Interagency Ecological Program 2023 Work Plan Element
Ecosystem Engineering Impacts of Water Primrose (*Ludwigia* spp.) in the Delta

Project Manager and Affiliation

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Principal Investigator and Affiliation

Erin L. Hestir

Annual Costs (thousands) and Funding Sources

$500 – CDFW Prop 1 funding estimate 2023; (Total budget: $952,188)

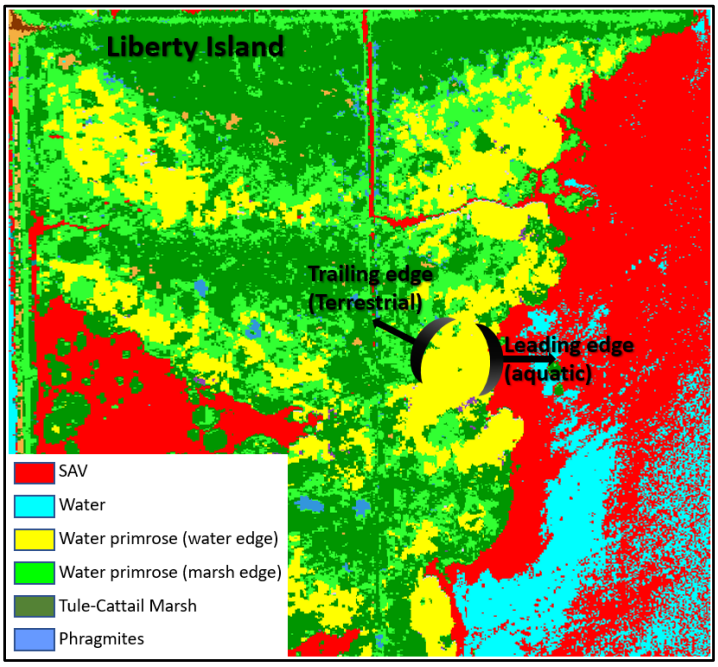

Figure 1: *Leading edge of water primrose patches at the water edge in aquatic habitat and trailing edge at the marsh edge in terrestrial habitat. The class image is from October 2019 in Liberty Island. Nine sites selected across the north-south and east-west extent of the Delta.*

Description

The goal of this project is to determine whether the growth strategy of water primrose, its allelopathic properties, or factors related to plant community structure are the cause of marsh loss following water primrose invasion in the Delta. As part of our study, we will identify and map the marshes most vulnerable to loss and quantify the spatial trajectory of marsh loss during the past 15 years. The project will collect data in the field on polyphenols to test for allelopathy, and plant traits to compare terrestrial and aquatic life forms of the species. Field,

drone, and archival remote sensing image data will be analyzed in the lab to test which of the above factors have been instrumental in the invasion success of this species.

Need

Water primrose (*Ludwigia* spp.) is a highly invasive, non-native creeping emergent macrophyte in the Delta that sends runners out on the water surface forming floating leaved mats. In recent years, water primrose has spread into marsh habitat, causing extensive mortality of marsh macrophytes, including tules and cattails. By improving understanding of the mechanisms of water primrose invasion and marsh vulnerability, our study will provide valuable information for restoring habitats in the Delta. The ultimate benefit of this work will be better understanding of the water primrose invasion processes in the Delta, which can be used to prioritize herbicide treatment of this highly invasive plant in marshes most vulnerable to invasion and with the highest habitat value.

Objectives

- Determine which water primrose functional traits such as its biophysiological characteristics (pigment, water, cellulose, lignin composition), growth rate, allelopathy, etc. are the likely cause of marsh loss in the Delta.
- Determine the effect(s) of community structure on water primrose invasion success and occurrence of marsh loss.
- Quantify the amount and spatial trajectory of marsh loss due to primrose invasion from 2004 – 2019.
- Using results from 1 to 3, identify and map the marshes that are most vulnerable to loss due to water primrose invasion in the Delta.
- Disseminate findings to relevant state agencies and additional stakeholders to ensure habitat restoration success and sustainability, and to focus resources on controlling water primrose in marshes most vulnerable to loss and of highest habitat value.

Schedule of Milestones

July 2020 – Funding contract in place
December 31st, 2020 – Site Identification

Annual and quarterly reports submitted to CDFW

Spring 2021 to Spring 2022 – Field sampling
Spring 2021 to Summer 2022 – Lab work/ data analysis
Alternate year – Presentation at IEP workshop/ Bay-Delta
Alternate year – Preliminary results shared at PWT meetings
October 1st, 2023 – Data Publishing and Reporting

On Polyphenol Sampling, plant traits, community structure, UAV, and archival RS

October 31st, 2023 – Draft Final Report
December 31st, 2023 – Final Report
December 31st, 2023 – Draft Manuscripts
December 31st, 2023 – ESRI Story Map
December 31st, 2023 – Delta-wide invasion and vulnerability map

Talk/Poster at IEP workshop/Bay-Delta – 1 per year, every year