Seagrasses in Variable Environments: The Importance of Life History in Controlling *Ruppia maritima* at the Everglades-Florida Bay Ecotone

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Importance of *Ruppia maritima* Globally and Locally

- Cosmopolitan SAV creating benthic habitat in variable environments
- Seagrass of the future? (Cho et al. 2009)
- Dominant at ecotone between freshwater Everglades and Florida Bay
  - Increased abundance specific CERP Goal (2005)
  - Specific Goal Restoration “restore SAV habitat functionality in transition zone” (RECOVER 2005)
  - SFWMD minimum flows levels fresh water FL Bay

Everglades Ecotone

(Figure credit Google Earth®)

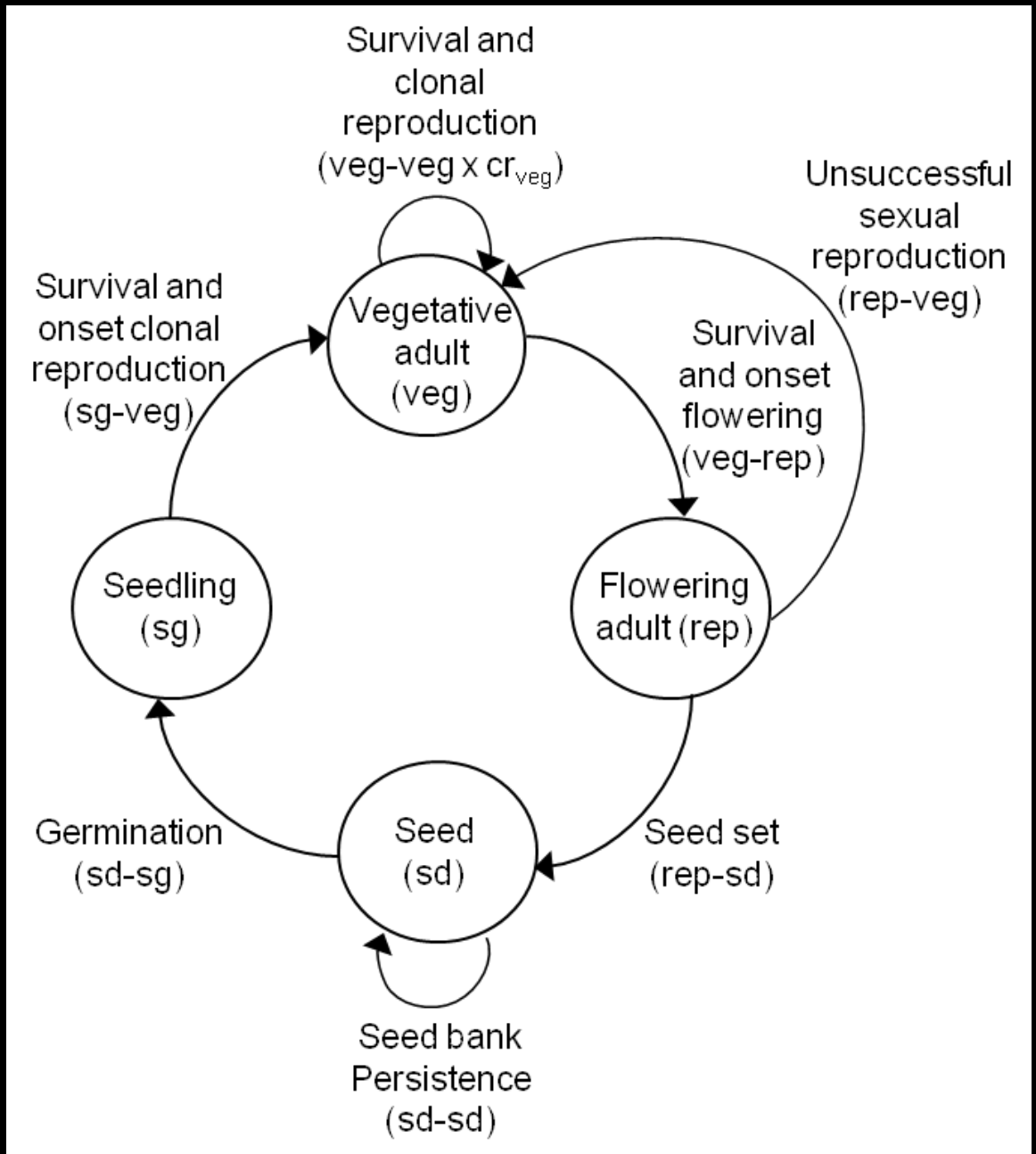
Overarching Objective

Determine mechanisms controlling *Ruppia maritima* distribution Everglades/Florida Bay ecotone

Working Hypotheses

- *R. maritima* is limited by germination and survival (abiotic)
- Species persistence at the ecotone is constrained by viable seeds / recruitment into the seed bank
- Controlled by competition (biotic)

R. maritima Stage-Based Life History Model



Experiments and Field Studies
FAU *Ruppia maritima* Ecotone Research Program

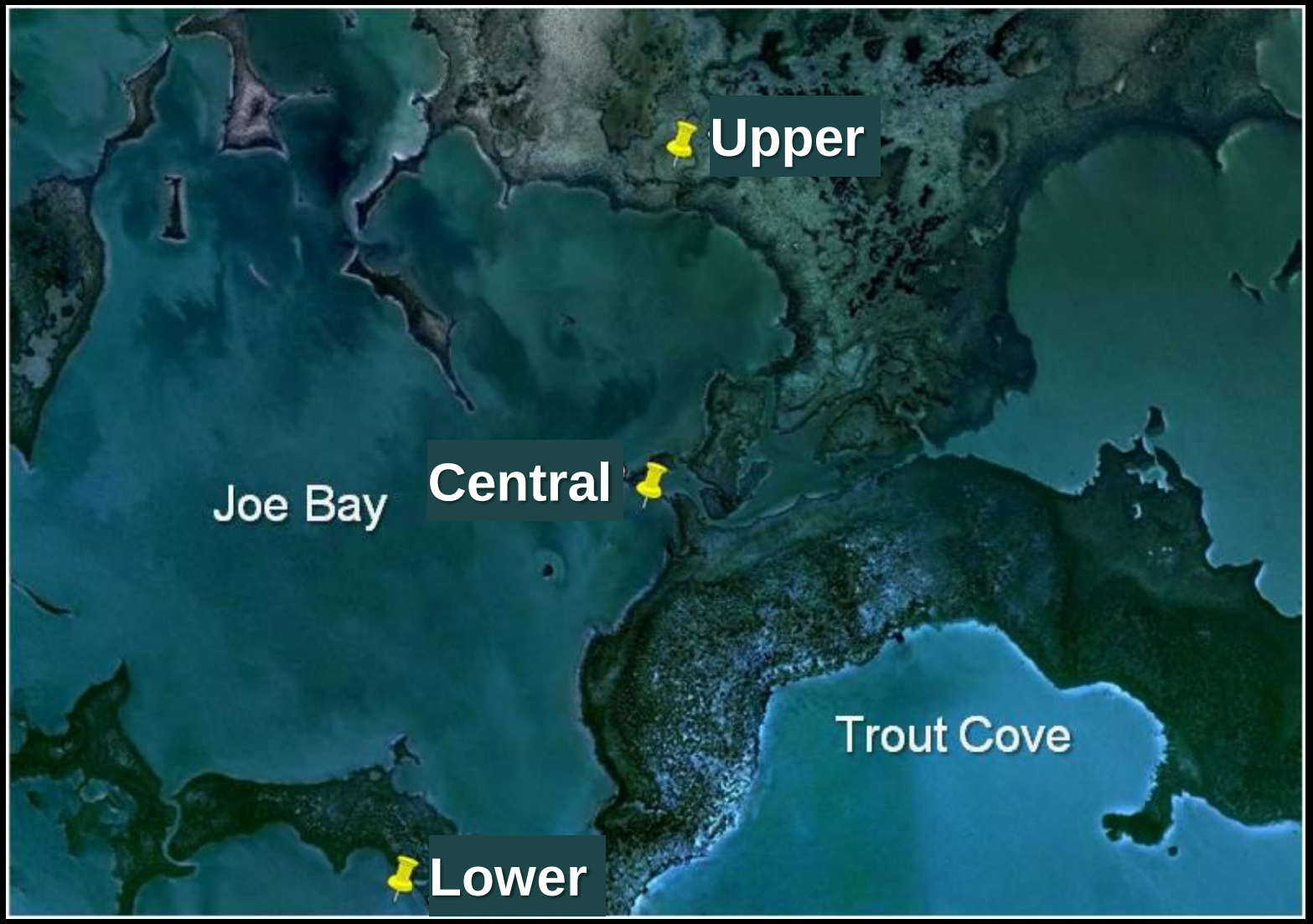
1. Mesocosm Germination
2. Seedling Salinity Experiment

I. Field Germination Study

II. Seed bank Viability Study

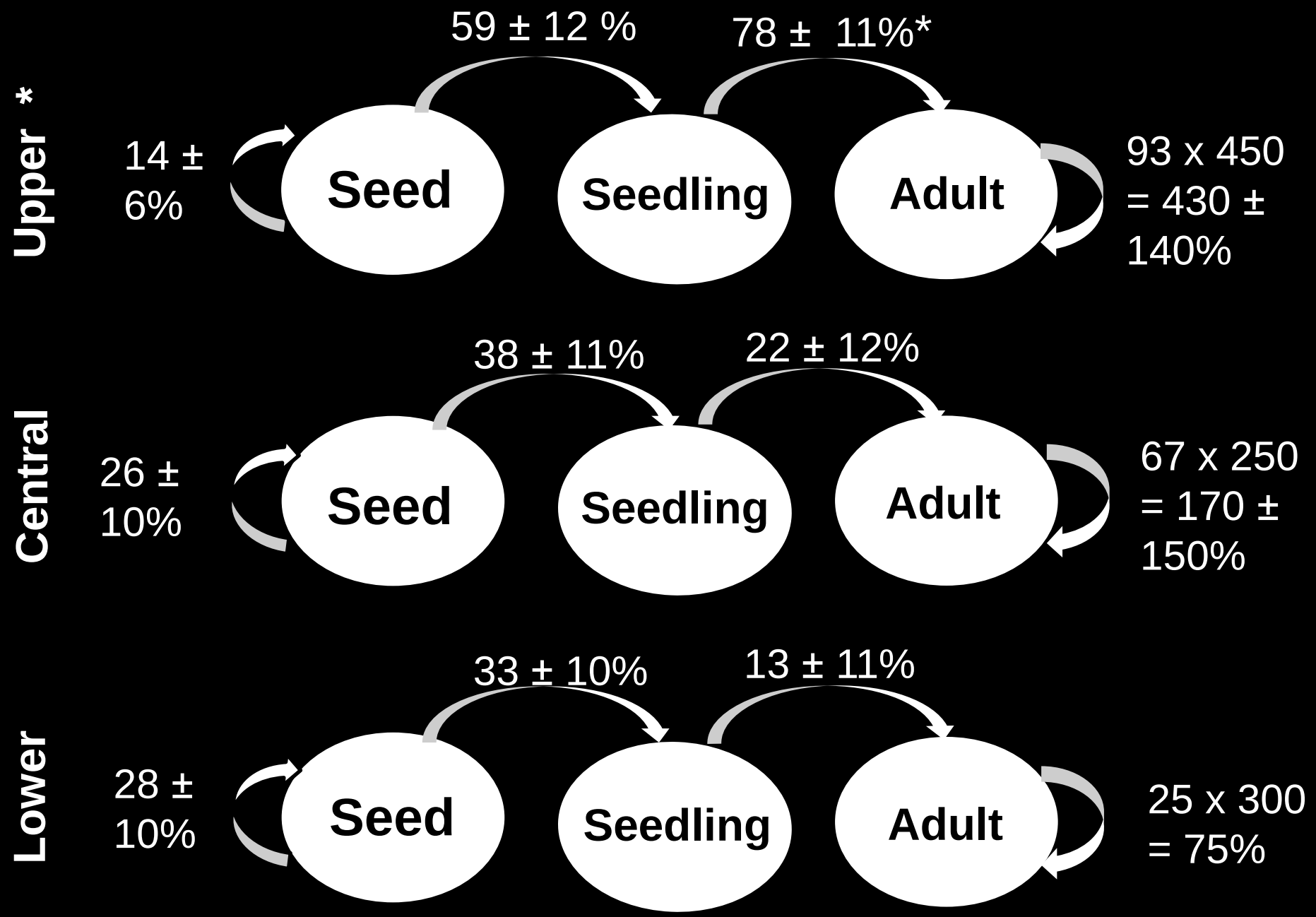
III. Competition Study

I. Field Germination Study Sites
(Joe Bay Transect)

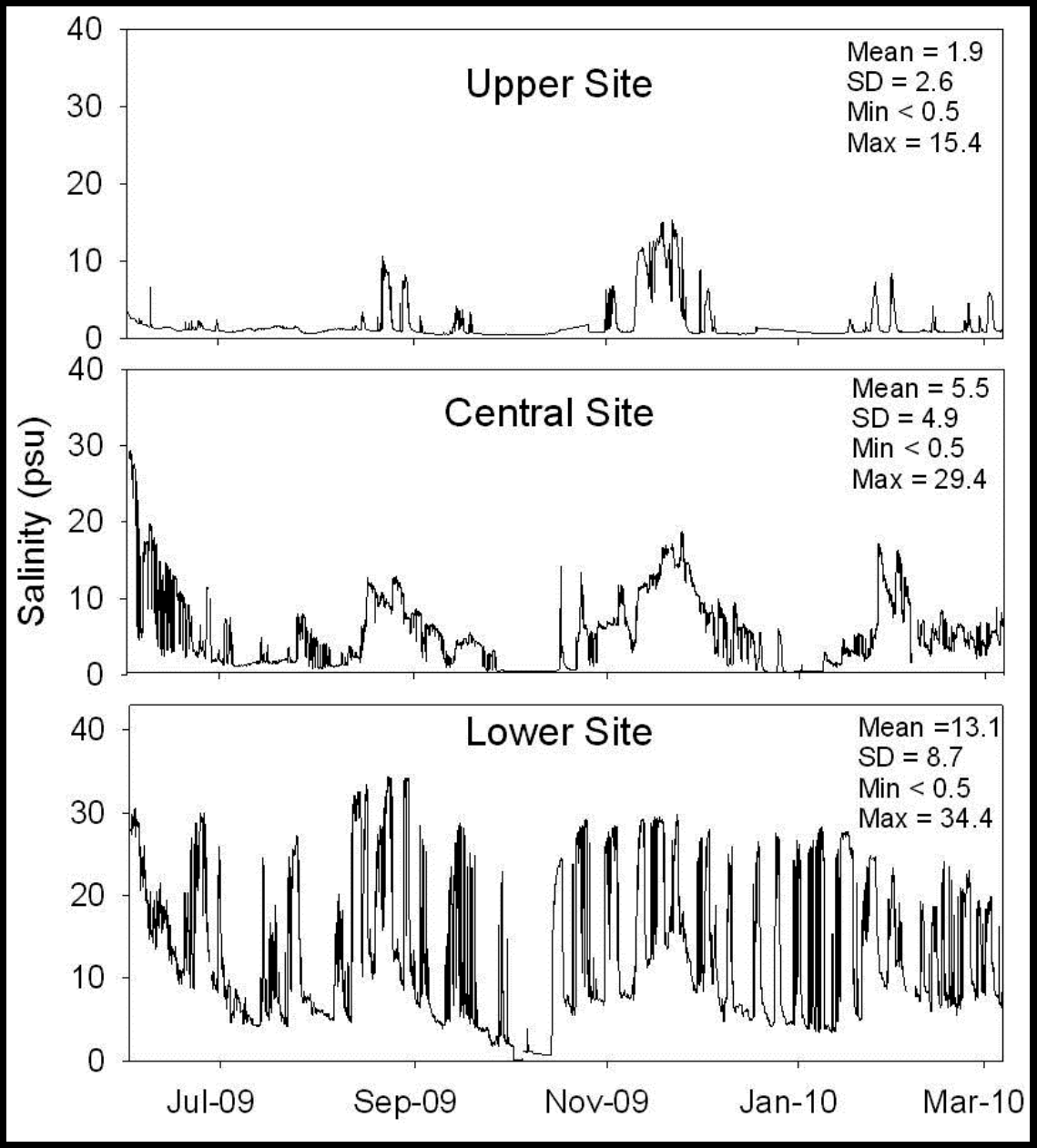


(Figure credit Google Earth®)

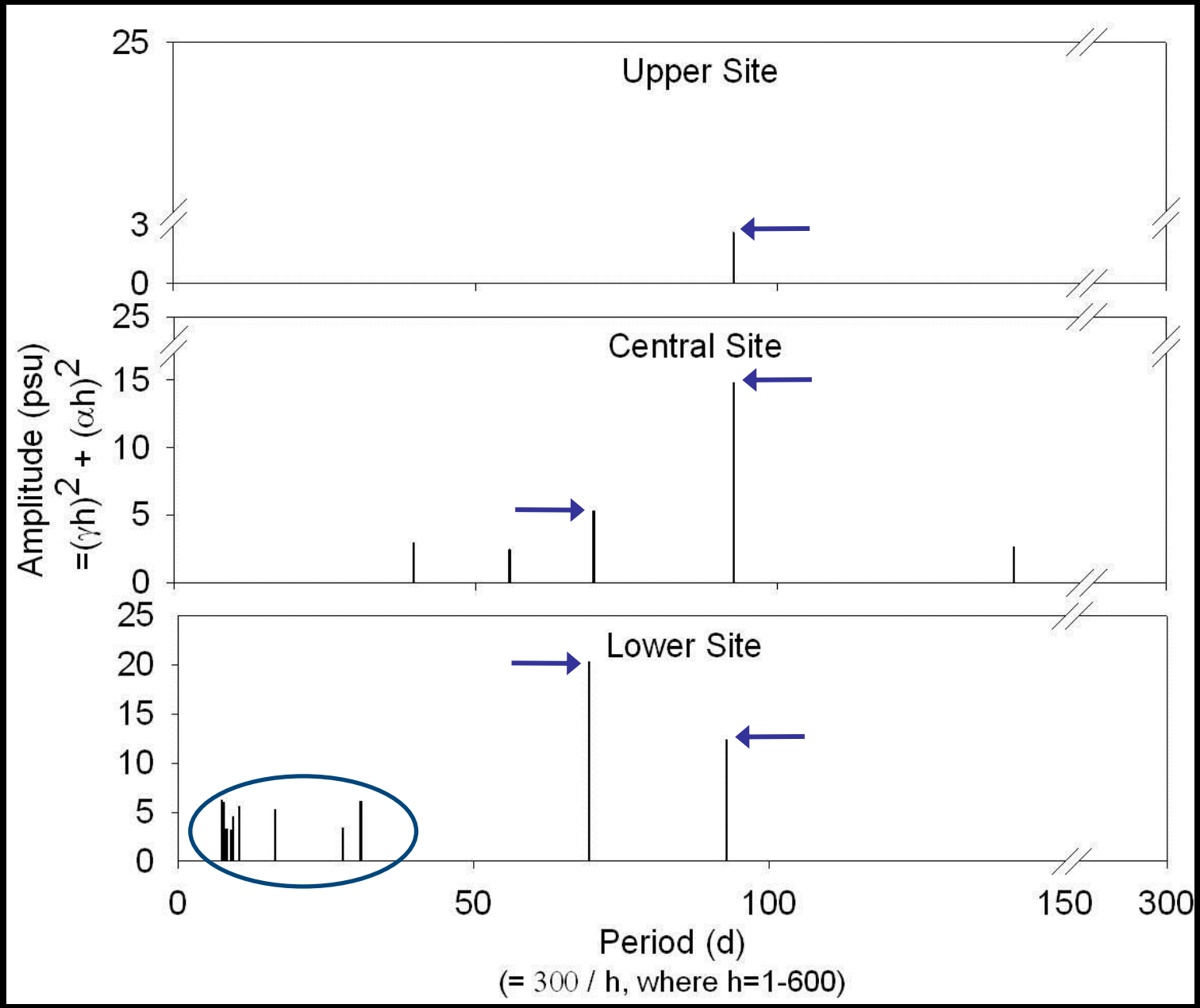
Transition Probabilities Joe Bay (% ± SE)



Germination Study Salinity Analysis



Harmonic (Fourier) Analysis of Salinities



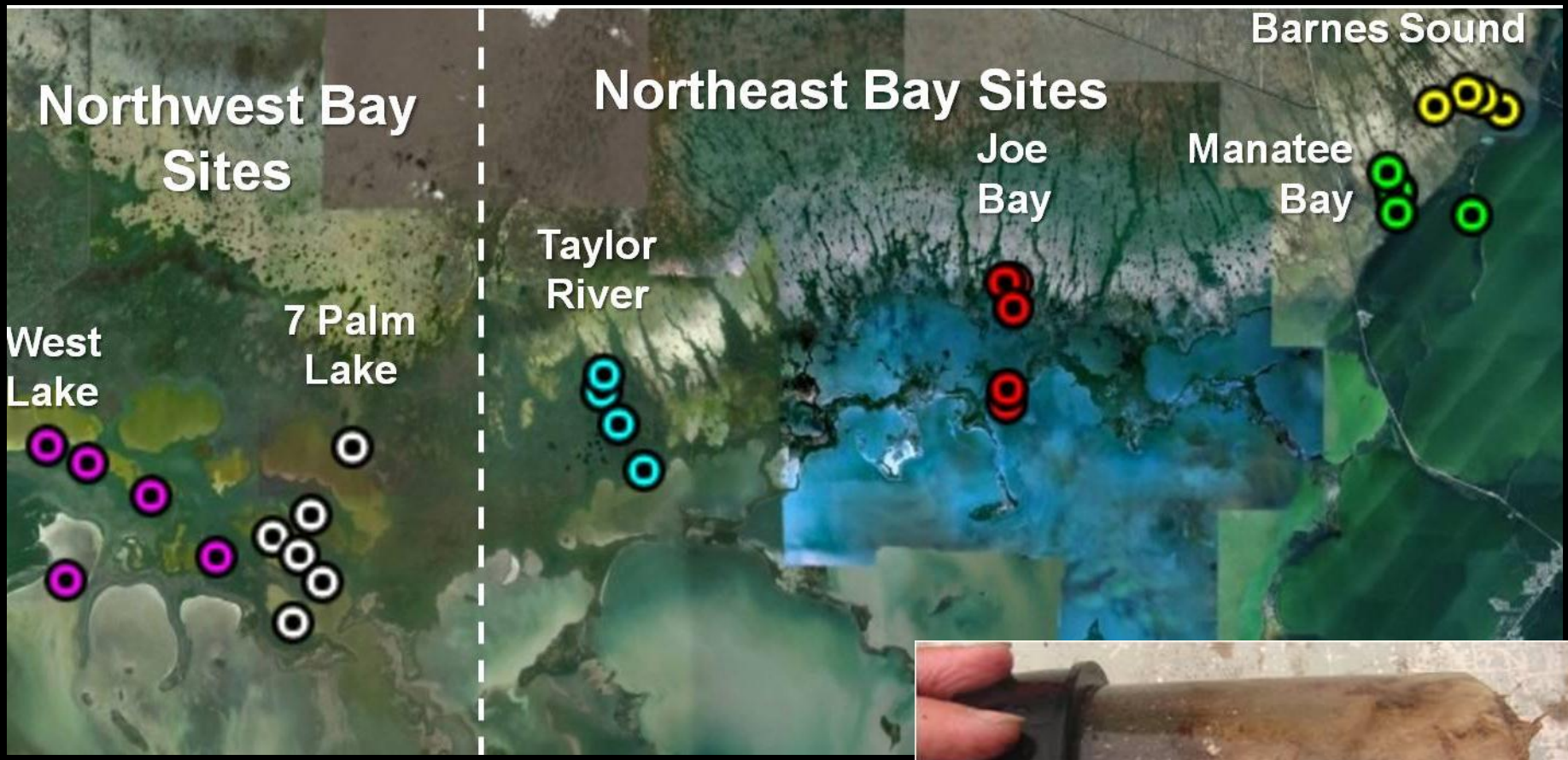
Correlations transitions to salinity parameters

	Transition				
	sd-sd	sd-sg	sg-veg	veg-veg	cr_{veg}
Salinity (psu)					
Min	-0.16	0.23	0.43*	0.62*	0.05
Max	0.26	-0.35	-0.72**	-0.65*	-0.20
Avg	0.22	-0.30	-0.60**	-0.69**	-0.14
SD	0.23	-0.31	-0.62**	-0.69**	-0.15
Fluctuations (h)					
< 12	0.21	-0.28	-0.55**	-0.68*	-0.12
12-24	0.23	-0.32	-0.63**	-0.69**	-0.16
24-48	0.26	-0.35	-0.73**	-0.63*	-0.21
48-72	0.15	-0.20	-0.37	-0.58*	-0.02
72-96	0.01	-0.02	0.03	-0.16	0.16

* $p < 0.05$, ** $p < 0.01$

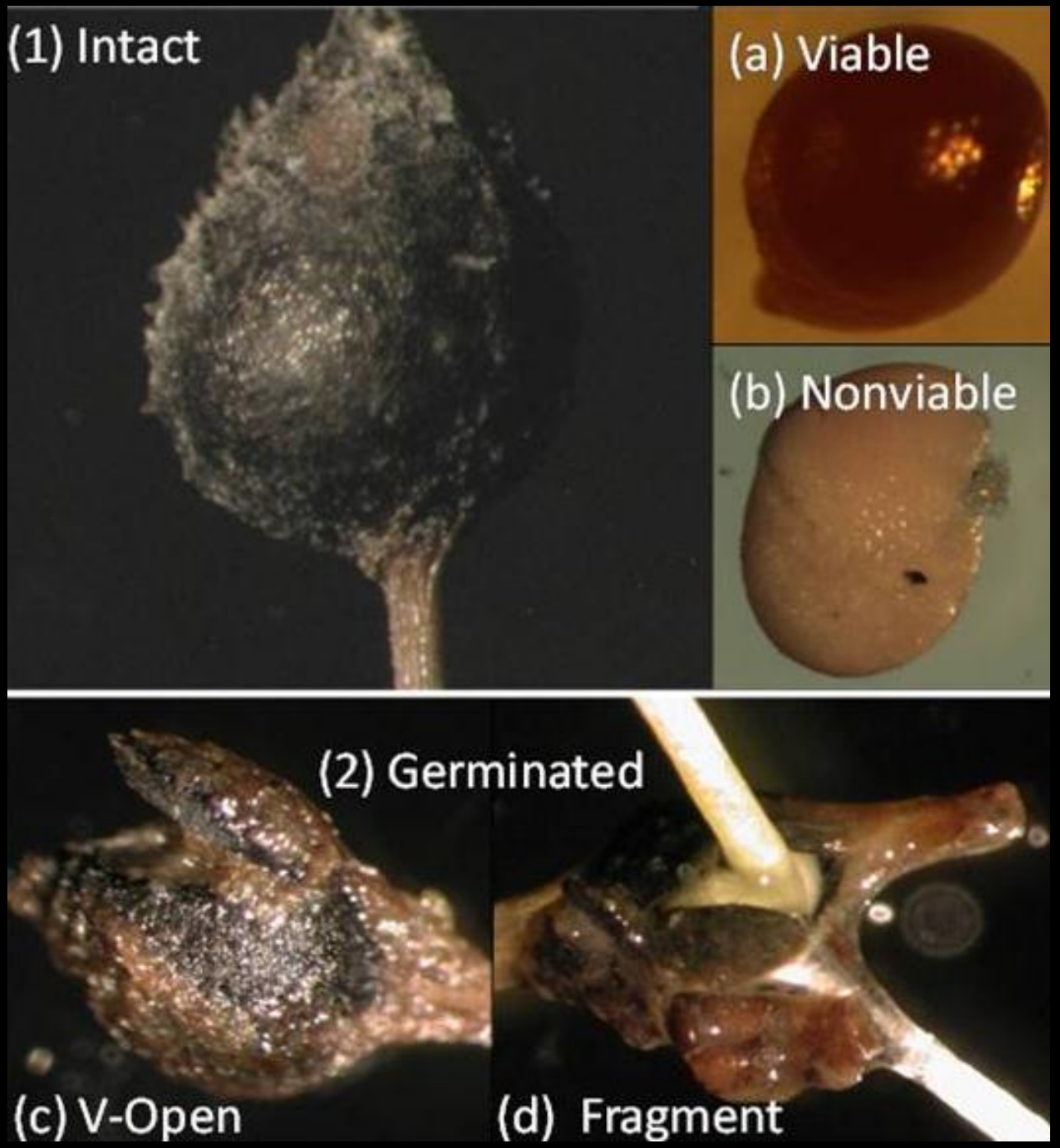
sd = seed
sg = seedling
veg = vegetative adult
cr_{veg} = clonal reproduction

II. *R. maritima* Seed Bank Study Sites

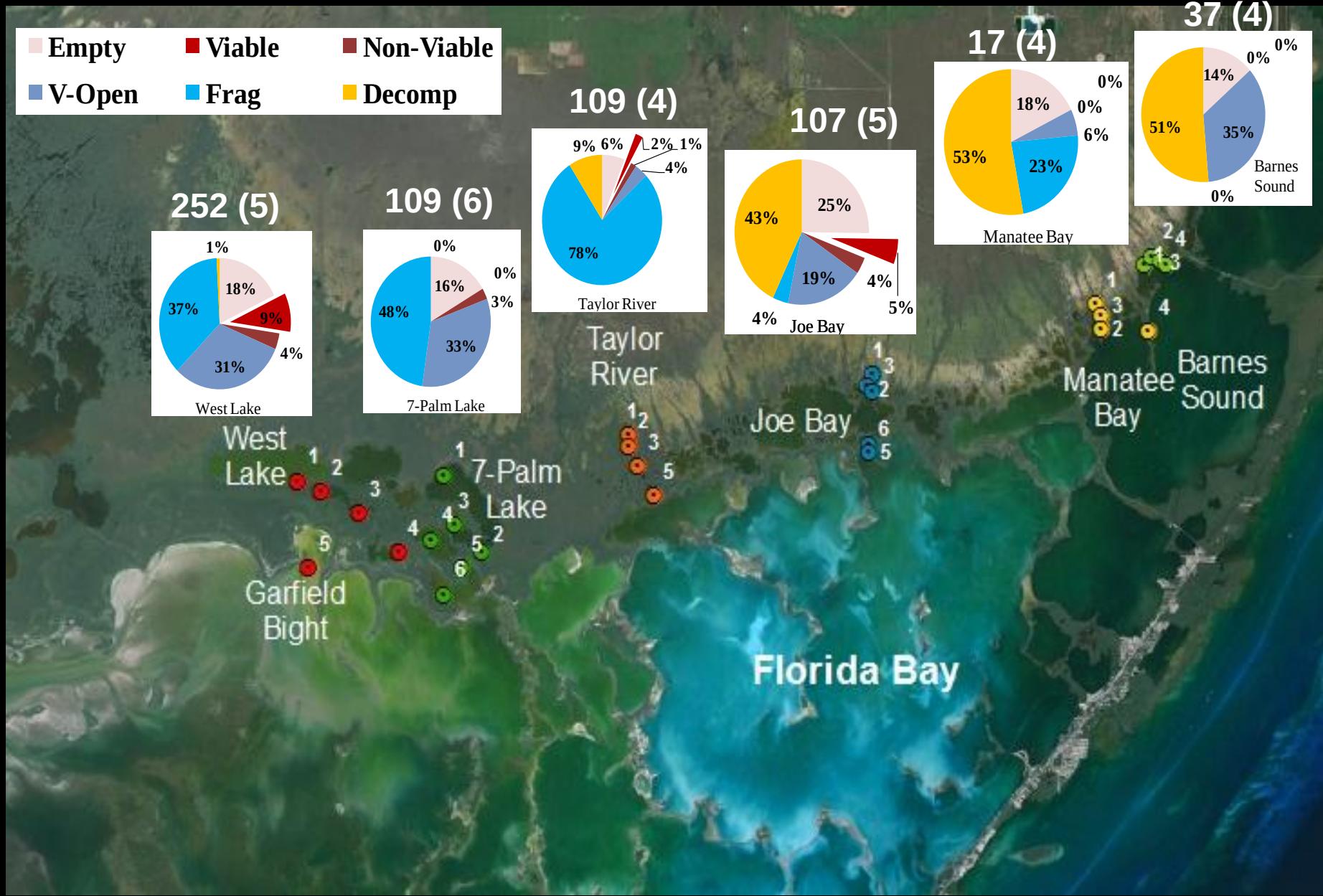


(Figure credit Google Earth®)

Seed Bank Classification



Low Seed Viability Ecotone *R. maritima*



R. Maritima Seed Densities in Reproductive Meadow

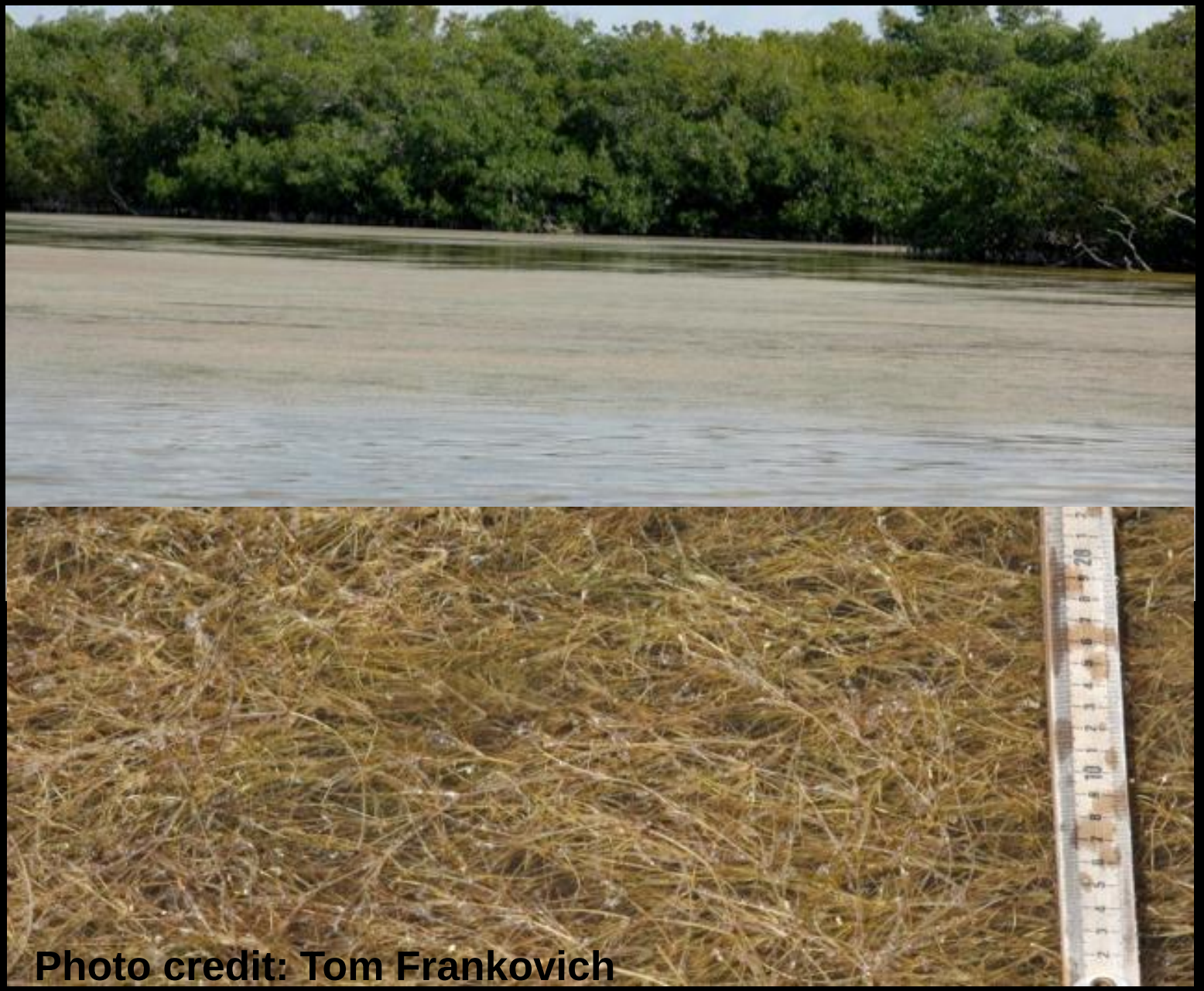
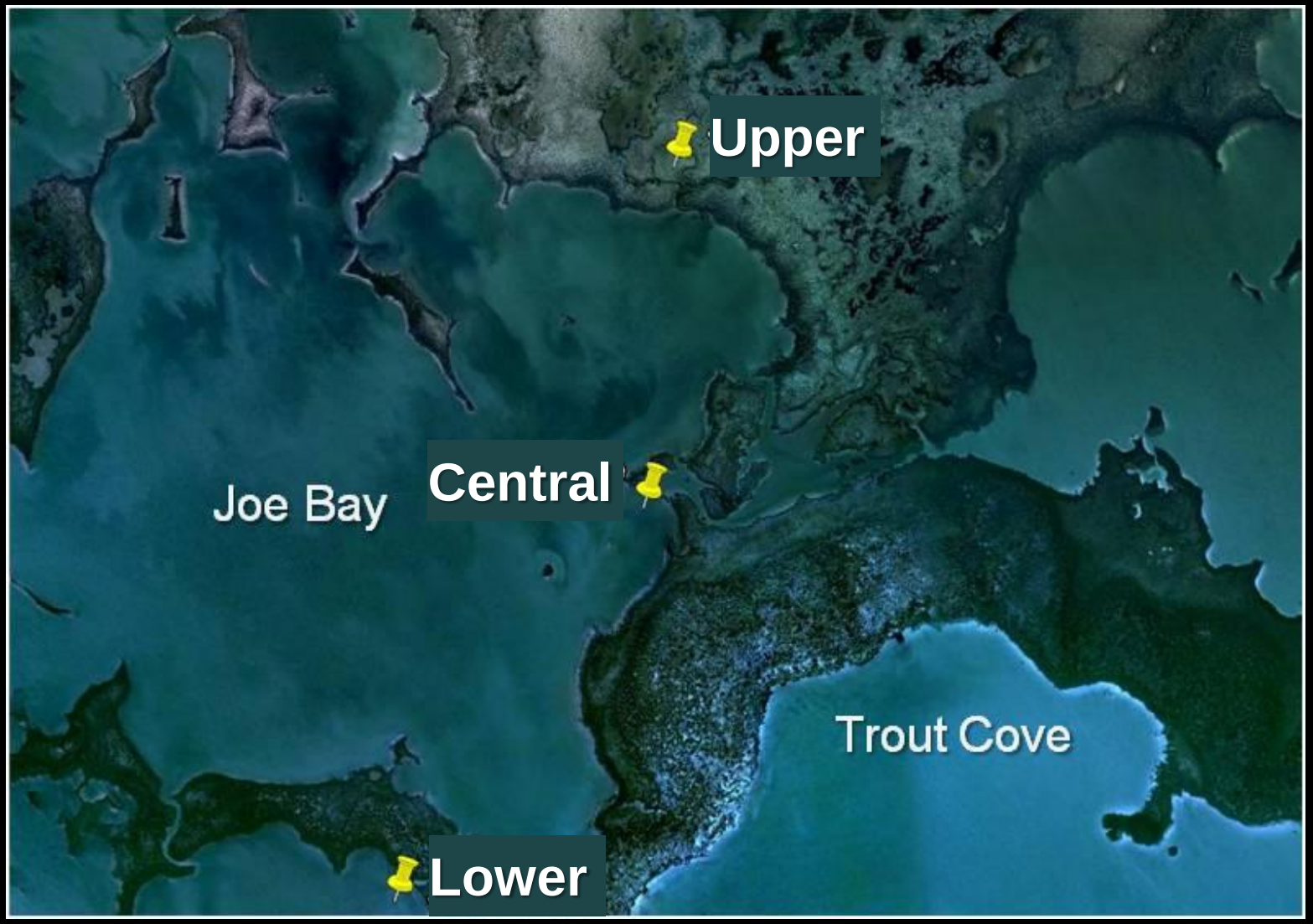


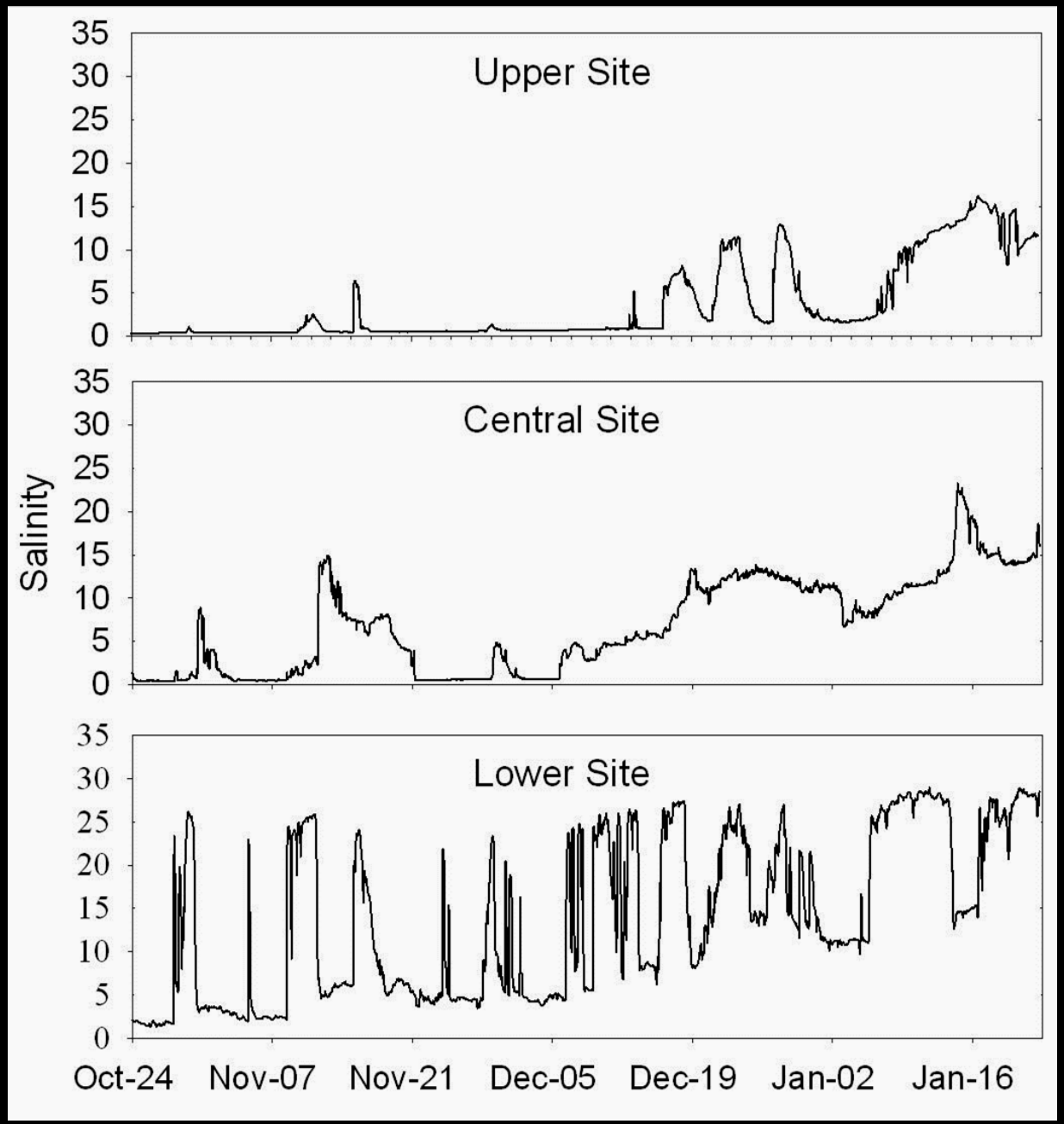
Photo credit: Tom Frankovich

III. Competition Experiment
(Joe Bay Transect)

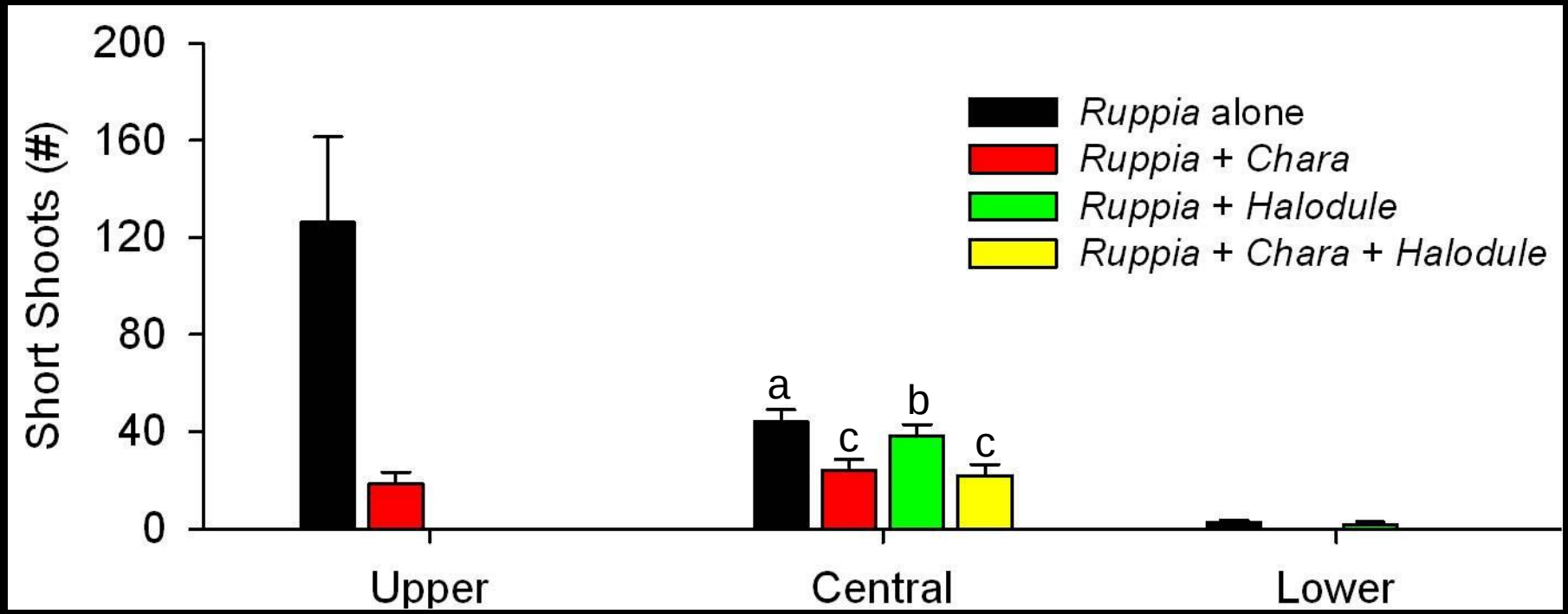


(Figure credit Google Earth®)

III. Competition Study Salinities



III. Competition Study Results



Conclusions

1. Competition limiting *R. maritima* at upper ecotone

2. Seedling and vegetative adults “bottlenecks” to life history development with variable salinities closest to FL Bay

3. Combination of salinity and competition at central ecotone

4. Small viable seed bank dependent on adult survival and sexual reproduction

5. High-density seed “hot spots” can rapidly generate a large biomass of *R. maritima* reproductive shoots, particularly in the more nutrient-rich west Bay

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Thank you!
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