

A PRICKLY PAPPOSE TARPLANT SUCCESS STORY: DISTURBANCE IN THE DELTA

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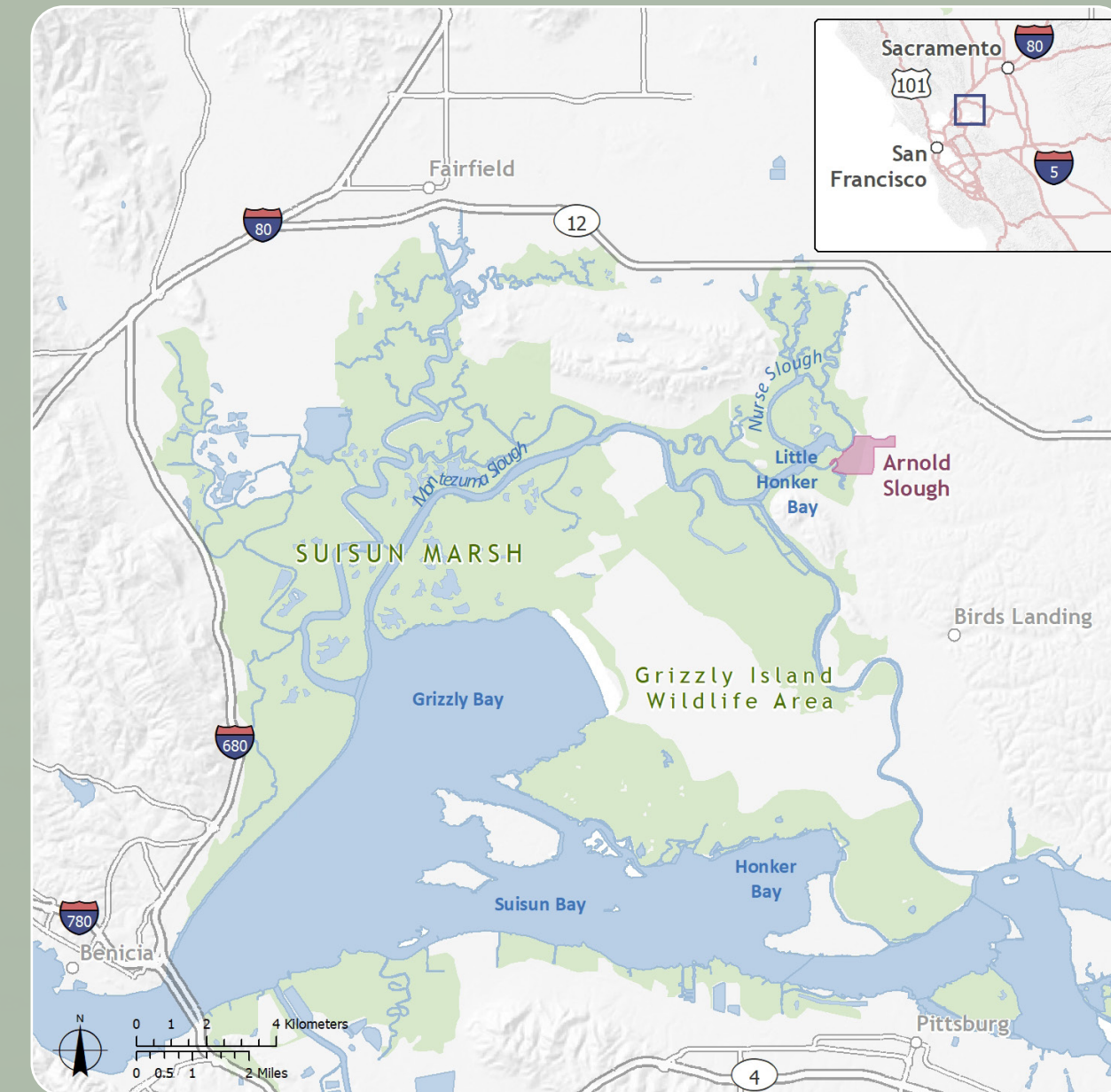


BACKGROUND

Centromadia parryi subsp. *parryi* (pappose tarplant) is a special-status annual herb in the Asteraceae family that is endemic to California with a California Rare Plant Rank of 1B.2. It occurs in coastal salt marshes and alkaline grasslands, predominantly within the San Francisco Bay Delta, Sacramento Valley, and inner North Coast ranges.



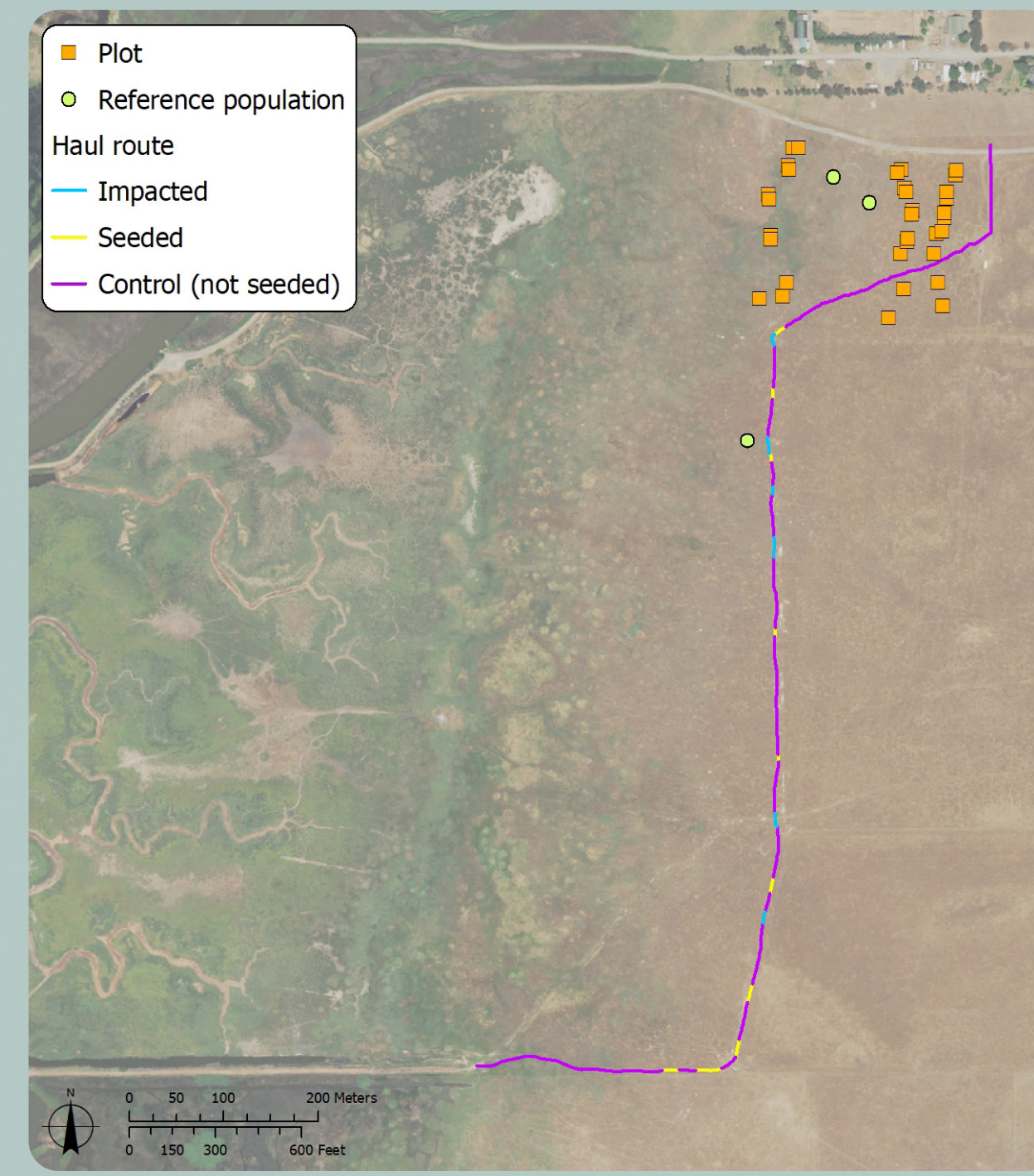
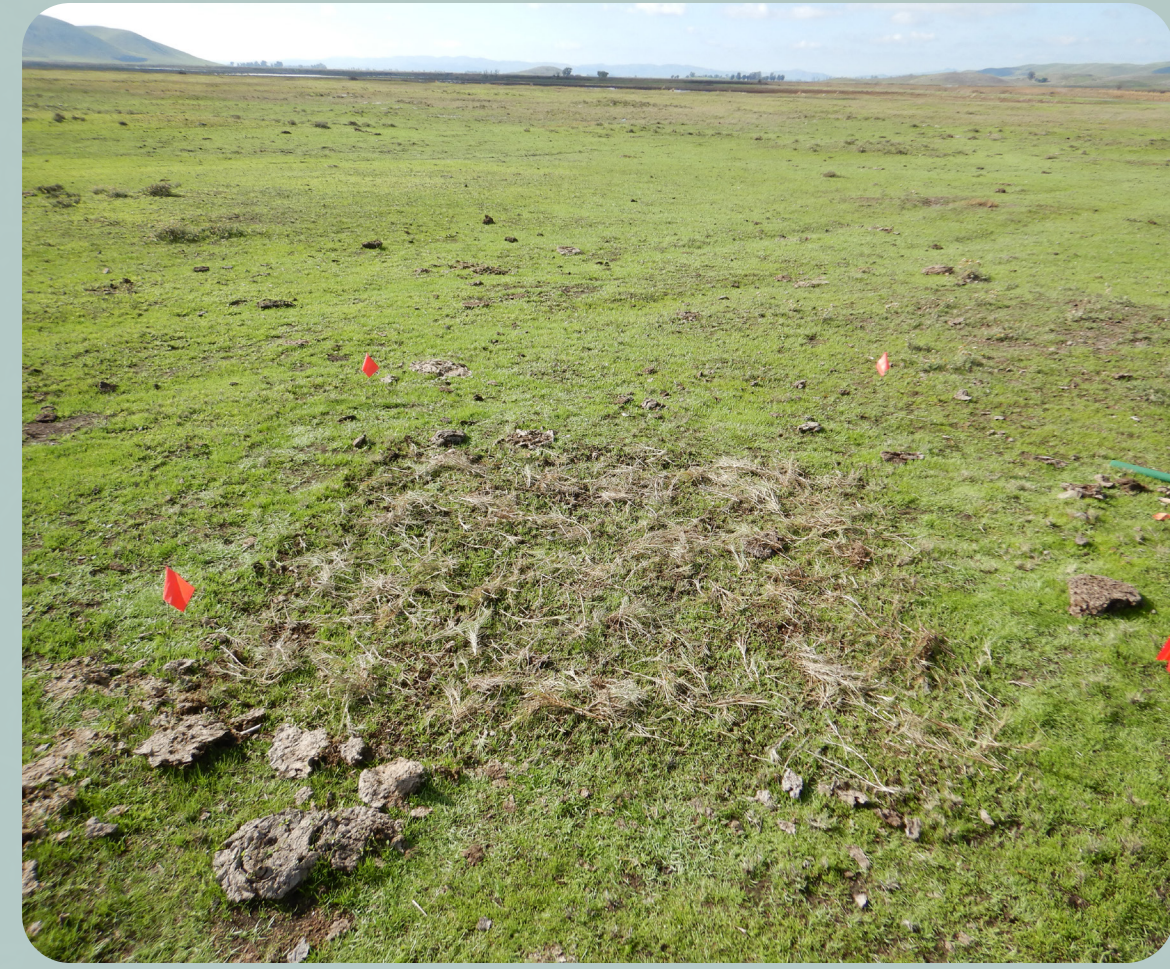
In 2021, DWR implemented the Arnold Slough Tidal Habitat Restoration Project, which restored tidal connectivity to 260 acres of high marsh, creating tidal and salt marsh habitats to benefit native species. Botanical surveys prior to construction documented over 6,000 pappose tarplant individuals within 100 acres of high marsh alkali grassland, ranging from 35 to 110 feet (ft) in elevation (NAVD88).



METHODS

Prior to project implementation, pappose tarplant seeds and plant material were collected for use in mitigation efforts. Three existing populations that were not impacted by construction were selected as reference populations to act as a control.

- 4,800 seeds were harvested from unimpacted populations throughout the site.
- 1,695 individual plants (including seed heads) were salvaged from areas to be impacted by the project's haul route.



Following construction in November and December 2021, seeds were distributed across the site, either at one of 33 plot locations or along the impacted haul route. Experimental treatments included:



- **Elevation above the existing tidal datum** to assess potential impacts of the increased tidal range expected following restoration. Plots were located within three elevation bands (10–13 ft, 13–16 ft, and 16–21 ft, NAVD88).



- **Seed preparation and sowing methodology** to assess germination requirements:
 - Seed preparation (individual seeds, whole seed heads)
 - Sowing methodology (no mulch, mulched with locally sourced mulch [i.e., shredded salt grass and pappose tarplant vegetative material]).



- **Disturbance level** to assess impacts of construction along the haul route relative to reference populations.

RESULTS

Pappose tarplant populations in seeded locations (i.e., plots and haul route) and at reference sites **consistently increased over two years of monitoring following construction**. Germination occurred at 9 of the 33 plots seeded in locations lacking the species prior to construction, with plant counts ranging from 1 to 56 individuals. Distance from the nearest pre-construction (i.e., 2021) source populations was not strongly correlated with pappose tarplant germination at seeded plots.



Elevation above the existing tidal datum

- No significant difference between elevation bands ($K = 1.18$; $P > 0.05$; Kruskal-Wallis test).
- Very weak positive correlation between elevation and count, with more germination occurring with increased absolute elevation (Spearman rank correlation coefficient 0.10).
- Populations were generally observed in vernal wet swales, suggesting microtopography may influence germination or growth.



Seed preparation and sowing methodology

- No significant difference in germination based on mulching treatment ($U = 123.5$; $P > 0.05$; Mann-Whitney U-test).



Disturbance level

- Compared to the pre-construction census, areas seeded following construction disturbance increased five times that documented at reference populations during the same time period, suggesting that **disturbance supports population growth**.

CONCLUSIONS

- Overall results indicate that with careful planning and a healthy dose of disturbance, **re-seeding suitable habitat after restoration-related construction activities can result in population increases** for pappose tarplant.
- Two years of monitoring data suggest that other factors (e.g., microtopography, interannual variations in precipitation) are more strongly linked to the species' viability at the site.
 - Neither relative elevation nor distance from the nearest pre-construction source populations were strongly correlated with pappose tarplant germination at seeded plots.
 - Application of locally sourced mulch at the time of seeding is not needed to increase germination success.
- **Drought year after outplanting could have reduced germination rates.** January 2021 – June 2021 had less than 2 inches of rain (average precipitation Jan – Jun is 15 inches).
- Incidental observations of germination occurring adjacent to plots could indicate **localized seed transport** and undetected germination.



NEXT STEPS

- Continued annual monitoring through fall 2026
- Re-census entire population and determine if overall population has shifted its elevation range in response to restored tidal regime

ACKNOWLEDGEMENTS

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