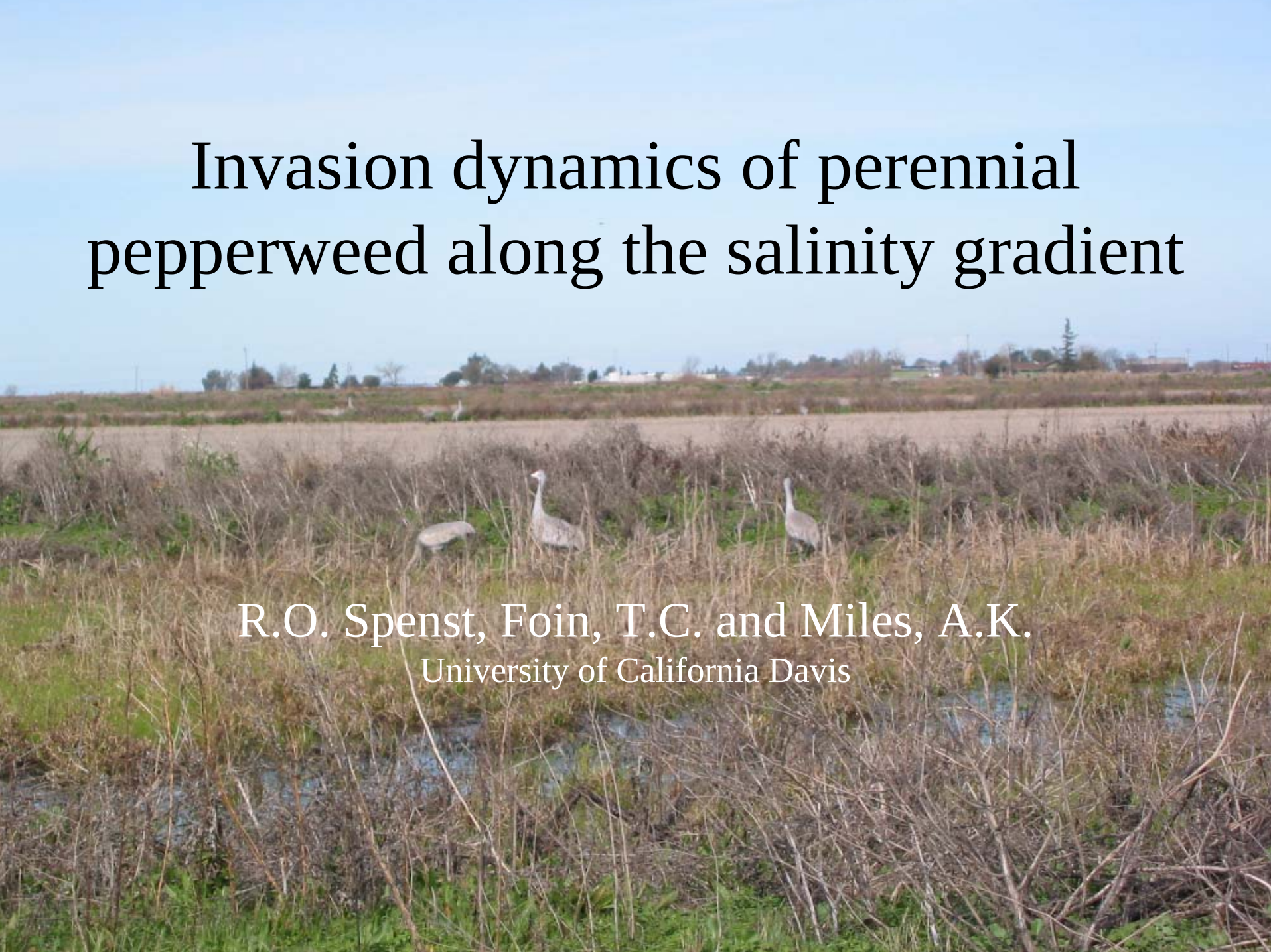
Invasion dynamics of perennial pepperweed along the salinity gradient



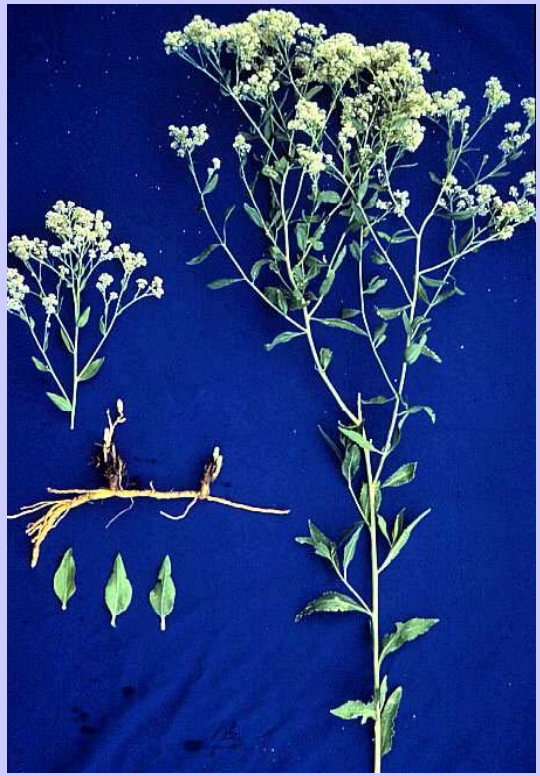
R.O. Spenst, Foin, T.C. and Miles, A.K.
University of California Davis

Lepidium latifolium:
one of worst potential invaders of the estuary

- CDFA class B noxious weed
- Cal-IPC A-1
- In all but 3 CA counties
- Flooding limitations & adaptations (Chen & Qualls, 2003)
- Salinity tolerant

Properties facilitating invasion

- 16 billion seeds/ha (Palmquist, unpublished)
- High seed viability in f.w. (Miller et al., 1986)
- Disperses by root fragmentation & seed
- Propagates vegetatively



Project Goal

To determine environmental relationships which favor and disfavor Lepidium invasiveness and which might suggest control actions to limit invasion

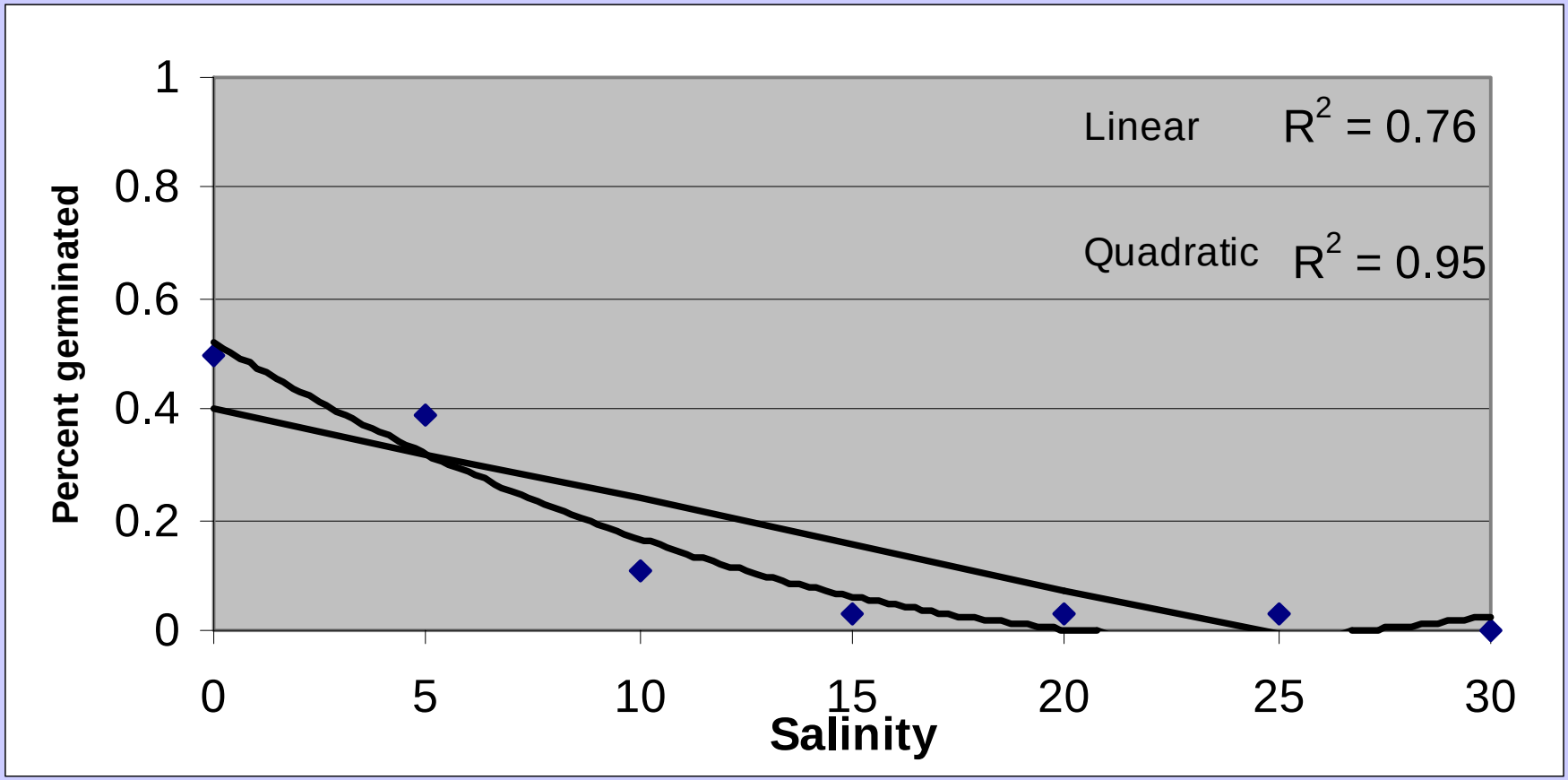
Specific objectives

- Tidal marsh properties influencing invasibility
- Association of reproductive life history strategies and environmental characteristics

Research Methods: Reproduction from Seed

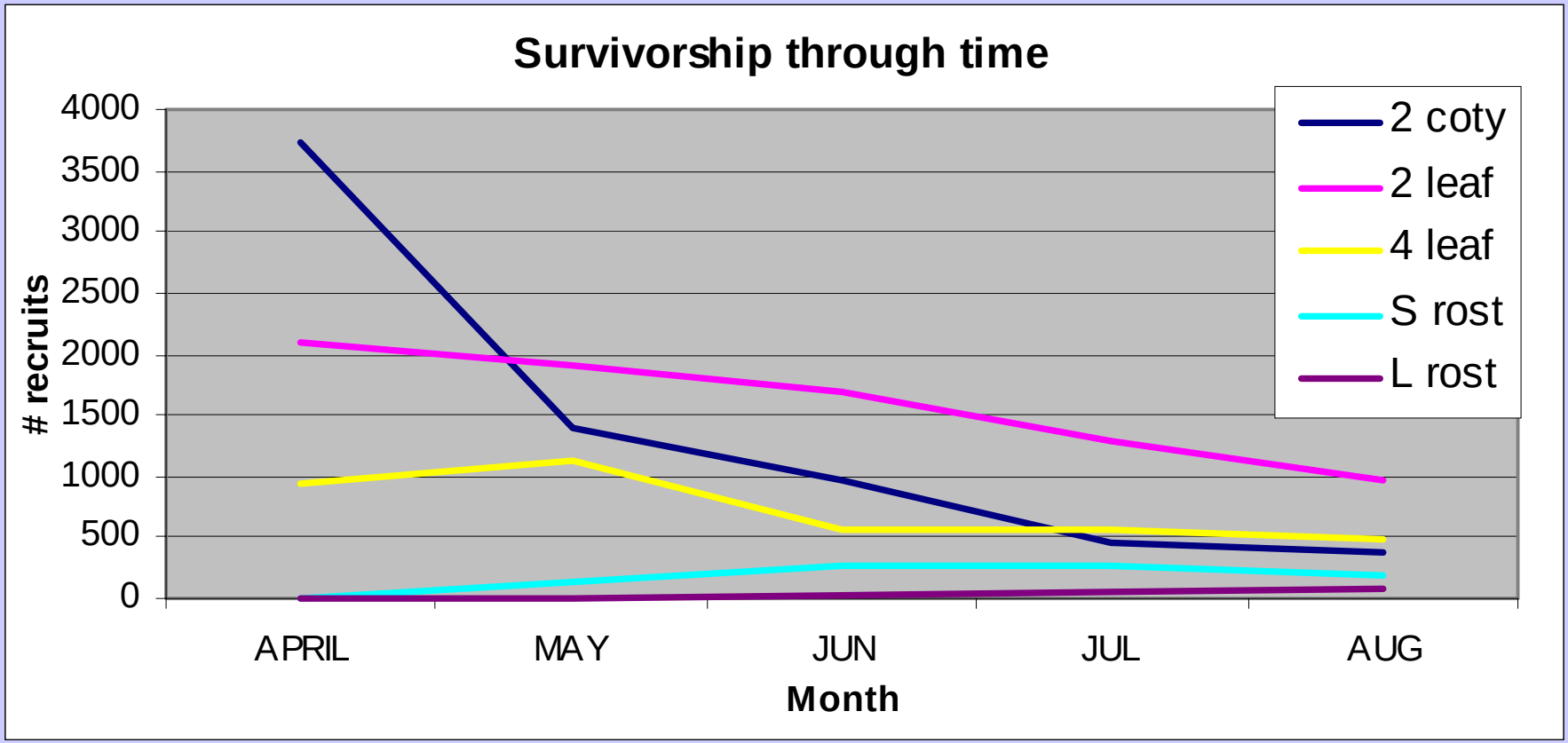
- Germination study in Petri dishes
- Recruitment study in wetland mesocosms

Seed Germination along a salinity gradient

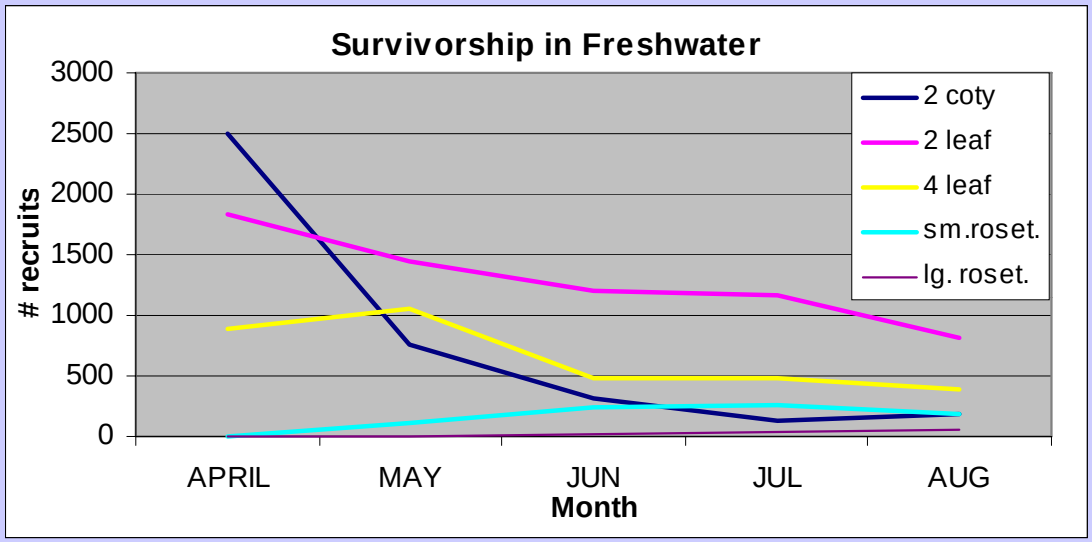


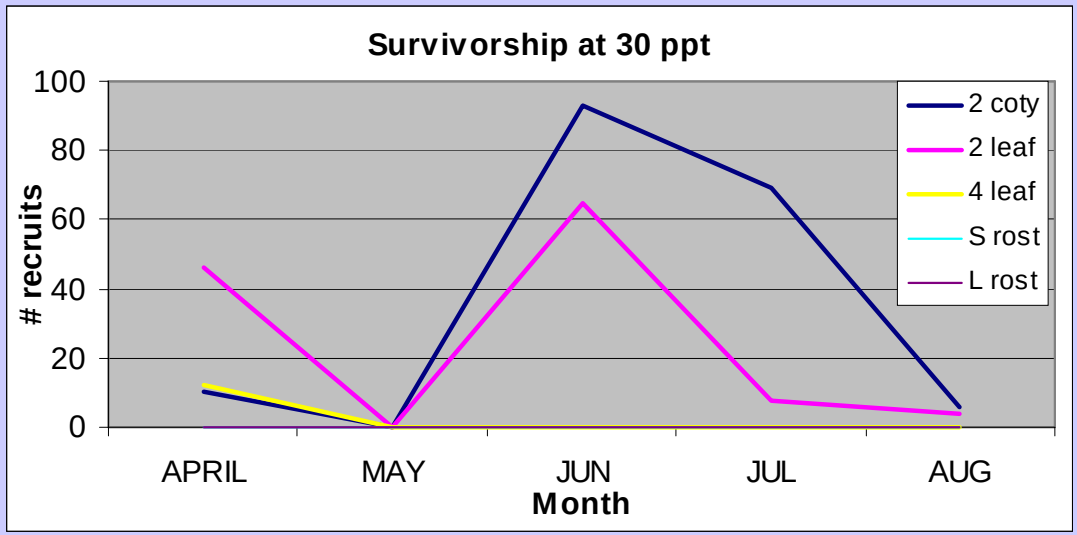
Mesocosm Experiment: Seedling Recruitment

- Demographic Comparisons:
  - Experimental Design: 4 salinities, 4 native species/bare ground, 2 flooding levels
  - Response variable: # recruits to stage classes

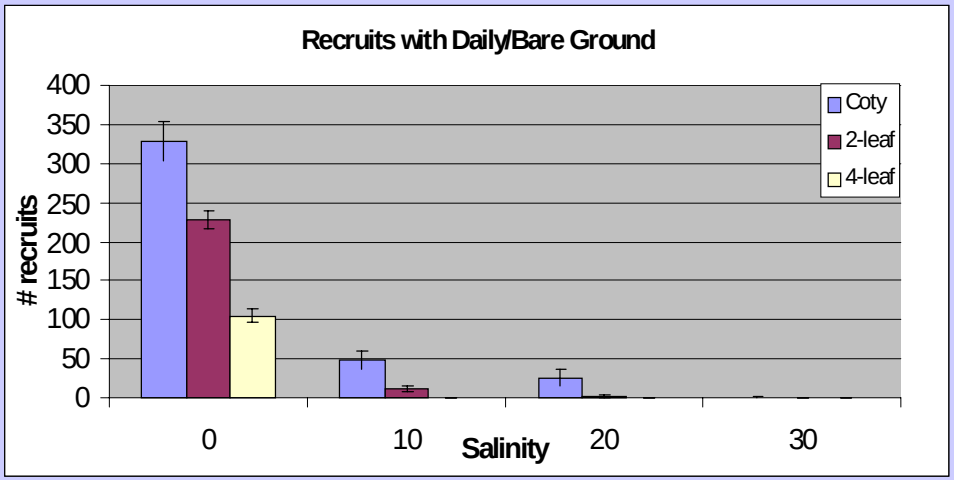

Survivorship through time
recruits
4000
3500
3000
2500
2000
1500
1000
500
0
APRIL
MAY
JUN
JUL
AUG
Month
2 coty
2 leaf
4 leaf
S rost
L rost

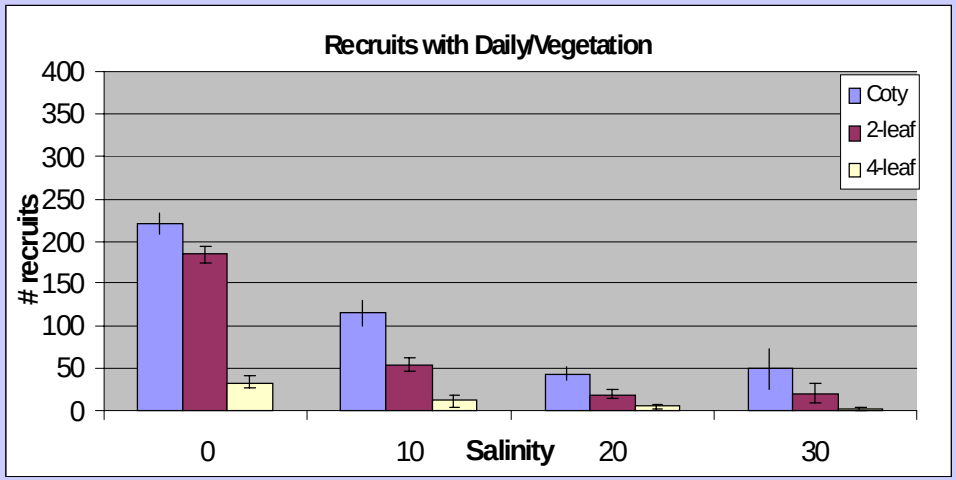
High Salinity delays germination peak

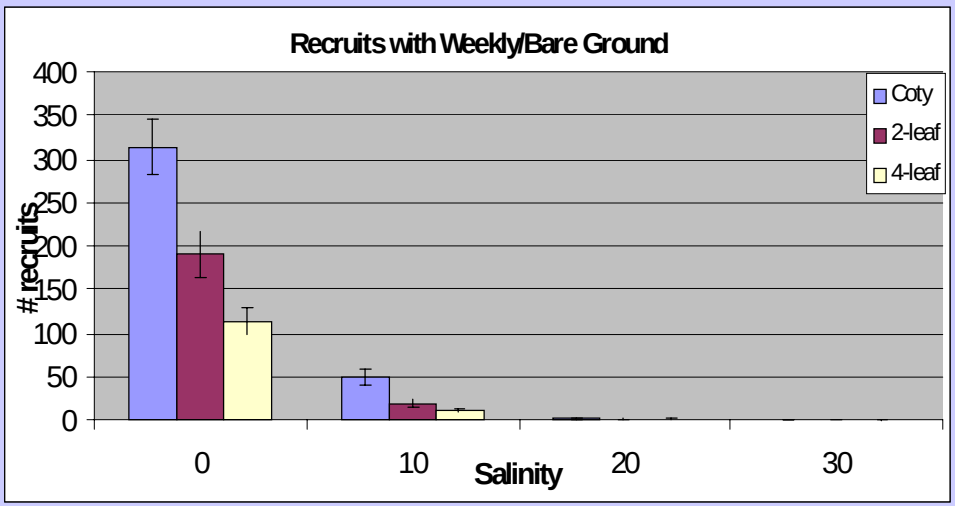


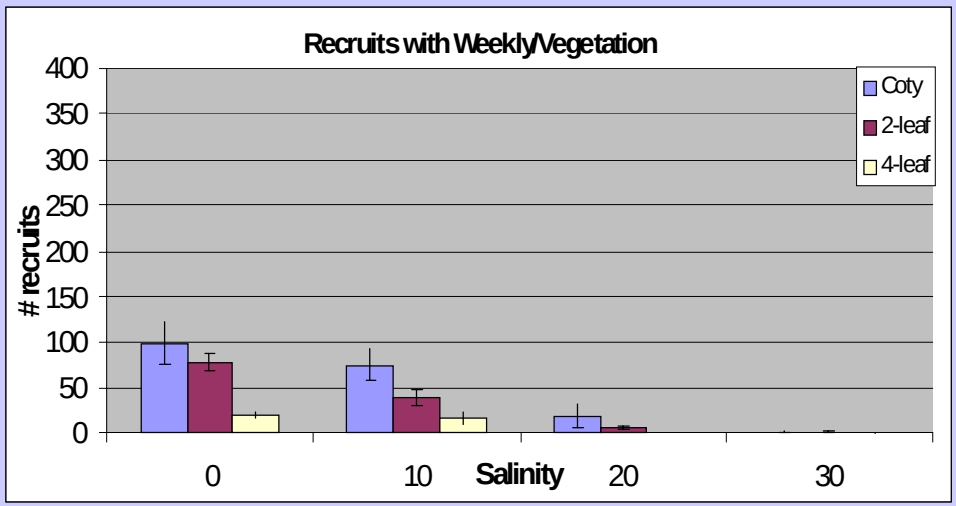


Early stage recruitment by treatment

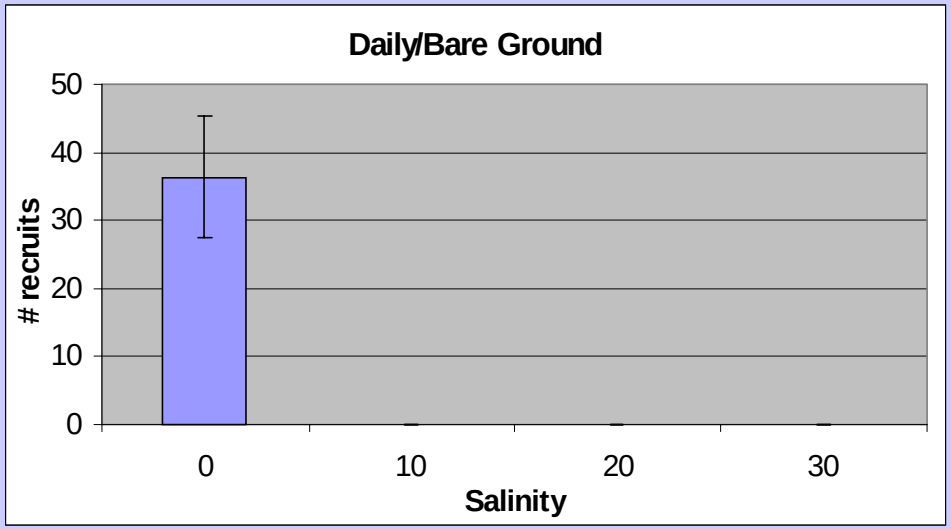


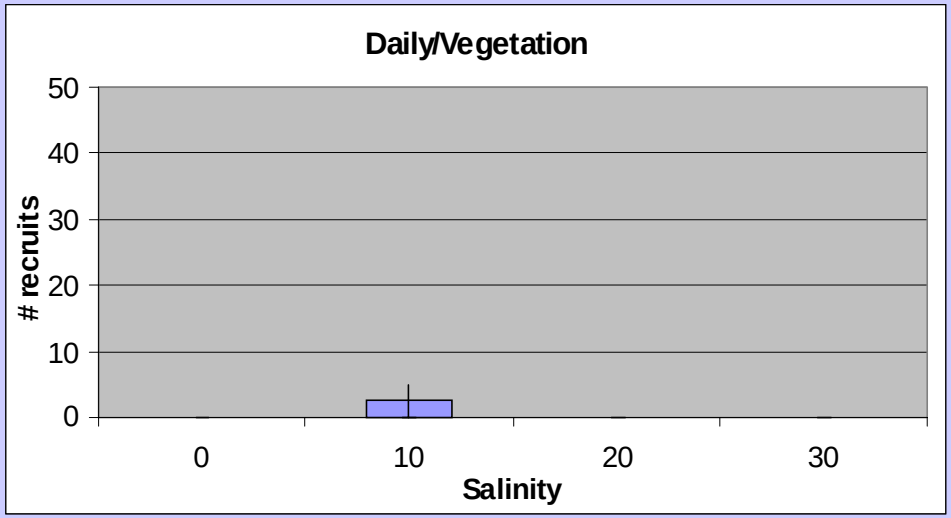


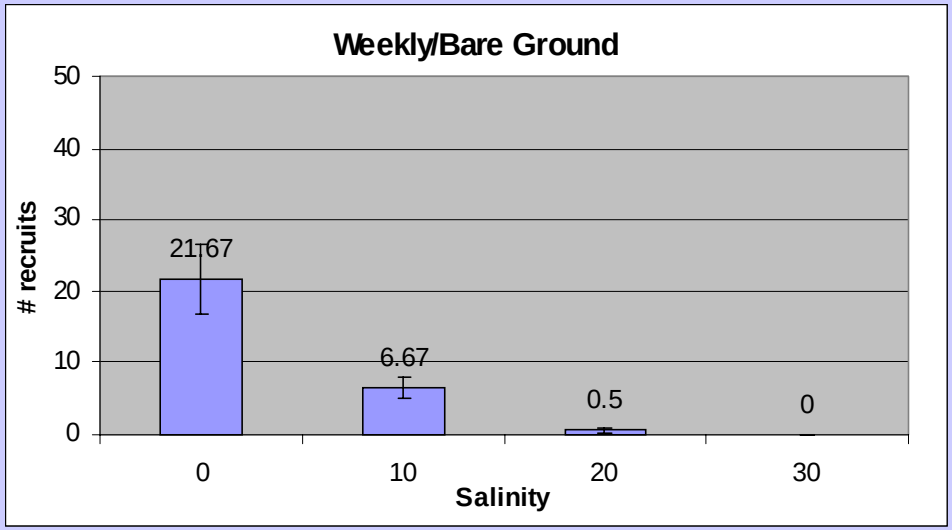


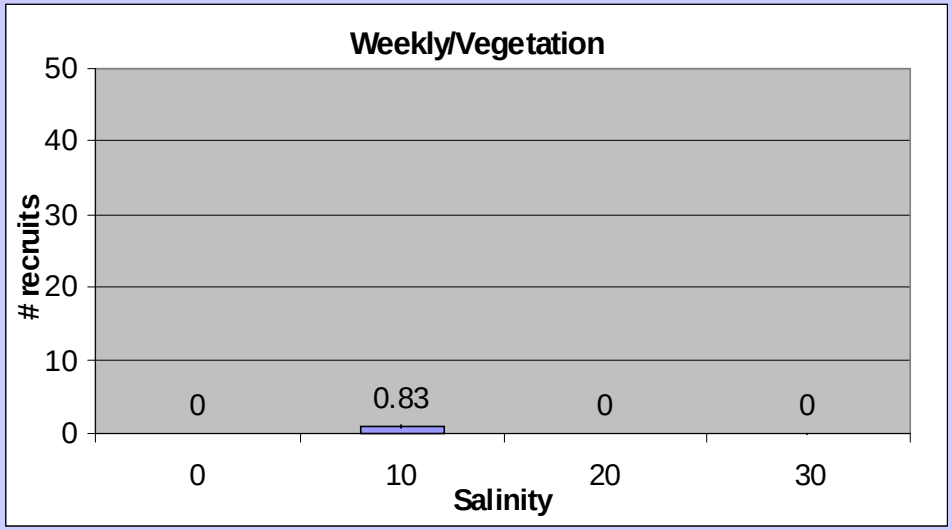


Small Rosette Recruitment by Treatment

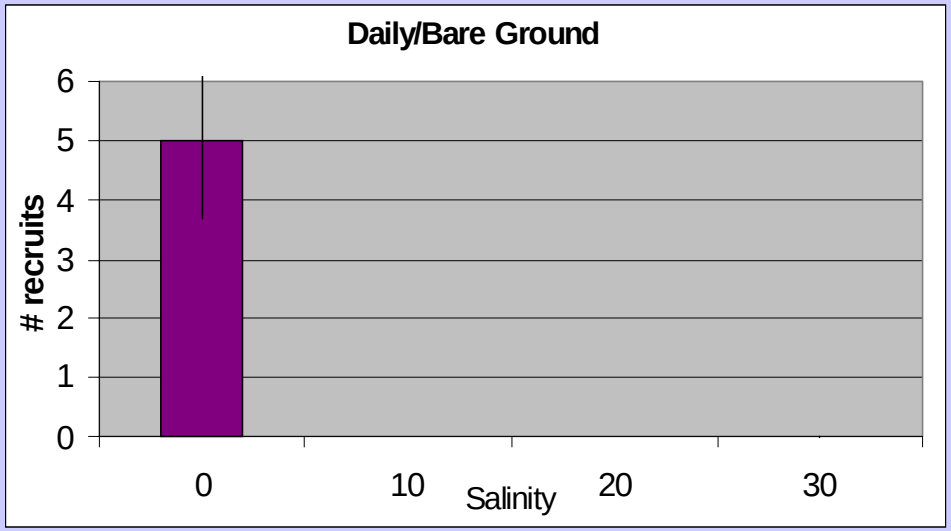


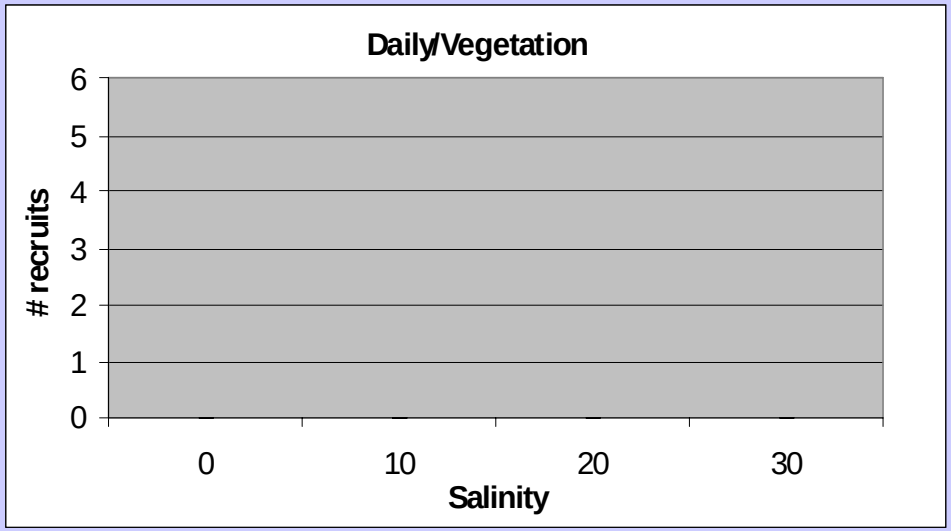


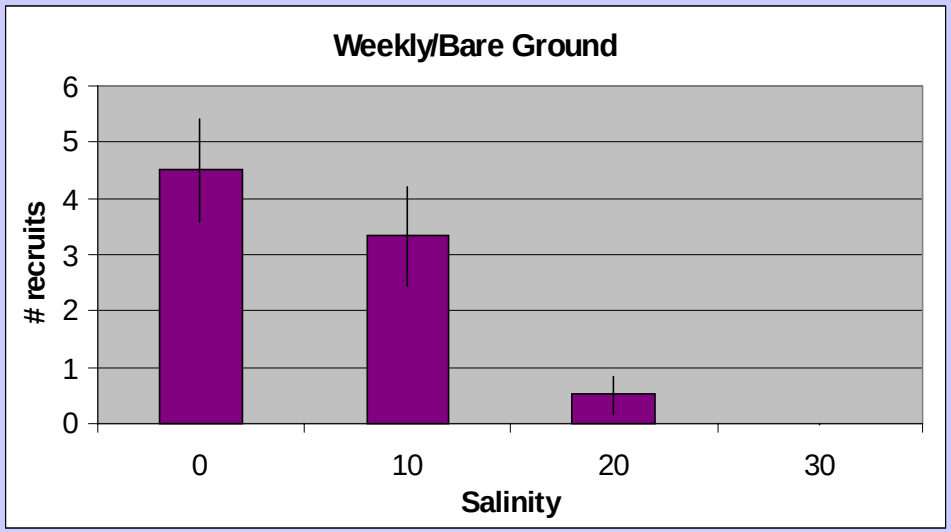


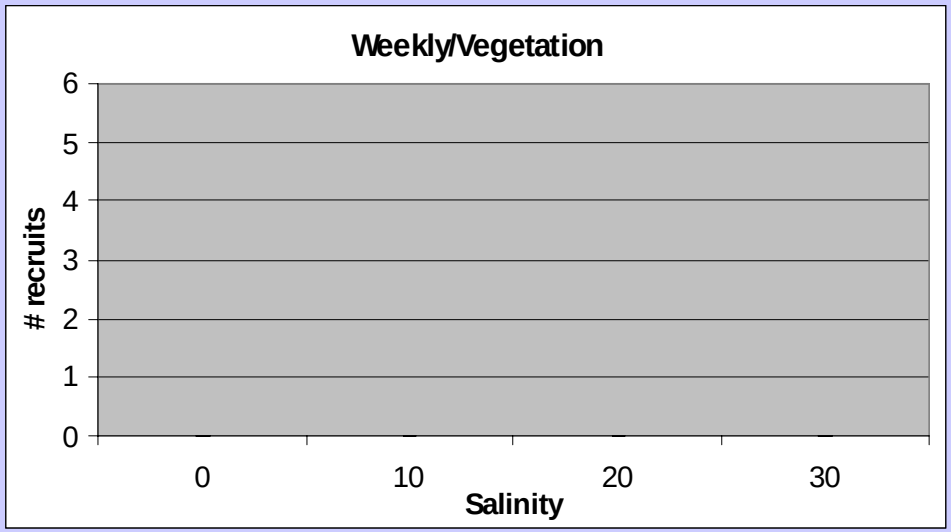


Large Rosette Recruitment by Treatment









ANOVA Results: Early Recruitment

2 cotyledon, 2 leaf, & 4 leaf stages

- All main effects were significant for early stages of recruitment ($p<0.0001$)
- Salinity * Flood Regime, Salinity * Month, Flood Regime * Month significant($p<0.0001$)

Rosette Recruitment:

- Salinity and vegetation significantly influenced recruitment ($p<0.05$)
- Infrequent flooding important for large rosettes ($p<0.05$)
- Interaction terms dropped out.

Discussion

- Disturbed, freshwater wetlands present greatest risk
- Flooding frequency unimportant in freshwater
- Vegetation affects stage progression: delay or inhibition?

Results suggest:

- Seed recruitment likely in low & mid-range salinities, then patchier
- Fresh end of estuary most susceptible
- Saline and hypersaline sites episodic
- Vegetation important, not prohibitive
- Stay tuned…

Acknowledgements

- Support from Calfed project ERP-02D-P58
- UC Davis Department of Agronomy and Range Science
- Foin Lab

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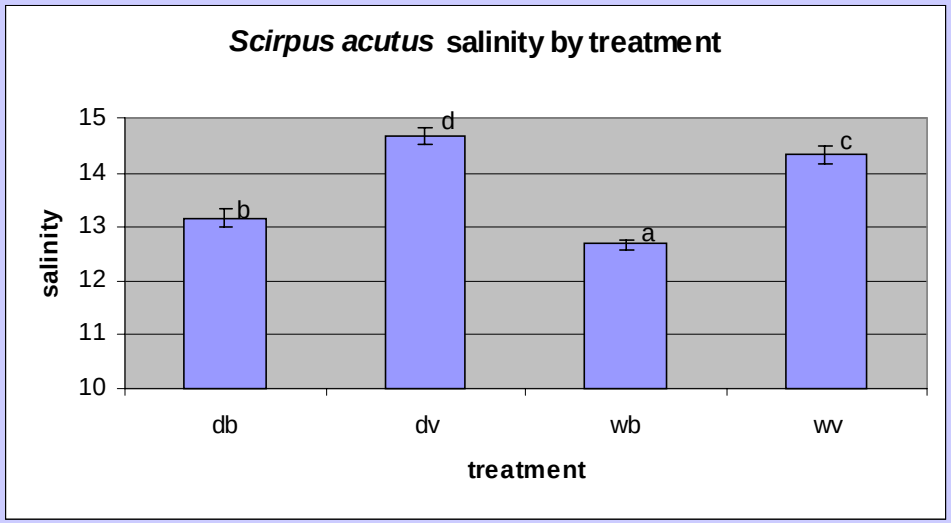
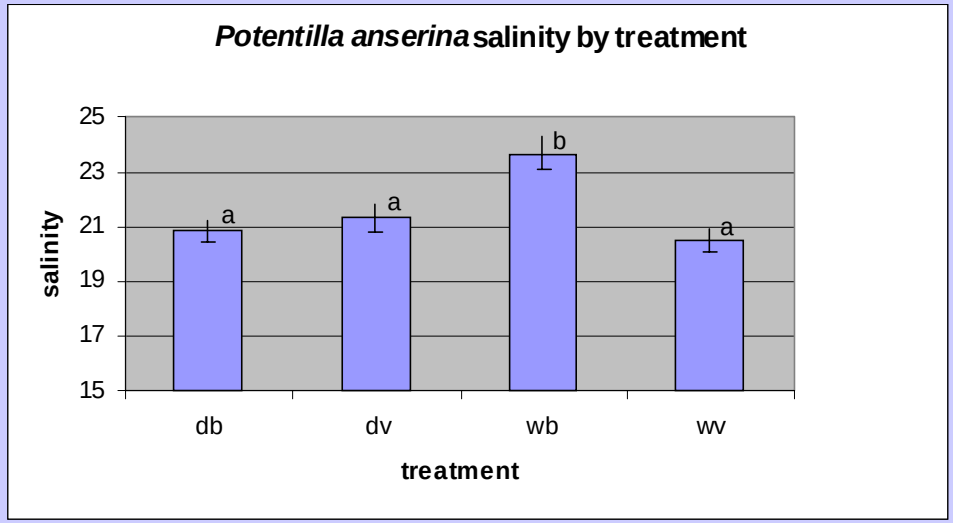
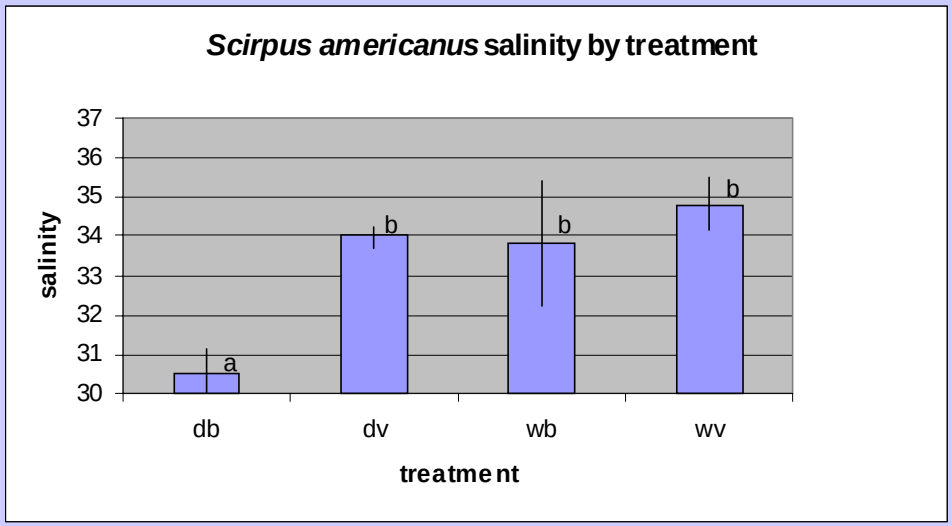
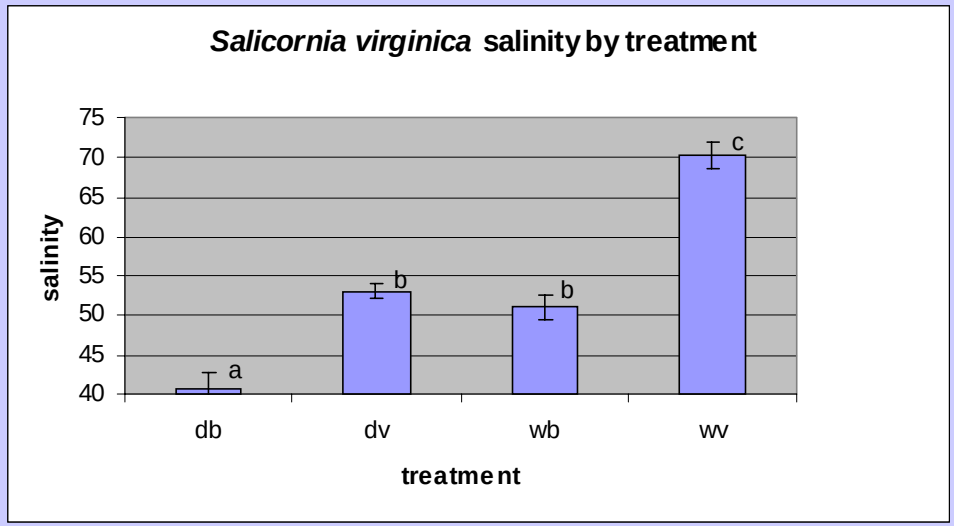
Salinity accumulation in pots 9/24/04









How this research supports Calfed restoration goals:

- Reduce negative impacts of invasive species & prevent additional introductions

- Protect and restore functional habitats