

FACTORS AFFECTING ENDANGERED *SUAEDA CALIFORNICA* ESTABLISHMENT & USE IN HIGH TIDE REFUGE IN SF BAY

Kelly Santos, Melissa Patten, Peter Baye, Katharyn Boyer
Estuary & Ocean Science Center, San Francisco State University



BACKGROUND

- 90% of tidal marshes in the San Francisco Bay have been lost
- Sea levels are rising and marshes are eroding in the SF Bay
- Tidal marshes provide habitat for endangered species such as the CA Ridgway's rail and salt marsh harvest mouse. These species need to escape flood waters in marshes
- Salt marsh plants that grow large and climb can be used as high tide refuge for wildlife to escape from predation or drowning
- Suaeda californica* is one plant that grows tall and climbs. It was extirpated from the San Francisco Bay in the 1960s. Its only natural population exists in Morro Bay, CA
- Very little is understood about *S. californica* life history. If we restore this plant, we need to understand more about its recruitment and growth
- Can restoring *Suaeda californica* increase high tide refuge in marshes?**



S. californica climbing in Morro Bay

LOCATIONS



QUESTION 1: What factors affect *Suaeda californica* reproduction and establishment?

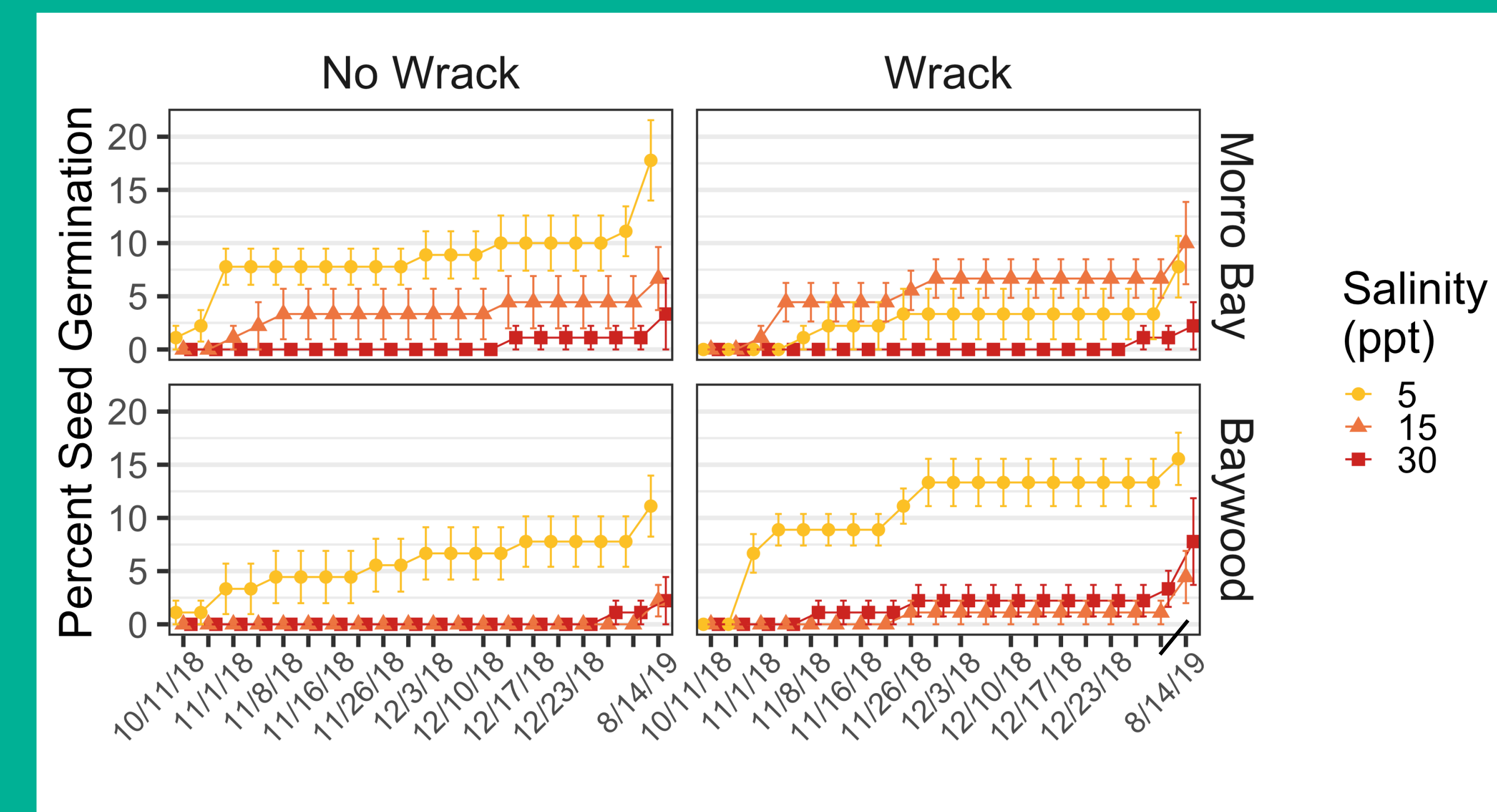
METHODS



S. californica seeds from two sites (Morro Bay and Baywood) were planted in pots at EOS Center. Pots contain a treatment of eelgrass wrack or no wrack to test if vegetation that washes ashore helps seeds germinate through the provision of nutrients or mulch.

Each pot is in a container of water with 5 PPT, 15 PPT, or 30 PPT salinity treatment to test the effects of varying tidal marsh salinity from freshwater rain events that might impact seed germination.

RESULTS



Percent germination at the Morro Bay and Baywood sites with wrack and salinity treatments. **Overall, there were low germination rates and salinity had a significant negative effect on germination ($p < 0.0001$).**

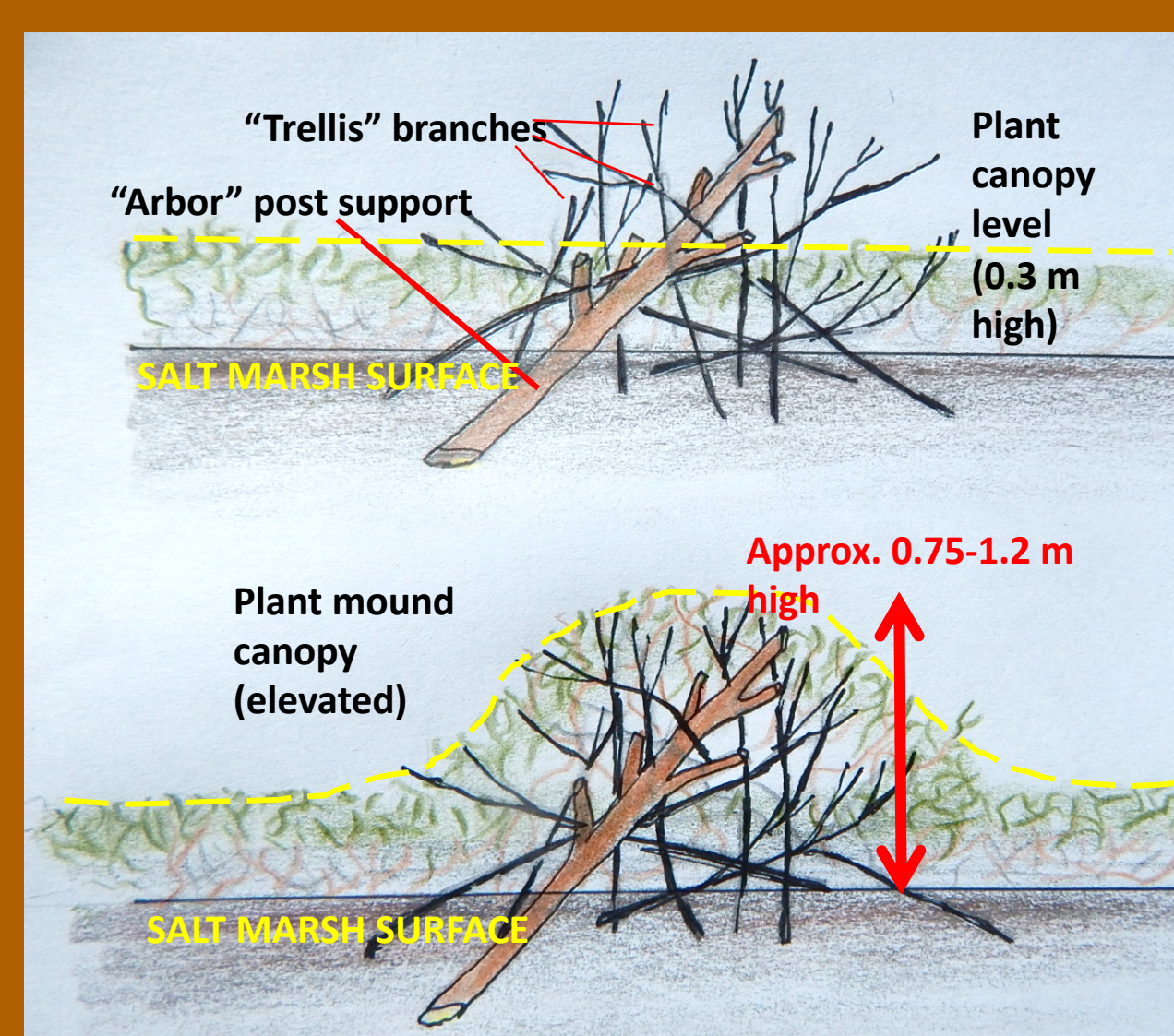
QUESTION 2: Can arbors be used to increase height growth and high tide refuge?

METHODS

- 2 transects (high & low), 32 plants (16 arbored & 16 unarbored) planted in high marsh in Blackie's Pasture in Tiburon, CA
- Measured length, width, & height of each plant



Measuring *S. californica*



Arboring technique used to increase height and branch formation
Drawing by Peter Baye

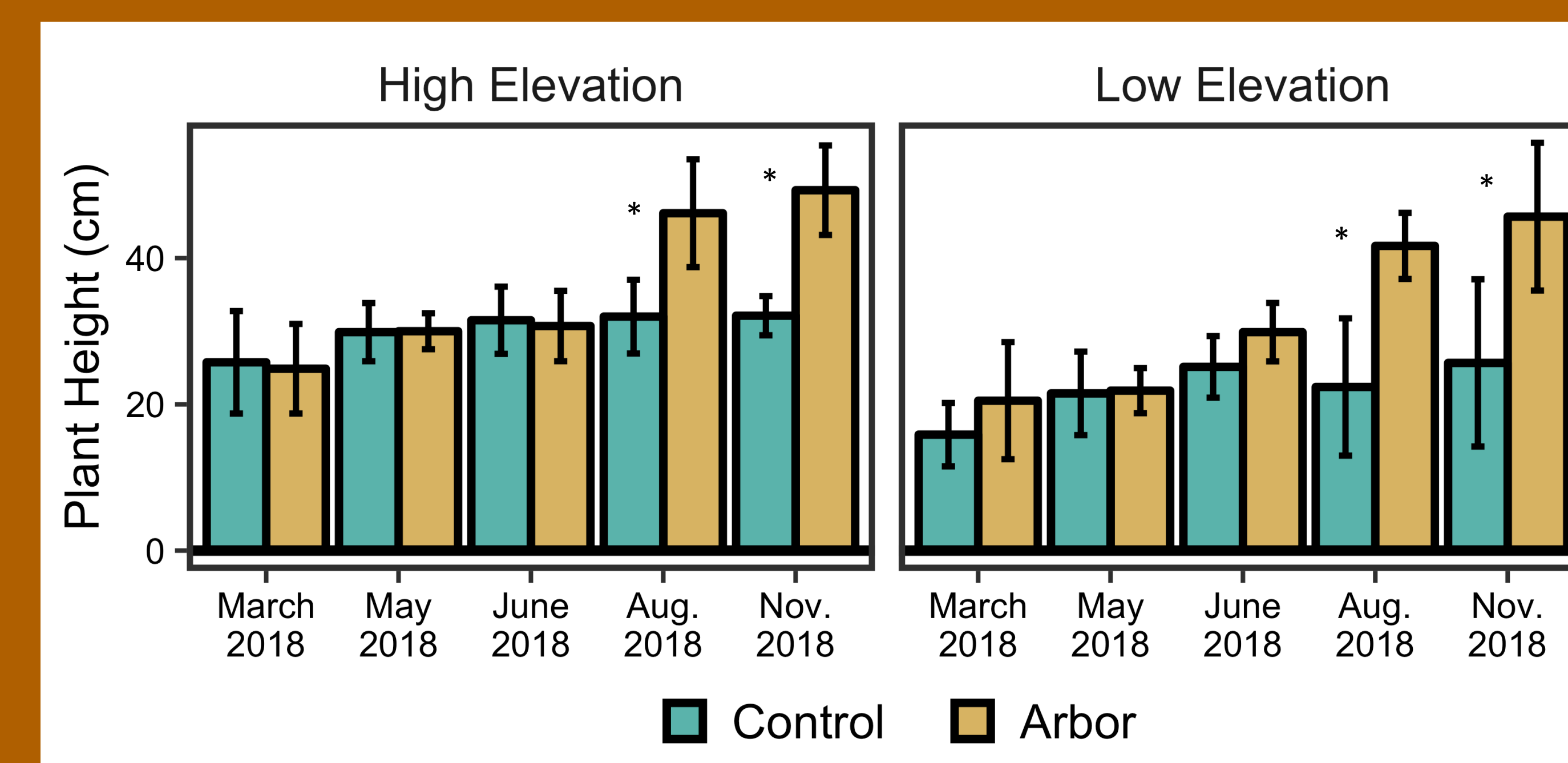


Arbored *S. californica*



Unarbored (Control) *S. californica*

RESULTS



Height of arbored and unarbored (control) plants at high and low transects at Blackie's Pasture over time. **Arbors are helping *S. californica* grow taller, especially in the high transect.** Error bars indicate 95% confidence intervals.

* Indicate significant differences between size of arbored and unarbored plants. (In the high elevation, $p < 0.01$ for Aug 2018 and $p < 0.001$ for Nov 2018. In the low elevation, $p < 0.01$ for Aug 2018 and $p < 0.05$ for Nov 2018)

POTENTIAL IMPLICATIONS

This research helps inform efforts to restore *S. californica* in the SF Bay and aid in future larger scale reintroduction efforts for this endangered plant. Understanding limitations to germination and recruitment will be important for sustaining the population. Knowing that *S. californica* seeds have a higher germination rate when exposed to fresher water conditions is important when considering site selection, weather conditions, and freshwater availability in restoration planning efforts.

With its ability to climb and grow large, *S. californica* has potential to provide high tide refuge for endangered animals such as the California Ridgway's rail, salt marsh harvest mouse, and other wildlife in the face of sea level rise.

