

Biology of *Sesbania punicea* seed banks and control by solarization and inundation

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CHANGE THE WORLD FROM HERE



Introduction

- *Sesbania punicea* is a riparian shrub originally from South America
- Invading CA rivers and floodplains, displacing native species
- Restoration flows may spread this species



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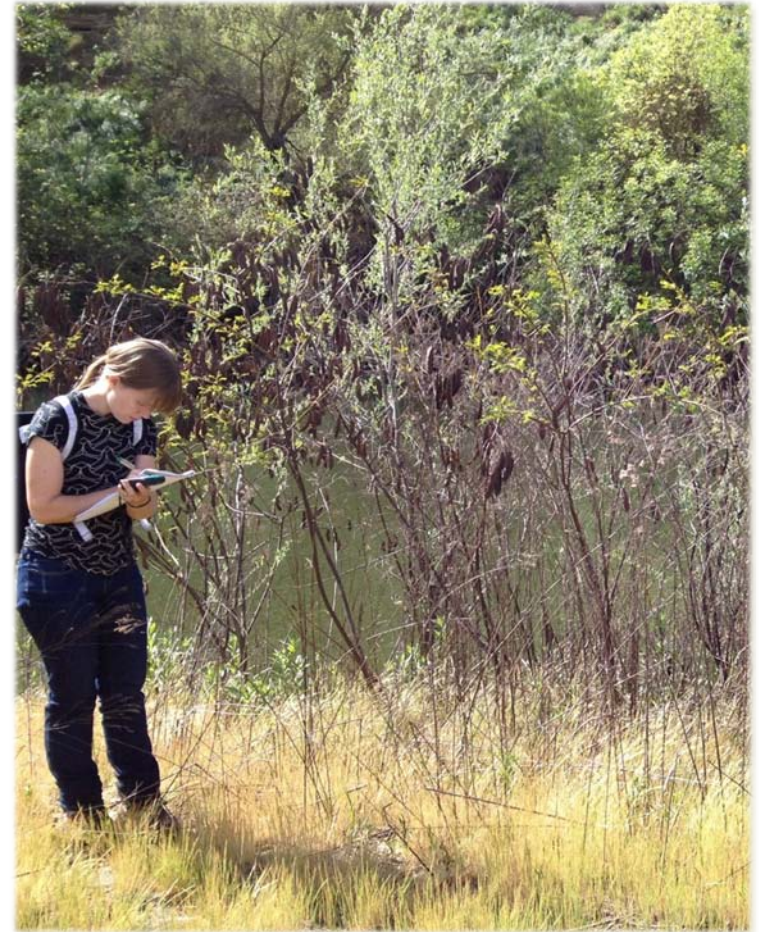
Sesbania observations over time



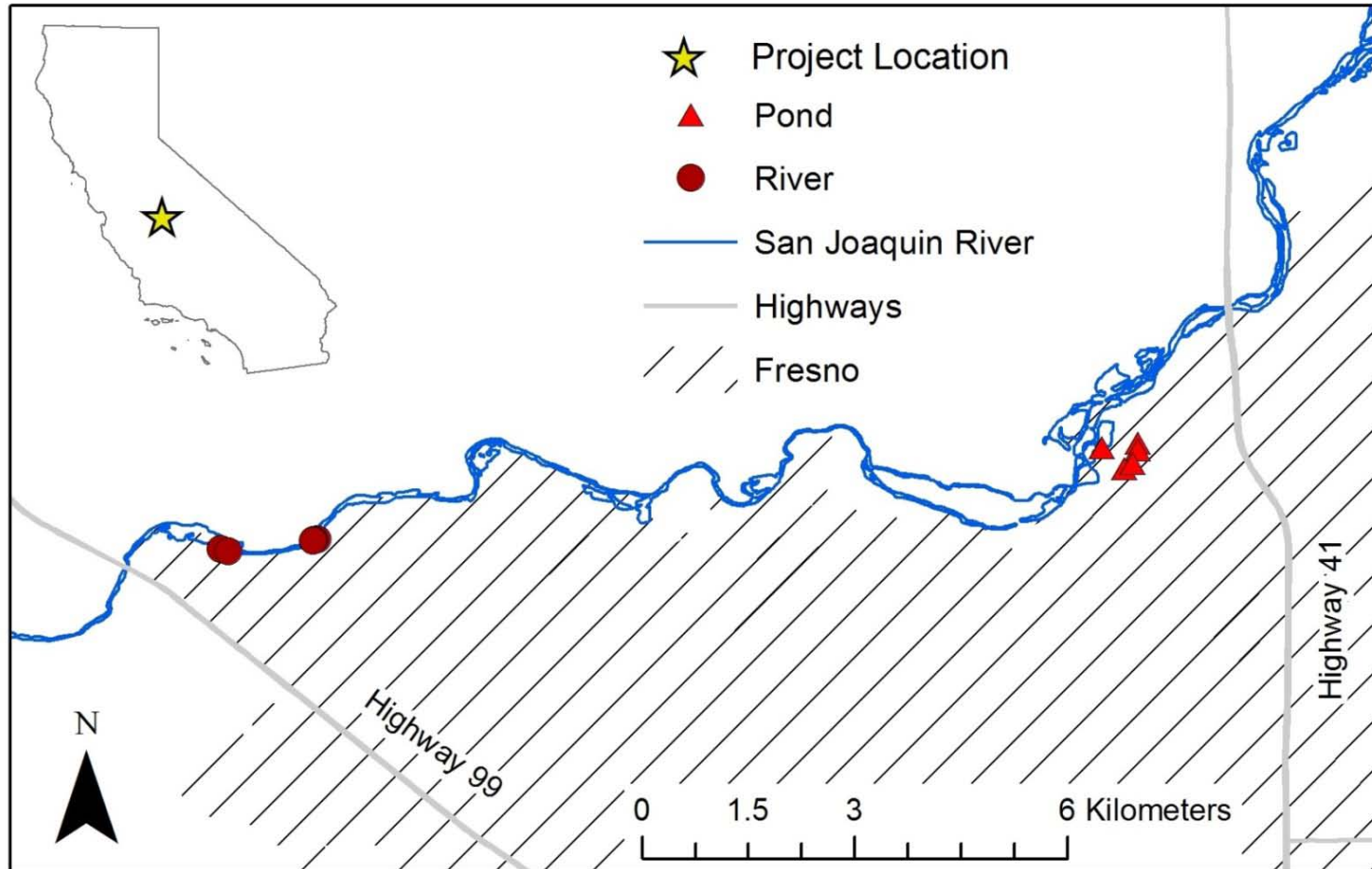
Documented *Sesbania punicea* locations
2001-2014 (data source: CalFlora Database)

Introduction

- Goals: non-herbicide control of *Sesbania* seed banks
- Field Experiments
 - Solarization
- Lab Experiments
 - Soil seed bank study
 - Thermal tolerance
 - Inundation tolerance



Study Site Locations

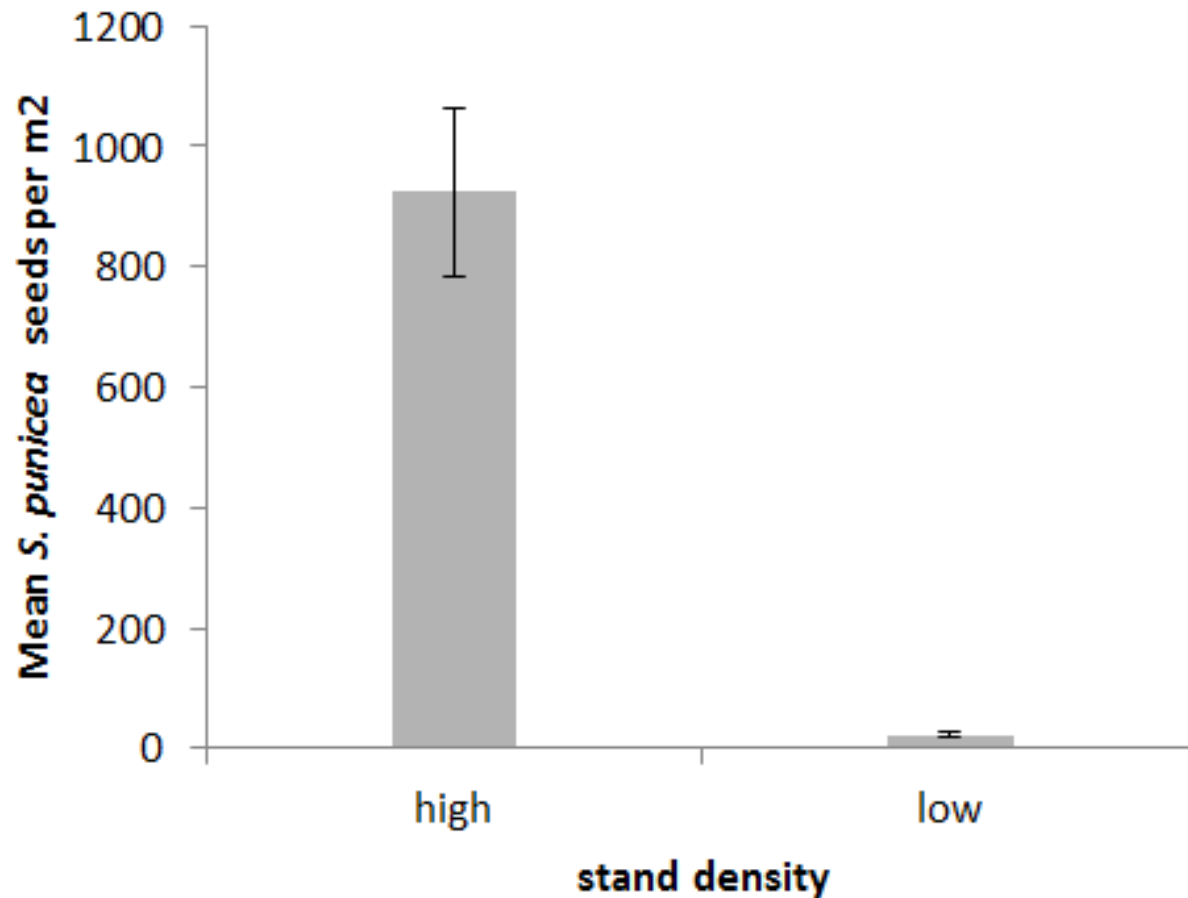


Sesbania Seed Banks



Dense, prolific stands lead to high seed abundance in the soil

Seed Bank Study



Seed Bank Results

Table 1: *Sesbania punicea* seed bank one-way ANOVA results for low density vs. high density stands.

Factor	Variable	DF	DF error	F ratio	P value
Stand density	Normal seed no.	1	84	20.623	<0.001*
	Malformed seed no.	1	29	3.446	0.074
	% Unscarified germination	1	54	9.893	0.003*
	% Scarified germination	1	53	0.789	0.379

* Significant at $p < 0.05$

Seedling Emergence Under Tarps

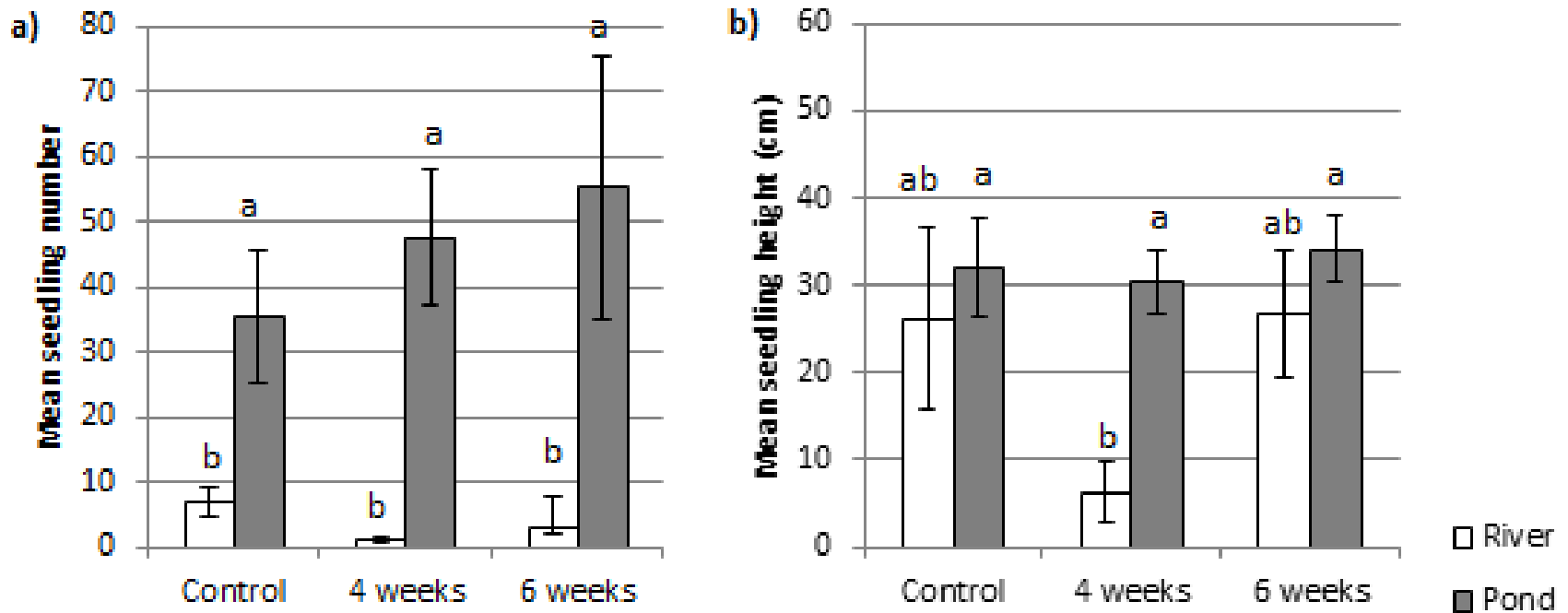


Solarization Soil Temperatures

Mean and max soil temperature (°C) (\pm SE) in solarization plots along the San Joaquin River north of Fresno, CA. Temperatures measured from Oct.-Dec. 2015 between 13:00–17:00 in the afternoon at 7 cm below the soil surface

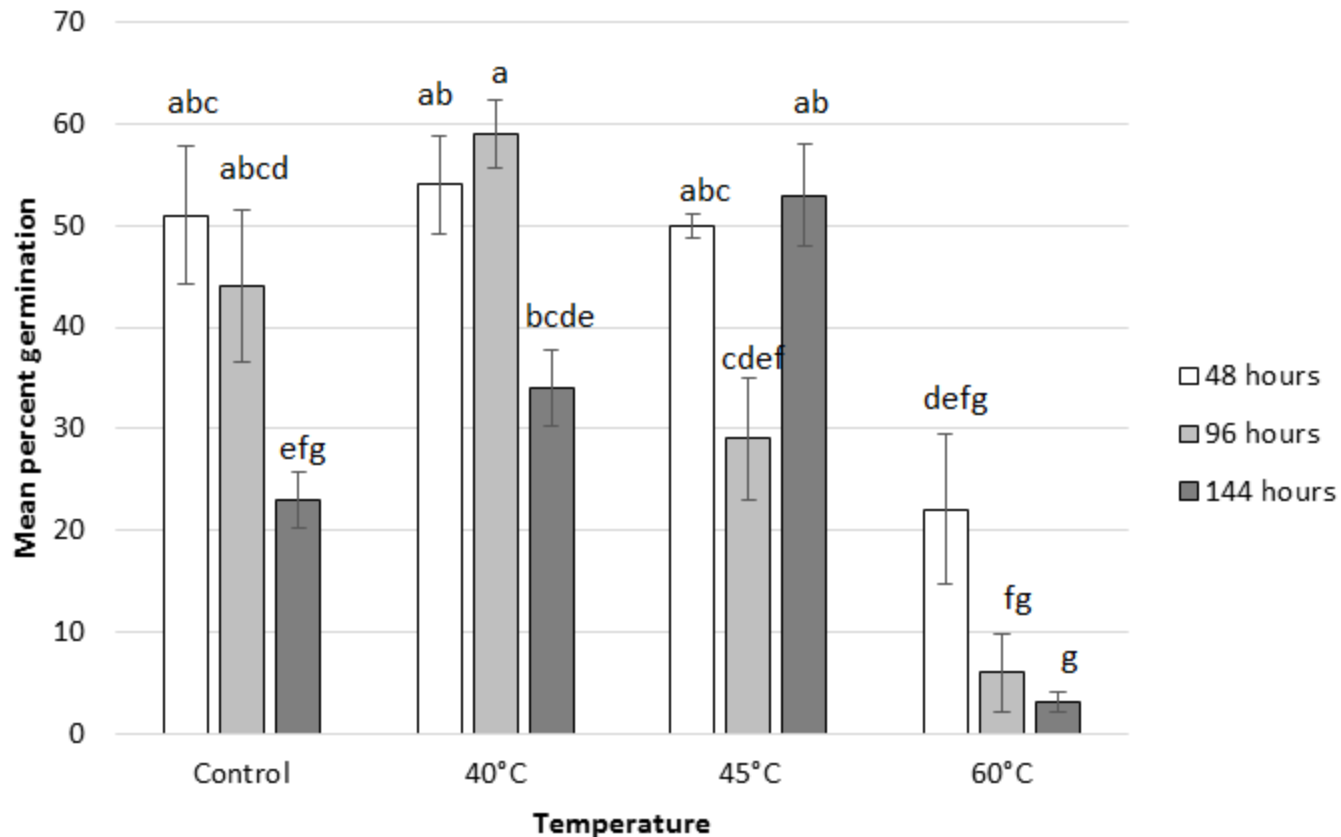
	River			Pond		
	Control	4 week	6 week	Control	4 week	6 week
Mean \pm SE	20.208 \pm 0.138	22.11 \pm 0.149	24.401 \pm 0.176	20.922 \pm 0.199	22.301 \pm 0.136	20.432 \pm 0.121
Maximum	33	33	38.5	31	31	29.5

Solarization Results



Results seven months after the start of solarization

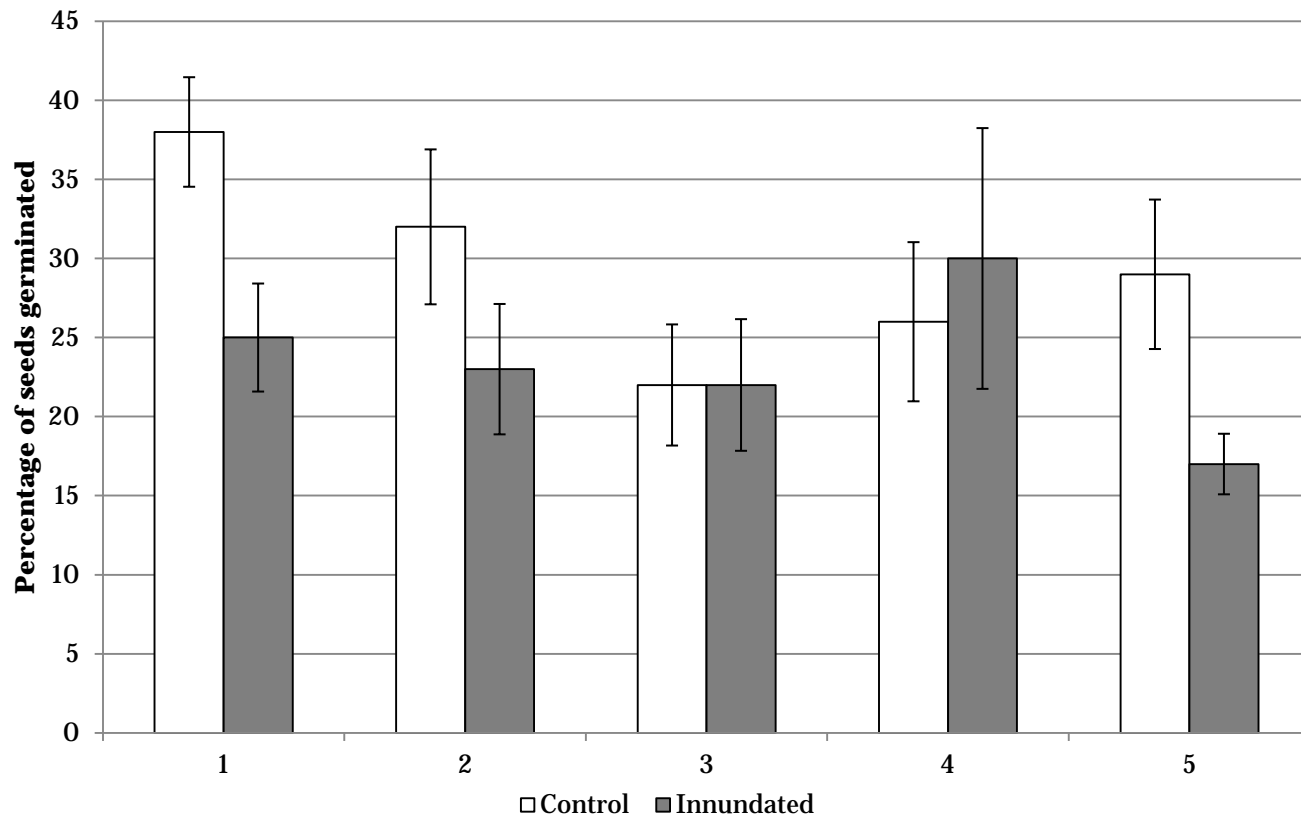
Thermal Tolerance



Mean % germination (\pm SE) of *Sesbania punicea* seeds under four temperature treatments and three durations. Columns without common letters differ significantly (Tukey $p < 0.05$).

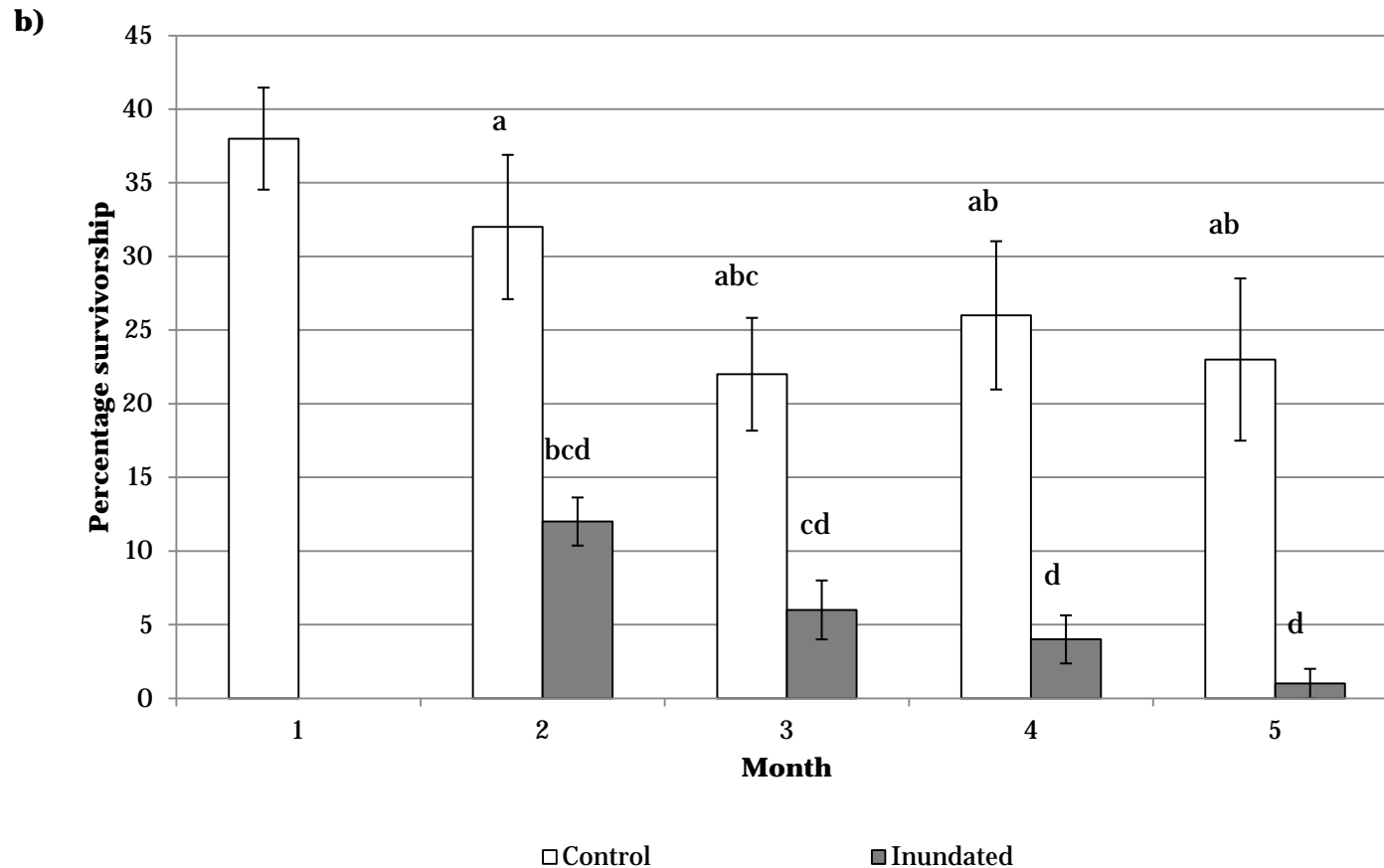
Seed Inundation Tolerance: Germination

a)



% (\pm SE) *Sesbania punicea* seed germination for inundated and control treatments

Seed Inundation Tolerance: Survivorship



% (\pm SE) *Sesbania punicea* seed survivorship for inundated and control treatments

Mature *Sesbania* and Inundation



**Mature stand after 5 months
inundation**



**Development of adventitious
roots at the waterline**

Photo: Trevor Meadows

Conclusions

- *Sesbania* has abundant, persistent seed banks which are resistant to fall solarization
- Solarization may not be a practical control method for this species
- Future research: solarization during summer months

Conclusions

- Current control method (biomass removal and herbicide) still appears to be the most effective
- Inundation may reduce seed banks, but could also lead to seed transport downstream in riverine systems
- Future research: Inundation trials in the field