TRANSITIONAL PLANT COMMUNITY RESTORATION AROUND POND A6

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Summary

The Santa Clara Valley Water District's (SCVWD) Healthy Creeks and Ecosystems' Environmental Enhancement Grant Program funded the planning and implementation of estuarine-terrestrial transitional plant community restoration at former salt pond A6. Pond A6 was restored to tidal action by the South Bay Salt Pond Restoration Project in December 2010, and in the fall of 2011 we seeded approximately 13 acres of the remaining levees with 28 species of native plants historically found at the Bay's margin (table below). Aerial hydroseeding (AeroTech Inc.) was used due to a lack of ground access, and NASA donated the use of Moffett Field.

After one rain in late October 2011 it did not rain again until mid-January of 2012. The worst drought on record, it was so severe that even the hardiest non-natives had very little success that year, and there was very little recruitment from the seed mix. So we modified our goal to how the methods could perform in the year after a drought. This is valuable information because climate change models predict more such weather variability.

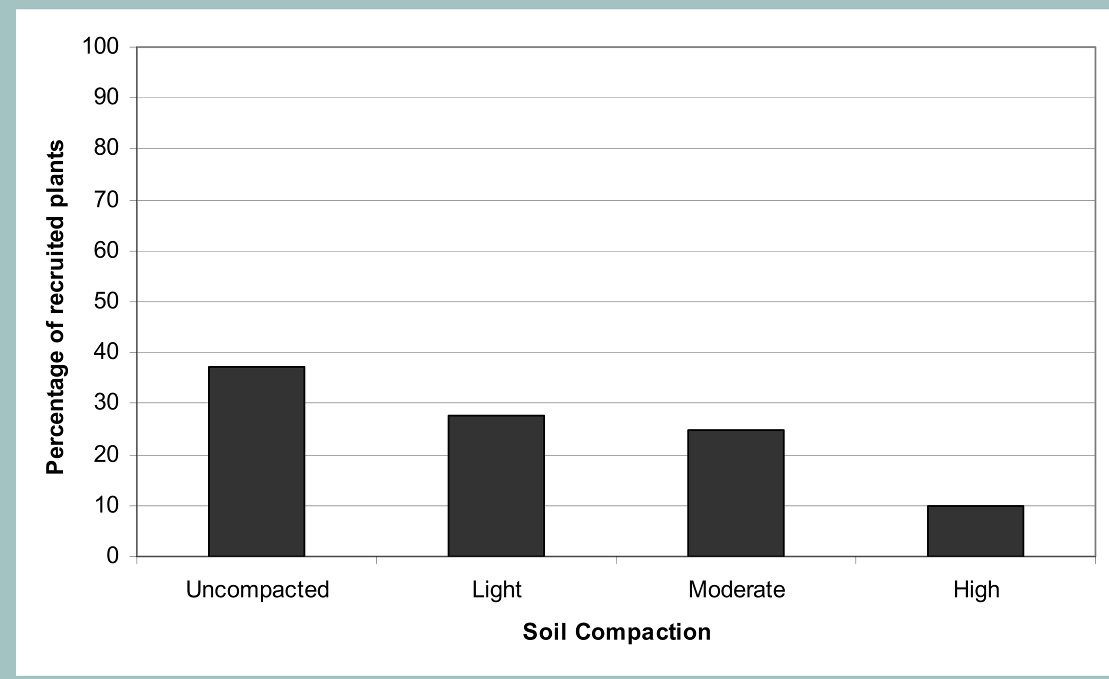
Although rainfall in year 2 (2012-13) started off well, seemingly adequate for other seeding projects implemented last fall (see Conclusions), rainfall since the beginning of the calendar year has been poor (the driest since 1874), so we cannot say if the results this year are indicative of a second year after a drought. Our monitoring this year showed some recruitment from seed, but not enough to meet our revised project goal, perhaps due to this year's drought. So we focused on characterizing the conditions where recruitment occurred to inform the restoration methods and improve their performance.

Table: Species Palette (seed mix)

Species	Name
Achillea millefolium	common yarrow
Ambrosia psilostachya	western ragweed
Amsinckia menziesii	common fiddleneck
Artemisia californica	California sagebrush
Aster chilensis	Pacific aster
Bromus maritimus	seaside brome
Calandrinia ciliata	red maids
Centromadia pungens	common spikeweed
Distichlis spicata	saltgrass
Epilobium brachycarpum	annual willow herb
Eriophyllum confertiflorum	golden yarrow
Escholschzia californica	California poppy
Euthamia occidentalis	Western goldenrod
Frankenia salina	alkali heath
Grindelia stricta	marsh gumplant
Heliotropium currasavicum	seaside heliotrope
Heterotheca grandiflora	telegraph weed
Hordeum depressum	alkali barley
Elymus triticoides	creeping wildrye
Elymus condensatus	giant wildrye
Limonium californicum	California sea lavender
Lotus purshianus	Spanish clover
Lupinus succulentus	arroyo lupine
Malvella leprosa	alkali mallow
Nasella pulchra	purple needlegrass
Phacelia californica	common phacelia
Sarcocornia pacifica	perennial pickleweed
Vulpia microstachys	annual fescue

Excessive compaction is known to inhibit establishment of plants. Although plants can establish in highly compacted soils their success will be higher in less compacted soils. Our data suggests that soil compaction may be playing a role in the seeding's success.

Figure: Proportion of recruits found in each soil compaction class



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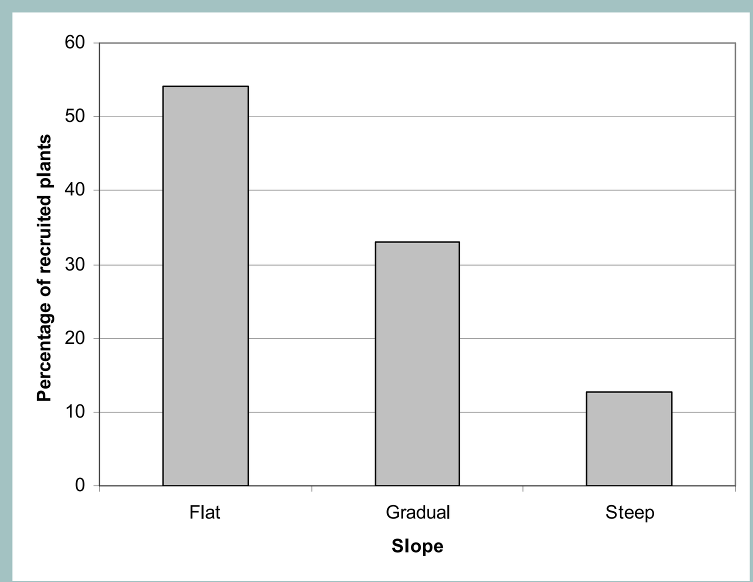
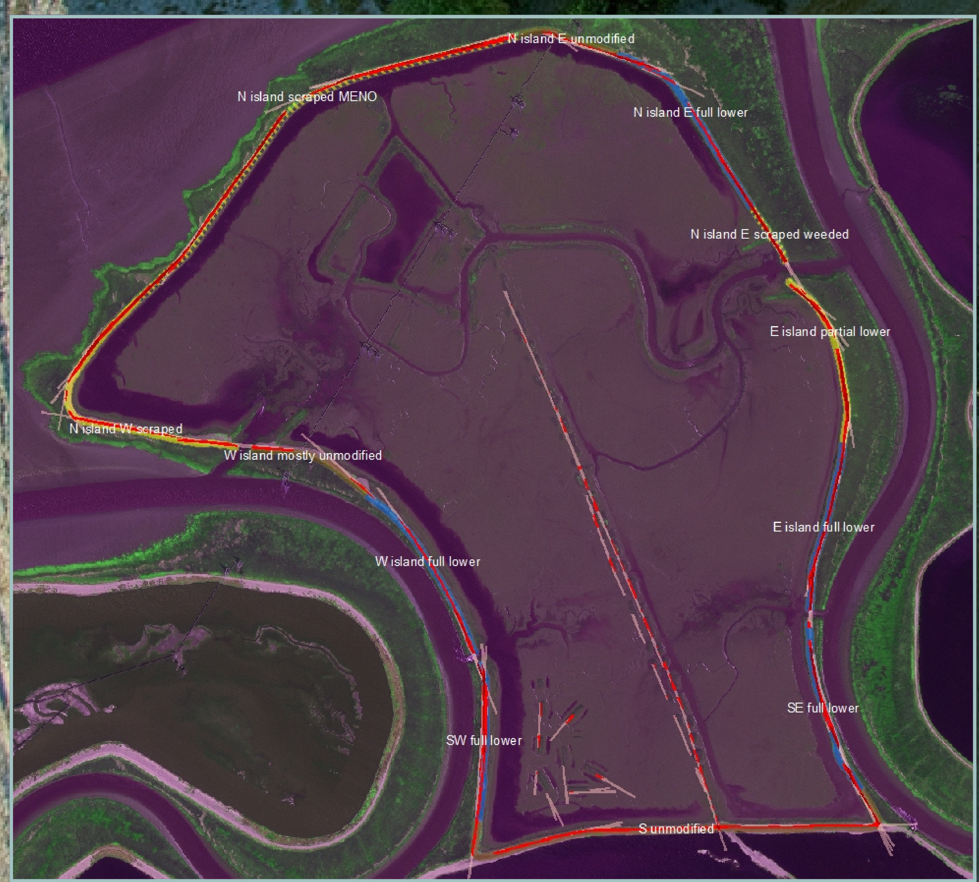
Slope alters solar aspect, influences soil moisture through altering Infiltration and retention, as well as influences the ability of seeding to stay put until germination. Our data suggests that slope influenced recruitment from our seeding.

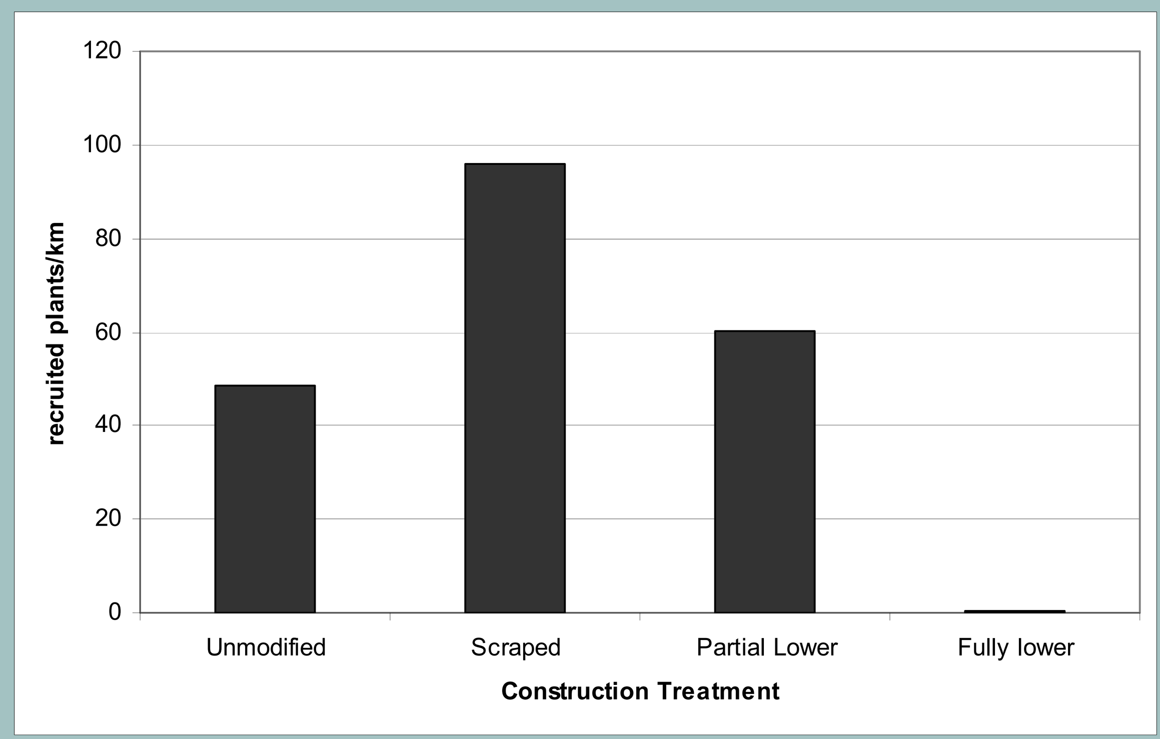
Figure: Proportion of recruits found in each slope class





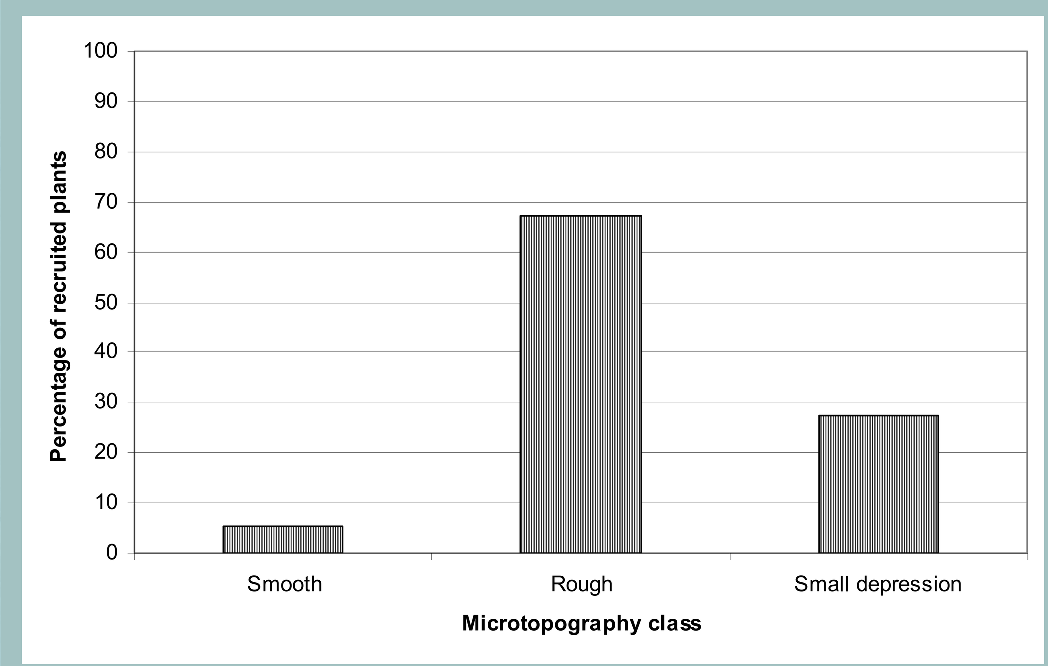
This figure shows a group of factors. Fully lower(ed) was designated as "high marsh", and Partial(ly) lower(ed) is most of the "transitional" strata, although transitions were found on the levee slopes of the Upland strata, which is shown in the "Scraped" and "Unmodified" categories below. As expected, our data suggests elevation influenced recruitment from seeding.

Figure: Proportion of recruits found in each construction treatment



Soil surface microtopography is known to influence the success of seed germination and seedling establishment. Surface roughness is known to facilitate the even infiltration of surface water, create shading or microhabitats for better seed germination and/or establishment, and may even reduce evaporative water losses that are likely significant at this site. Our data suggests that microtopography may be playing a role in the seeding's success.

Figure: Proportion of recruits found in each microtopography class



Conclusions

The creation of transitional plant communities in the estuary is an ongoing need, but continues to be a technical challenge. We do not understand these sites well enough, and in particular their soils. This project helped us clarify some issues, refine our recommendations for construction plans, and we continue to test our methods at other sites.

We did not see the quantity of recruitment in Year 2 that was seen at another site seeded in 2012 (pictured below). And we did expect to see more than was found based on the data collected (extent of persisting hydromulch, continuing presence of viable seed, and more germination in year 2 than year 1). The lack of recruitment could be influenced by the second drought year, as well as seed loses (viability, animal browse, and/or surface water).

Based on our results the primary factor that remains uncontrolled is soil chemistry. Soil samples were tested and the lab did identify some issues. However, marine sediments placed supra-tidally (i.e. subjected to oxidation) are complex chemistries. These soils are known to acidify, and their high clay content provides chemical and structural binding sites for elements that influence suitability for plant life.

Our recommendations to create future plant communities on remnant levees are as follows:

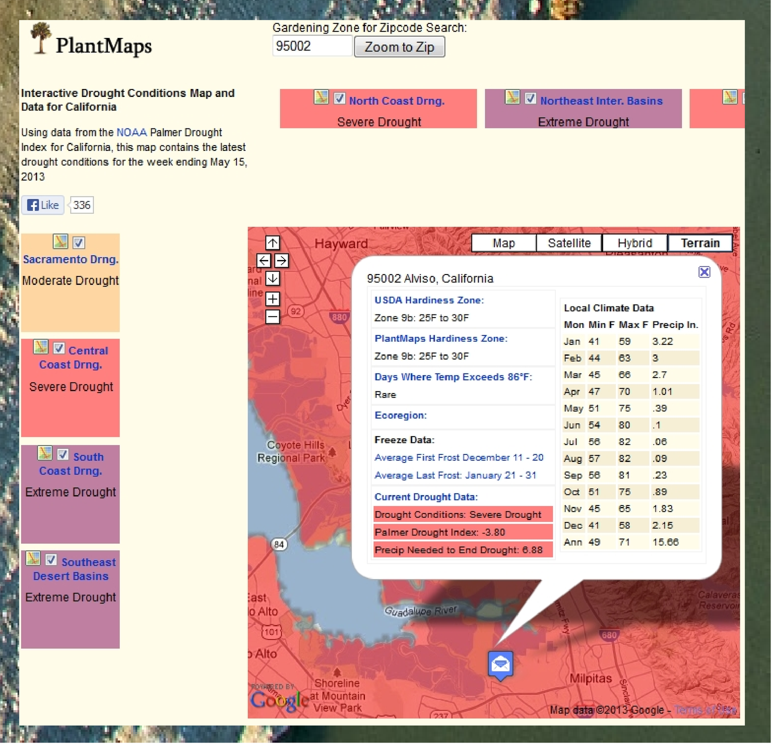
Focused research by specialized soil and plant scientists to clarify the chemistries of oxidized dredge spoils and their suitability for plant communities.

Construction specifications must include:

- not lowering levees below transition zone elevations,
- uncompacting the upper 1-3 feet of the soil surface,
- creating microtopography (roughness and small depressions) via tilling or other methods,
- reducing the slopes as much as possible through creating broad levee flanks,

Continued applied research on suitable native species, and an emphasis on the use of diversity in habitat restoration projects, so that appropriate plant species can be found regularly in the commercial seed industry.

2012 Moffett Field Seeding



Santa Clara Valley Water District

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