2013.

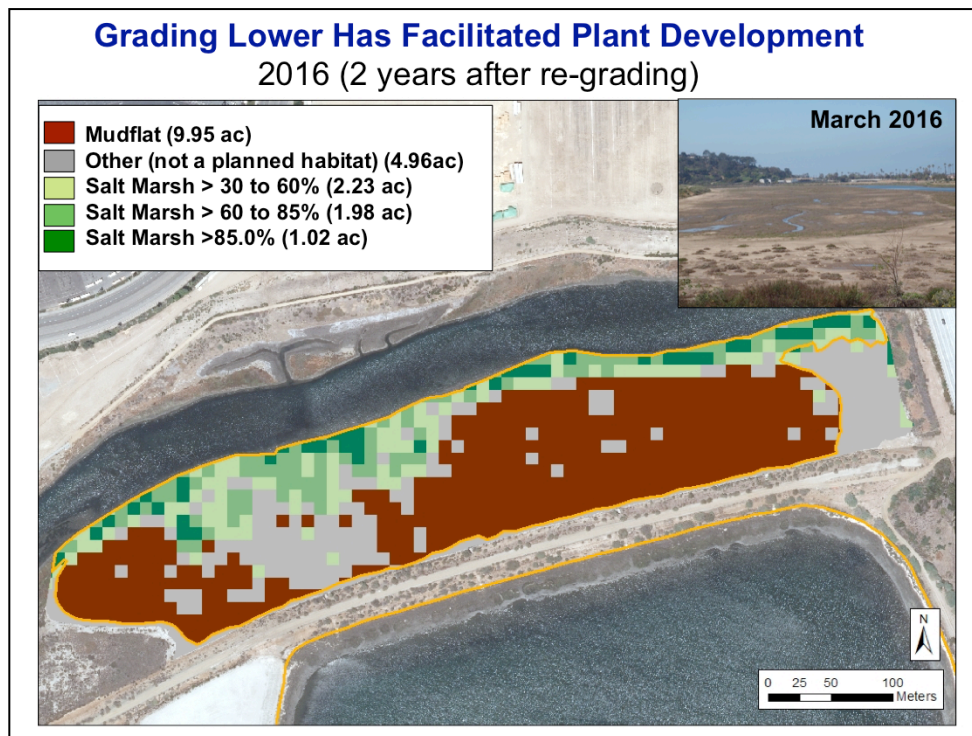
Grading Lower To Facilitate Plant Development After Re-grading 2014



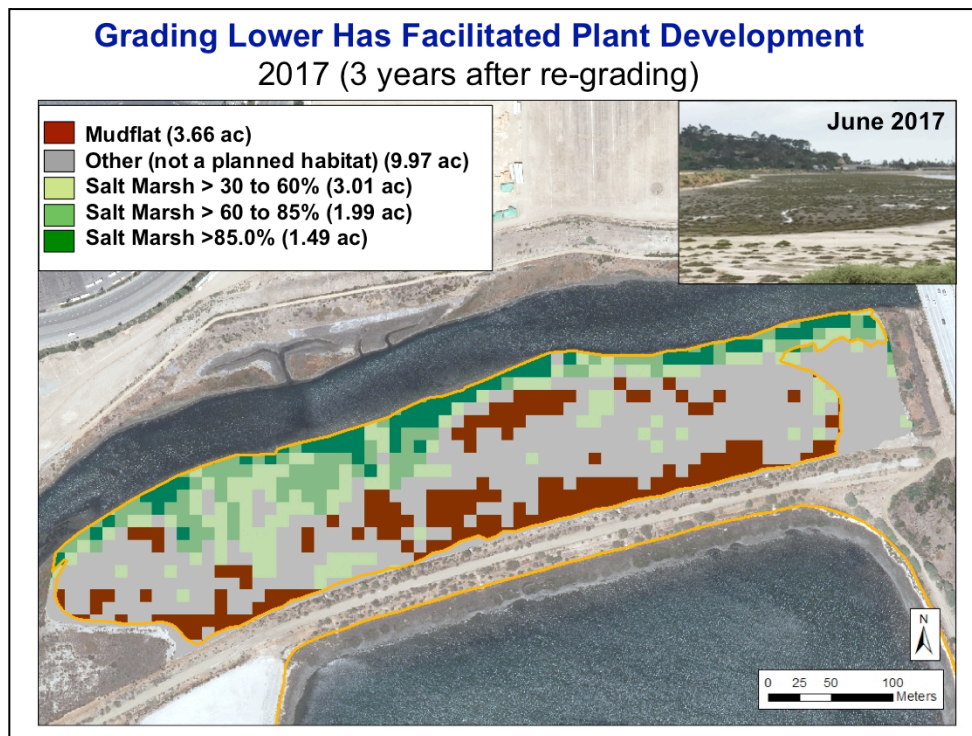
- Most of this higher area were re-graded lower in March 2014 with more slope to improve drainage.
- Since it was below 3.5' with less than 5% cover of vegetation it was classified as mudflat rather than other.
- Note the Other located at the east end of this module.



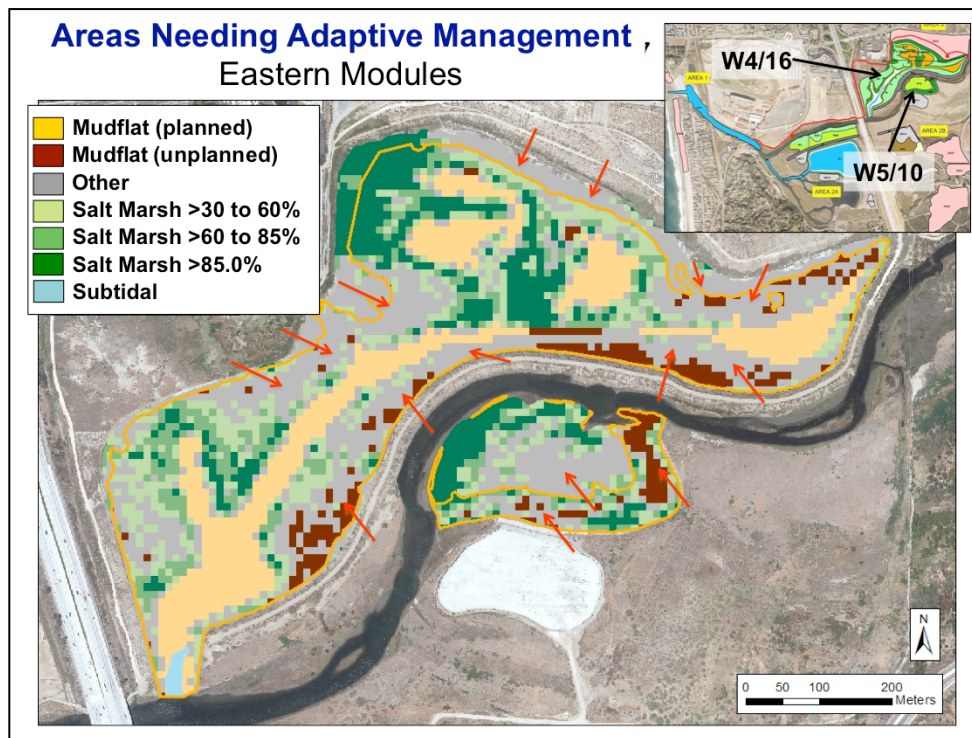
- Some recruitment of pickleweed was evident in 2015, but not visible in the aerial imagery that we use to estimate cover.



- Vegetation cover increased in 2016 such that some re-graded areas were classified as Other, areas that had from 5-30% cover.
- Salt marsh continued to fill in the lower elevations in 2016, evident in the photo in the upper right.
- The area in the foreground in the photo were sparsely vegetated.



- Vegetation has continued to fill in into 2017.
- It is expected that this pattern will continue throughout much of this module.
- However, the area in the foreground remained sparsely vegetated, feeling the effects of the drought, and SCE has identified that about 12 acres may need some type of adaptive management in the form of planting or irrigation to encourage vegetation establishment within a reasonable timeframe, depending on vegetation development over the next year.

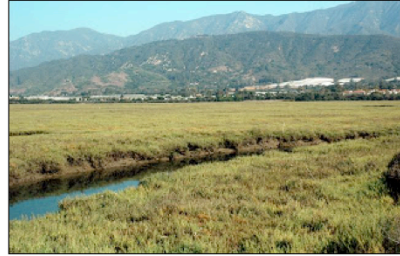


- Turning to areas that also require management--
 - There are ~14 acres in W4/16 on the east side of the freeway that require intervention to facilitate vegetation establishment: including areas along the north-east, north-west and south side of the module.
 - In addition, there are ~4 acres in this module (W5/10) that are sparsely vegetated.
- (~2 acres in W1, includes Grand Avenue)

Vegetation Cover



Mugu Lagoon



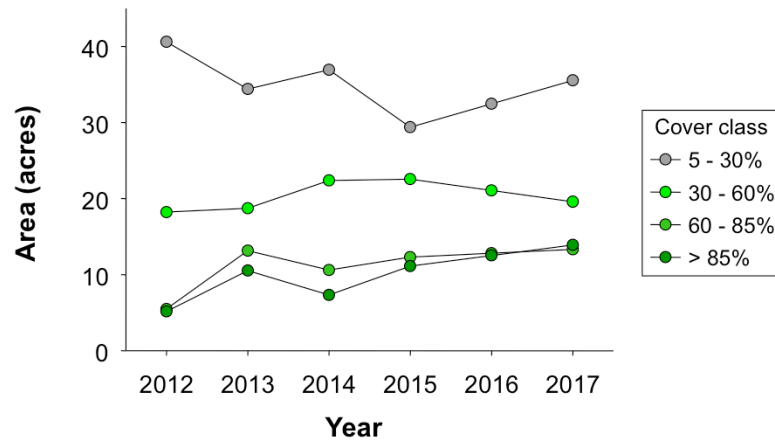
Carpinteria Salt Marsh



Tijuana Estuary

- In addition to the habitat areas standard, which is an absolute standard, vegetation cover is a relative standard that requires cover in SDW in salt marsh habitat to be similar to that of the reference wetlands.
- Vegetation cover is high in natural wetlands, illustrated here for the reference wetlands, Mugu Lagoon, Carpinteria Salt Marsh, and Tijuana Estuary.

Vegetation Cover in San Dieguito Wetlands



- This figure shows the progress of SDW vegetation by cover classes, 5-30%, 30-60%, 60-85%, and >85%.
- The goal is to achieve not only a minimum of 83.3 acres of salt marsh habitat, but a high cover of vegetation similar to the reference wetlands.
- At present, the increase in cover in the higher classes is very shallow, with only ~13 acres of 85% cover, much of this is due to a high cover of vegetation around the basin, and Spartina growth in W16 on the east side of the freeway.

SCE's Adaptive Management Program



Proposed adaptive measures:

- **Soil ripping and amendments**
- **Planting & irrigation**
- **Channel modification**
- **Spot grading**

- Moving forward, SCE is implementing an adaptive management program to try and get vegetation established in areas that are performing poorly.
- In total , SCE proposes to implement a planting program in a little over 32.3 acres, a minimum of 36.5 is required to meet the habitat areas standard.
- Currently have 46.8 acres salt marsh; need to get to 83.3 acres
- At present, this plan is or will involve:
 - Soil ripping and amendments to reduce soil compaction
 - Planting and irrigation to reduce soil salinity and increase moisture
 - Excavation to improve drainage in areas that are ponded at low tide.
 - Spot grading to lower elevation to increase tidal inundation and drainage
- (They believe that 12.1 acres on trajectory + 46.8 acres they have + 32.3 acres = 91.2 acres (83.3. minimum))

Approach at Higher Elevations



- To illustrate, this photo shows a sparsely vegetated area in the modules on the east side of the freeway.
- Notice the white indicative of the accumulation of salts on the sediment surface.
- Note also the white arrow as a reference point.

Approach at Higher Elevations



- SCE contractors have tilled or ripped this area to break up compacted soils and installed irrigation line.
- This area has been and will be planted with native marsh plants and irrigated until they become established.

Approach at Higher Elevations



- Other areas, some planting in bare patches and the installation of irrigation line.

Installation of Tidal Creek to Improve Drainage



June 2017



March 2018

- To address the issue of ponding, in one area SCE contractors have excavated a small tidal creek to improve drainage.
- This slide shows this area before and after construction of the small creek.

Considerations in Adaptive Management

Plants are Successful in Some Higher Areas



- Taking a look at some considerations in adaptive management.
- There are areas located higher where vegetation is doing well, an example of which is shown here.
- One consideration is to look at areas at higher elevations that are doing well to understand why these plants are successful, whereas neighboring areas are sparse.
- In this case, notice the location of tidal creeks that likely improve inundation in this area.

Experiments to Optimize Planting Success

Understanding the factors that affect plant establishment may save money and time in the long run

Factors to consider:

- Irrigation frequency & duration
- Planting density
- Plant species
- Planting configuration & location
- Irrigation withdrawal



- Another consideration is that conducting experiments in advance of large scale planting may save money and time in the long run.
- Factors to consider in a planting program include how frequently to irrigate and for how long, planting density and plant species, planting configuration, e.g., clumped versus individually, and lower down in areas of sparse cover, and if plants become established with irrigation, how to reduce the stress associated with the withdrawal of irrigation.

Monitoring the Success of the Planting Program

CCC contract scientists will monitor the performance of the plantings to:

- Provide feedback to SCE regarding changes that may need to be made in the irrigation plan to improve plant performance.
 - Measurements of plant survival and growth, recruitment, and soil salinity & moisture within the planted and control areas every 2 months
- Determine if plantings are surviving and growing in a trajectory that will allow for the habitat areas and cover standards to be met within a reasonable amount of time.
 - Assessments of cover every 6 months

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- Assessments of cover every 6 months

Summary

- **Absolute standard for habitat areas has not yet been met.**
- **Relative standard for vegetation cover has not yet been met.**
- **Vegetation is performing well in some areas of the wetland, but underperformance in other areas has lead to a short-fall in salt marsh habitat and vegetation cover.**
- **Poorly vegetated areas are usually higher in elevation with poor drainage leading to the accumulation of salt in soils.**
- **SCE is implementing a planting and irrigation program, along with spot grading and some excavation to facilitate vegetation development.**
- **CCC contract scientists will monitor the performance of the irrigation and planting program to determine if it is meeting the goal of facilitating vegetation establishment and to suggest adaptive management measures.**

- Vegetation is performing well in some areas of the wetland, but underperformed in other areas resulting in an approximate 40 acre short-fall in salt marsh habitat.
- Absolute standard for habitat areas has not yet been met.
- Performance monitoring has revealed poorly vegetated areas are often higher in elevation with poor drainage leading to the accumulation of salt in soils.
- SCE is implementing a planting and irrigation program, along with spot grading and some tidal creek excavation to facilitated vegetation development.
- CCC contract scientists will monitor the performance of the irrigation and planting program to determine if it is meeting the goal of facilitating vegetation establishment.