

DELTA SCIENCE FELLOW 2013



Rachel D. Wigginton

Doctoral Student

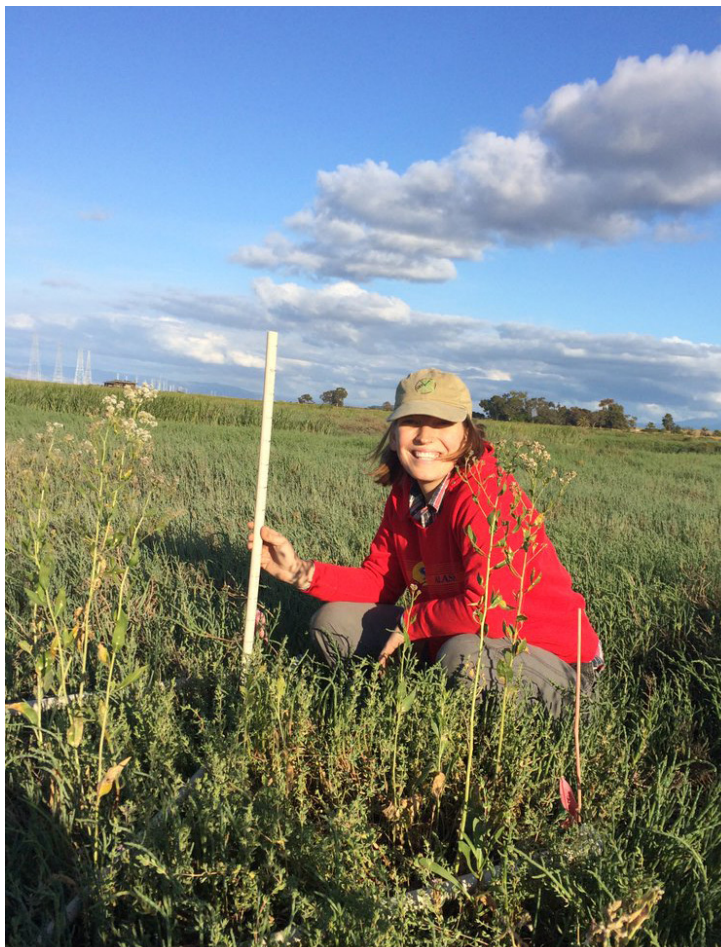
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WHY THIS RESEARCH MATTERS

There is an often evoked but less often tested concept that invasive species alter ecosystem functions. *Lepidium latifolium* is a widespread invasive plant in the Bay-Delta Estuary that potentially hampers some ecosystem functions while bolstering or having no impact on others.

L. latifolium often persists in very high densities within tidal marshes, but there is limited information on how the plant's impacts might shift as control efforts progress, stand densities change, or drought alters freshwater inputs to systems. This research seeks to fill that gap.

Examining the effects of perennial pepper weed on tidal marsh ecosystems and identifying strategies to stop the noxious weed's spread



Rachel Wigginton measures *Lepidium* stem heights in one of the marsh plots. Courtesy photo

PROJECT

The project investigated how invasive broadleaved pepperweed (*Lepidium latifolium*) alters the ecosystem functions of tidal marshes within the San Francisco Bay-Delta. Specifically, the Fellow examined which ecosystem functions are most impacted by *L. latifolium*, at what densities these patterns hold true, and how drought may impact overall *L. latifolium* densities. The Fellow tested this by comparing plots with native plant communities to invaded plots over the course of three different years during the California drought, as well as excluding rainwater from experimental plots during a single rainy season to understand how lack of rain might impact *Lepidium* densities.

RESULTS

Results showed *L. latifolium* does hamper some ecosystem functions, including soil carbon retention, while bolstering others - increasing aboveground biomass and plant species density within plots. The presence of *L. latifolium* also impacted the abundance and richness of invertebrates in the tidal marsh-terrestrial ecotone.

Stem densities varied year to year, but significantly decreased following intense drought conditions. The researcher originally hypothesized that these drought related changes in density were related to increased soil salinity after lack of freshwater rain. However, the experimental exclusion of rain from plots did not cause a significant decrease in *L. latifolium* stems, indicating that some other drought related process may be driving these density changes. Over the course of the study, the paired native and invaded plots became more similar. The decrease in *L. latifolium* stem density coincided with an increase in cover of native plants in the invaded plots. Long term transects

of invaded marsh show a decrease in *L. latifolium* stem density that has yet to recover to 2013 levels, even after the El Niño water year in 2015-2016 brought ample freshwater rain.

MANAGEMENT APPLICATIONS

This work indicates those seeking to manage *L. latifolium* should fold both the impact of annual weather and changing climate into their management strategies. Attempting to use herbicide to control *L. latifolium* might be more successful in drought years. Additionally, following the natural decrease in stem density during a drought with herbicide control could have less unforeseen consequences to native wildlife than more extreme control measures that rapidly decrease *L. latifolium* stem densities without giving native plants time to compensate. The fellow has presented these results to the Delta Science Council (January 2017) and plans to coordinate a brown bag seminar with the East Bay Regional Parks Department, which has numerous marsh sites infested with *L. latifolium*.



Researcher Rachel Wigginton takes a short break in the marsh. Invasive *Lepidium* stems and her boots are shown in the foreground, and the mid marsh extends out into the background. Courtesy photo

RESEARCH MENTOR

Ted Grosholz, Department of Environmental Science and Policy,
University of California, Davis

COMMUNITY MENTOR

Brenda Grewell, United States Department of Agriculture

SELECT PUBLICATIONS AND PRESENTATIONS

Wigginton, R.D. 2016. Understanding a Drought Induced Die-back of *Lepidium latifolium* in Invaded Tidal Marshes. Bay-Delta Science Conference, Sacramento, CA, USA. [Oral Presentation]. Public/professional presentation, 100 attendees, 2016-11-30

Wigginton, R.D. 2016. Does Drought Result in a Die-back of invasive *Lepidium latifolium* in a Salt Marsh. Western Society of Naturalist Conference, Monterey, CA, USA. [Poster Presentation]. Public/professional presentation, 75 attendees, 2016-11-11

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