

Tidal Marsh Ecotone Vegetation Management Research

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And especially to all our volunteers!



Abstract

Vegetation management is often just hard work: control weeds, amend soils, plant natives, maintain things during establishment, and some maintenance to ensure the community stabilizes as intended. However in habitats adjacent to San Francisco Bay, basic methods have not meet with success, forcing managers to reconsider dominant paradigms and test novel tactics. For three years we have attempted to establish grasses in an effort to preclude invasive forbs during habitat creation as recommended in the site's management plan, but have found grasses difficult to establish onsite and ineffectual against invasive forbs, at least in the short-term. Further background research and the casual introduction of native forbs led us to reconsider the grassland focus, which has led us to create a forbland this fall.

Another new tactic is the use of saltwater as an herbicide against intolerant weeds. The method consists of pumping saline water through an irrigation system, mixing a simple sodium chloride solution for spraying with backpack sprayers, or spreading granular sodium chloride in treatment areas. It is relatively inexpensive and in saline habitats it can be applied heavy enough to hold ground against salt-intolerant weeds longer than any herbicide. The treatment also doubles as supplemental irrigation for native halophytes. And if used properly it should not interfere with soil ecology.

Methods tested

In 2007 we broadcast seeded *Lolium* species as recommended in the site's vegetation management plan. That crop failed to grow well, perhaps due to the lack of seedbed prep and/or insufficient water.

Late in 2008 we hydroseeded the *Loliums*. Even with supplemental watering (poor rainfall again) that crop also failed to perform well, but intensive animal browse was identified as a significant factor (see photo to right).

In 2009 the project altered course due to a change in scope (we began to develop methods for use throughout the estuary). The use of *Loliums* as a temporary cover crop was replaced with a suite of native grasses found throughout the estuary's margin, and we drill seeded, which is the last applicable mechanical method available.

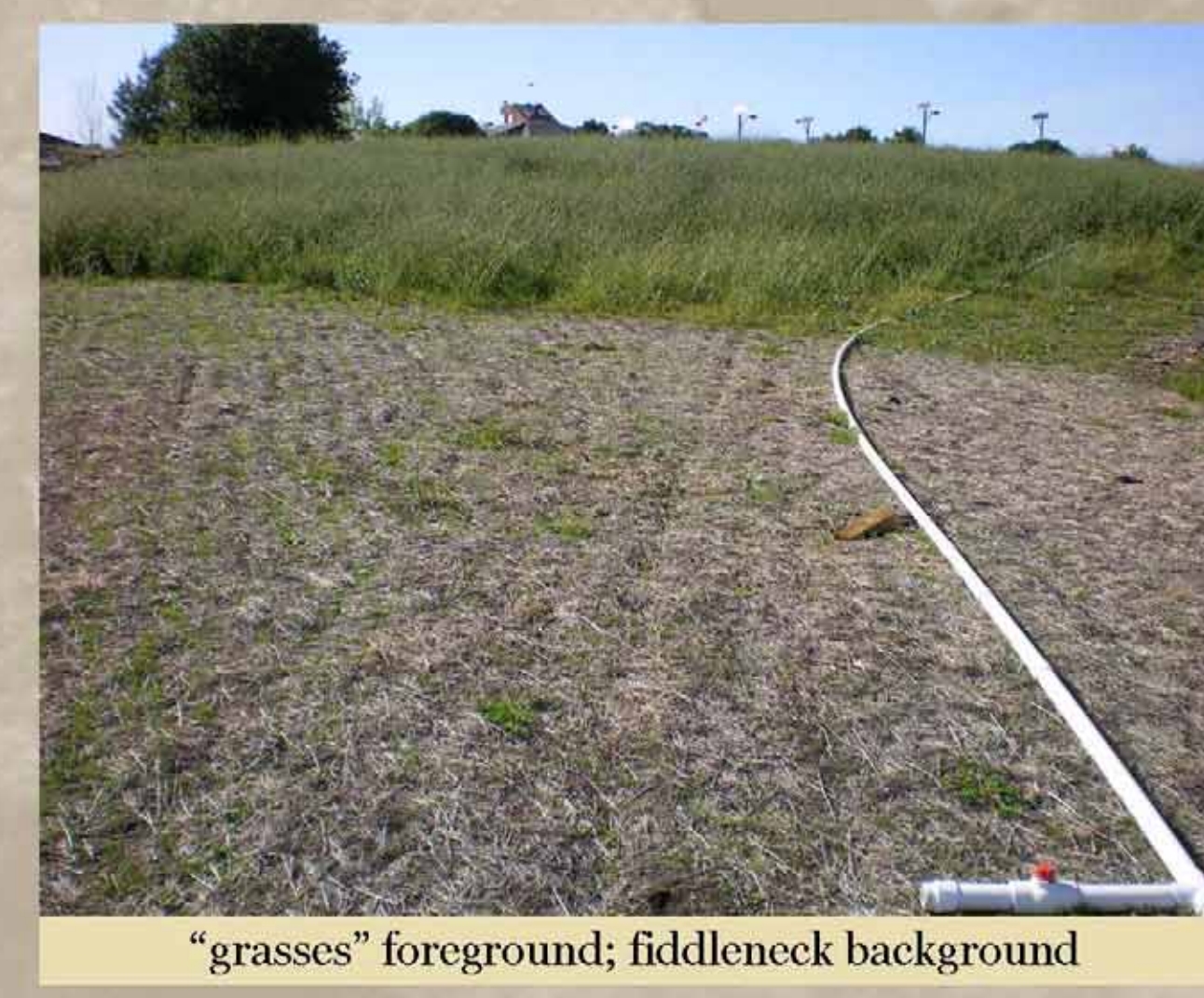
We performed extensive seedbed preparation, consisting of a factorial arrangement of tilling, composting, and straw mulching eight 1/2-acre plots. Two pre-seeding weed abatement methods (aka the stale seedbed) were done to reduce competition in the short-term. Again, even with supplemental watering the grasses failed to create a substantial presence onsite.

But a native annual forb hand-spread by a volunteer performed exceptionally well (see photo to right), and helped us ask the questions: why are we so focused on establishing grassland? Why not use native forbs historically found in the estuary's margin? So we are now focusing primarily on native forbs, and are working with regional botanists and seed collectors to acquire them for our 2009-10 testing this fall.

We will be seeding over 10 native forb species collected around the estuary this November (see list below). We will also be seeding two grass species that performed well last year, and we will be "sprigging" (spreading root divisions) two grass species that are too infertile to propagate by seed.

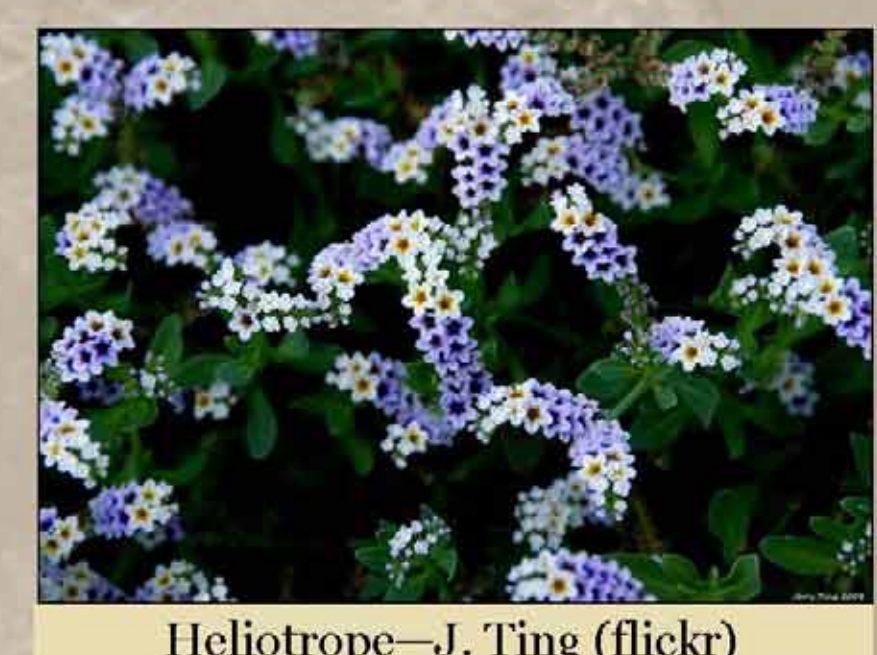


Animal browse kept our 4-acres too well cropped.



"grasses" foreground; fiddleneck background

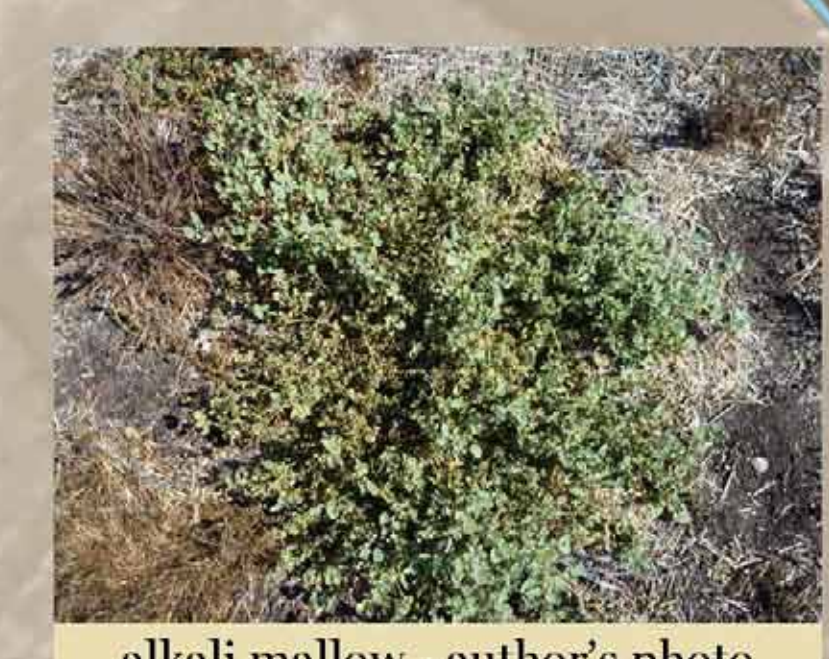
A few of the native forbs we will seed this fall:



Heliotrope—J. Ting (flickr)



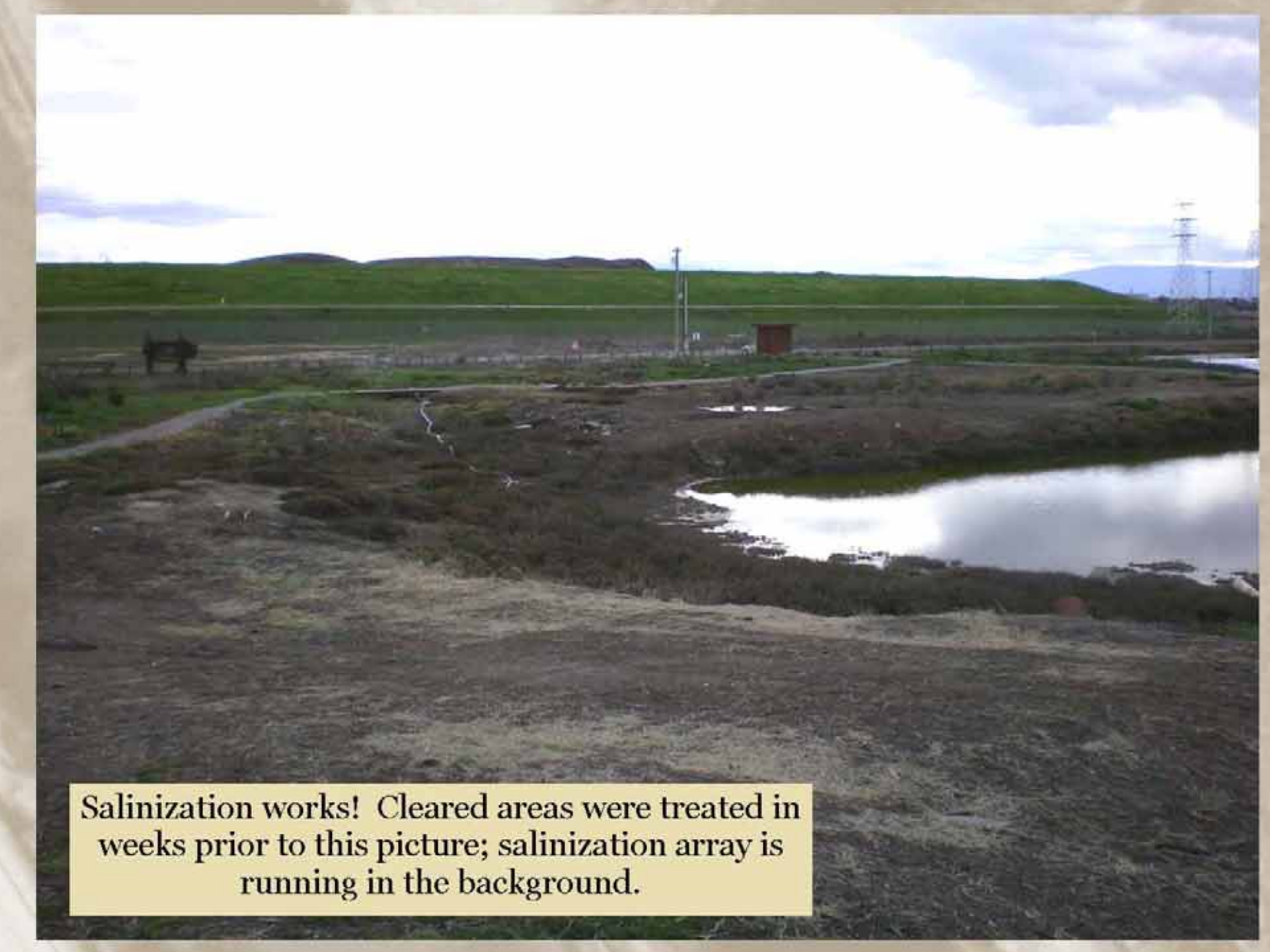
spikeweed—J. Ting (flickr)



alkali mallow - author's photo



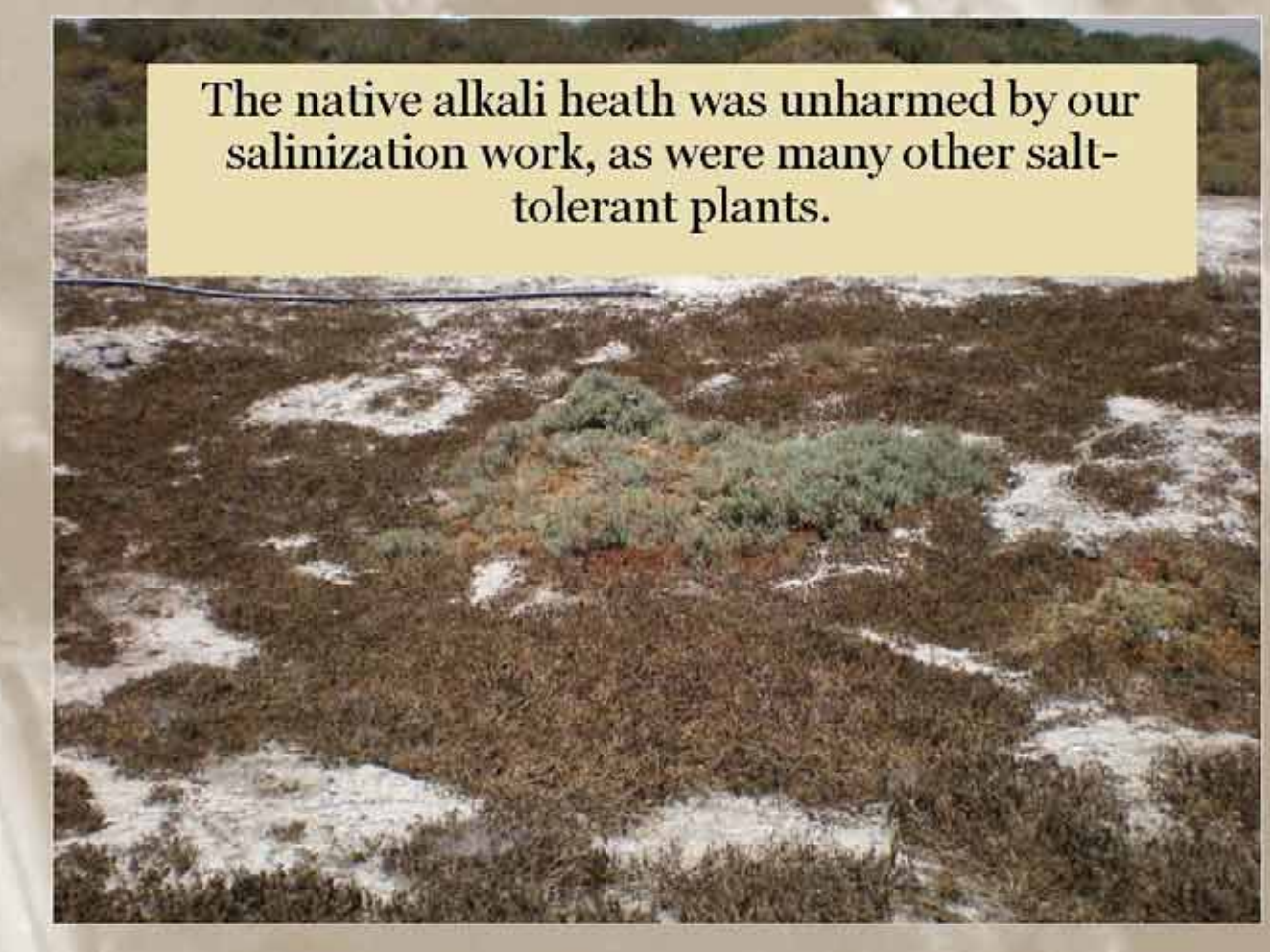
seaside goldenrod - author's photo



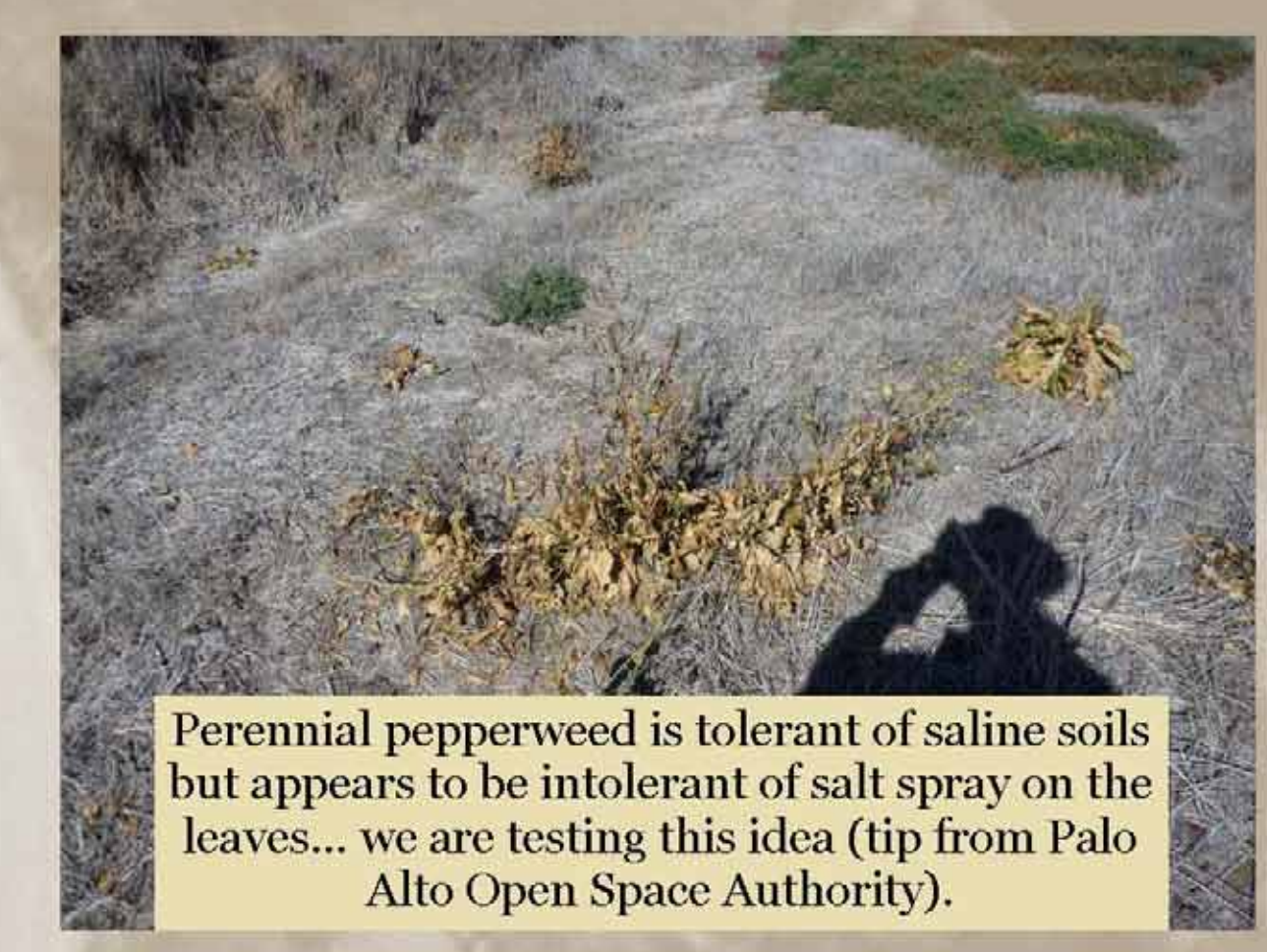
Salinization works! Cleared areas were treated in weeks prior to this picture; salinization array is running in the background.



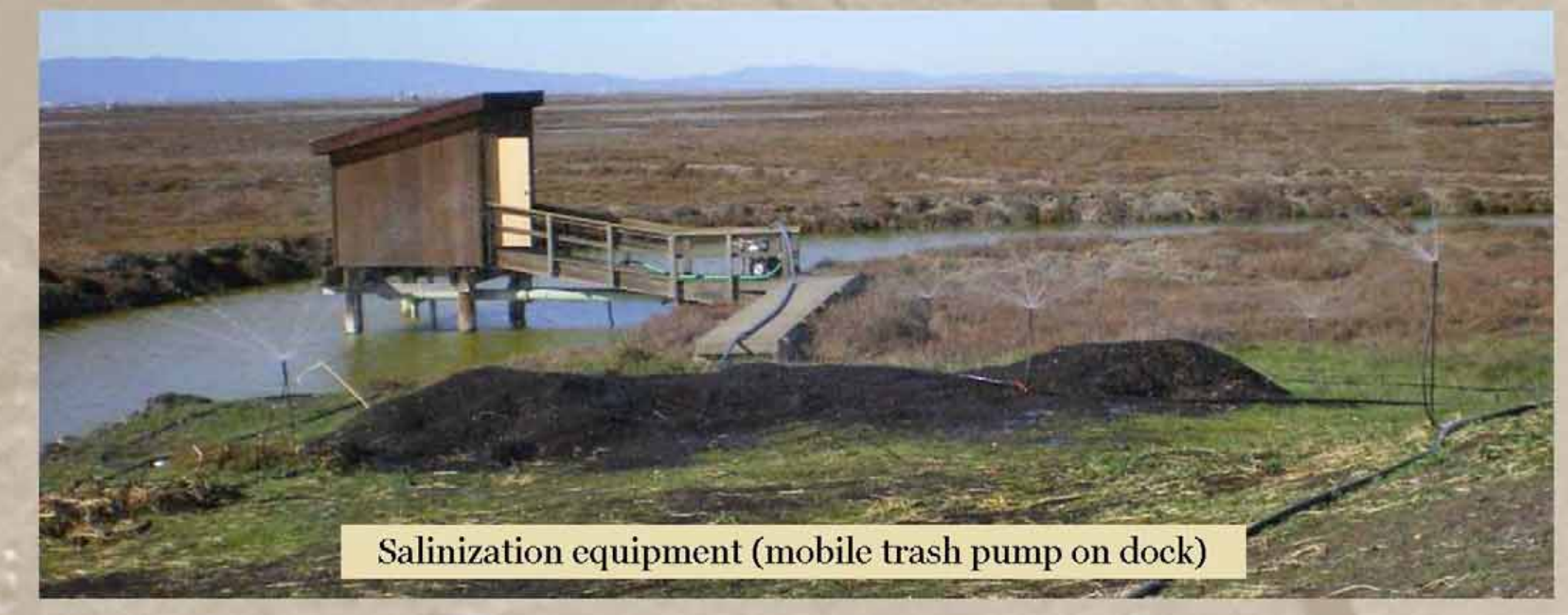
Harding grass appears to have been controlled, but we are watching for resprouts this year.



The native alkali heath was unharmed by our salinization work, as were many other salt-tolerant plants.



Perennial pepperweed is tolerant of saline soils but appears to be intolerant of salt spray on the leaves... we are testing this idea (tip from Palo Alto Open Space Authority).



Salinization equipment (mobile trash pump on dock)

Salinization—using salt water as a herbicide

Baye (2006) recommended salinization and Charlie Moore (EEC volunteer) developed the methods for pumping salt water out of the adjacent marsh and onto appropriate parts of the site to control salt-intolerant weeds.

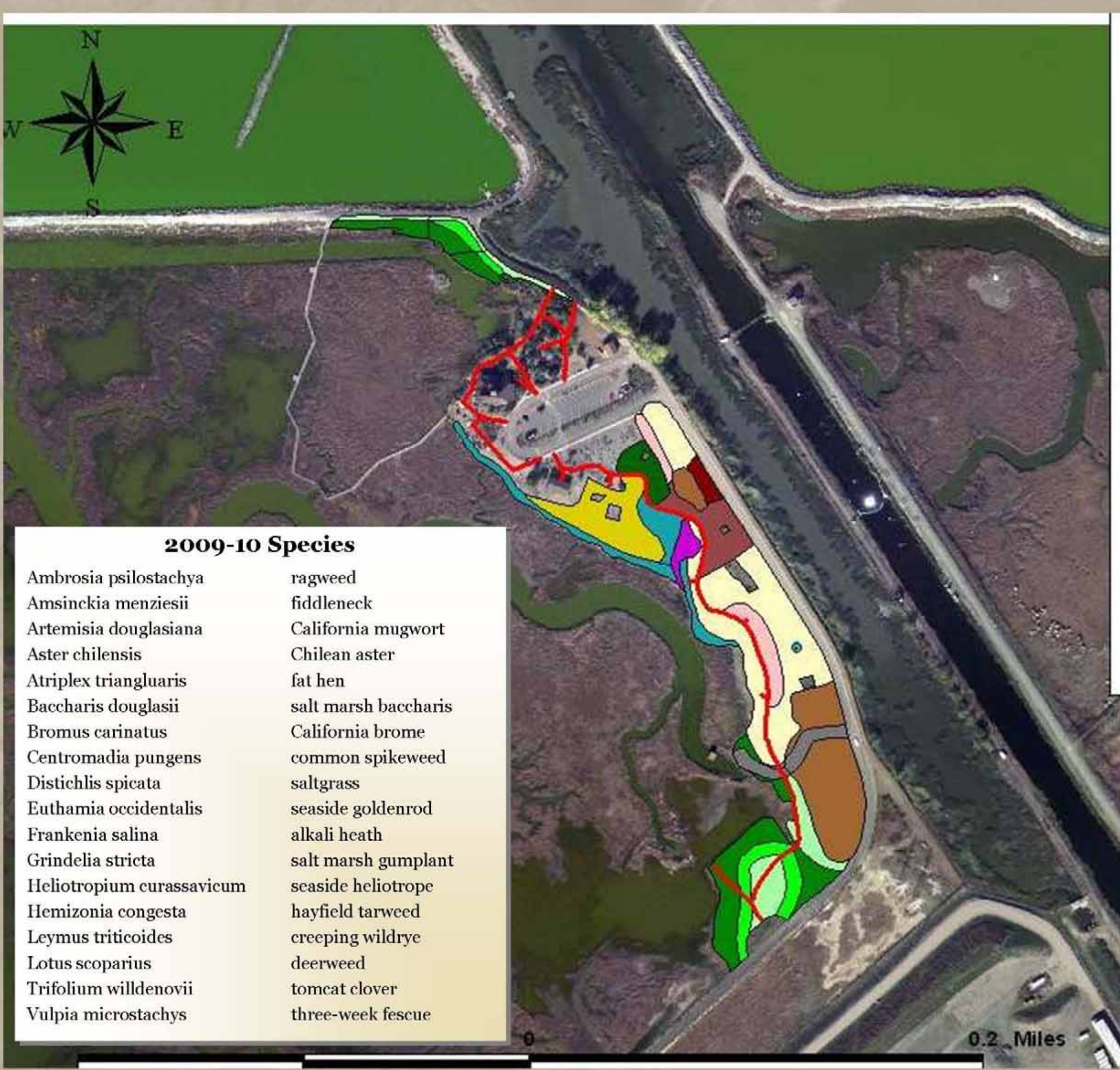
- 1) guild-inspecific, so both grass and forb weeds are controlled, but
- 2) native halophytes respond as if irrigated, and
- 3) sufficient quantities can control weeds for years—longer than any herbicide

Both Cal-DPR and the US EPA both stated that the pumping of natural salt water only land is not regulated under FIFRA, the mixing of NaCl with water should be a "25B compound", which is exempt from regulation, and spreading granular NaCl would not be regulated either.

Baye, 2006. *Vegetation Management Plan for the Don Edwards San Francisco Bay NWR Environmental Education Center in Alviso, CA. Technical Report. 50p plus appendices*



Unfortunately annual iceplant is also salt tolerant, but it decreasponds well to flaming with a propane torch.



Weed List

List of commonly found invasive plants at the EEC	Scientific Name	Cal-IPC Rating
perennial pepperweed	Lepidium latifolium	High
yellow star thistle	Centauria solstitialis	High
fennel	Foeniculum vulgare	High
jubata	Conyza jubata	High
poison hemlock	Conium maculatum	Moderate
italian thistle	Carduus pycnocephalus	Moderate
mustard	Brassica spp.	Moderate
slimwort	Dittrichia graveolens	Moderate
toscolite	Centauria melitensis	Moderate
bull thistle	Cirsium vulgare	Moderate
harding grass	Phalaris aquatica	Moderate
teasli	Dipsacus fullonum or sativus?	Moderate
tobacco tree	Nicotiana glauca	Moderate
tree of heaven	Ailanthus altissima	Moderate
annual iceplant	Mesembryanthemum nodiflorum	Moderate
several mustards	Brassicaceae	Limited
white horsehound	Marrubium vulgare	Limited
livehook bassia	Bassia thysopifolia	Limited
broadleaf filaree	Erodium botrys	Eval No List
sweet clover	Medicago sativa	Eval No List
bur-chervil	Anthriscus caucalis	not listed
mexican-tea	Chenopodium ambrosioides	not listed