Population Expansion and Regional Management of Red Sesbania *(Sesbania punicea)* in California

Ramona Robison, Nita Barve and Dale Pooley ▪ ICF International, 630 K Street, Suite 400, Sacramento, CA 95814 ▪ Contact: rrobison@icfi.com

Abstract

Red sesbania is an invasive South American shrub forming dense stands along California waterways. It can increase flooding, alter hydraulic roughness in shallow channels and decrease biodiversity of riparian corridors. Over the past decade, red sesbania has rapidly expanded its range in California, emphasizing the need to prioritize eradication sites at a regional scale. To accomplish this, we updated baseline location data in summer 2010 using field surveys. The regional survey identified major propagule inputs, upstream and downstream extents for each watershed, and provided data in areas where there was no previous information, such as the Sacramento River between Redding and Verona. We then employed the Weed Heuristics: Invasive Population Prioritization for Eradication Tool (WHIPPET) to prioritize individual populations for eradication. WHIPPET prioritized small populations isolated from the main infestation, as well as outliers in residential areas. WHIPPET also identified small, upstream populations along riparian corridors that act as sources for seed migration downstream as management priorities. Results from WHIPPET and expert opinion were then used to select a location for a control program. Churn Creek in Redding was selected due to its upstream location, size of infestation and engagement of community groups. Western Shasta Resource Conservation District was engaged to remove red sesbania biomass from Churn Creek and volunteer watershed groups were trained to monitor the creek in the future to look for re-sprouting sesbania plants. This type of community partnership is vital in maintaining long-term control of this highly-invasive plant.

Introduction

Red sesbania was mapped along the Lower American River in Sacramento and the San Joaquin River before 2001, and the California Department of Fish & Game (CDFG) compiled data statewide between 2001 and 2005. This study provides current regional distribution data for red sesbania occurrences in California and provides further detail on the extent and density of infestations.

2010 Red Sesbania Mapping Project Highlights

1. Sacramento River mapped from Redding downstream to Miller Park in Sacramento, not previously surveyed
2. Steelhead Creek mapped in Sacramento County, not previously surveyed
3. San Joaquin River mapped from its upstream extent to downstream extent, expanding the previous distribution in the CDFG database
4. Previously mapped locations in the Delta were verified and some locations in Solano and San Joaquin Counties were added
5. Locations on the Feather River were verified and the upstream and downstream extents were mapped to the confluence with the Sacramento River
6. Locations on the Russian, Stanislaus, Napa, and Guadalupe rivers were verified and new locations were added
7. Two historic locations in Orange County were visited and no red sesbania was found
8. Urban locations in Contra Costa County were provided by the County Agriculture Department and included in the database

Mapping Results

The extent of red sesbania was verified and expanded from existing data (CDFG, CDFA, Calflora, and Consortium of California Herbaria) from June to September, 2010 (Figure 1). For all 2010 data, density (e.g. percent cover) of red sesbania populations was recorded for all the existing and new locations as well as mode of survey. This new information may assist land managers with planning and management strategies.

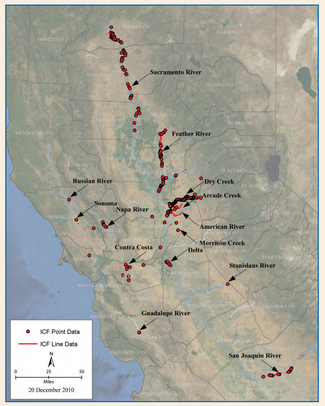


Figure 1. ICF 2010 Red Sesbania Locations

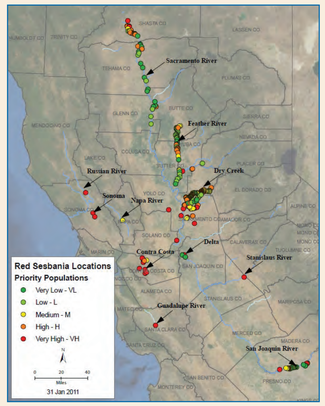


Figure 2. WHIPPET Red Sesbania Priority Scores

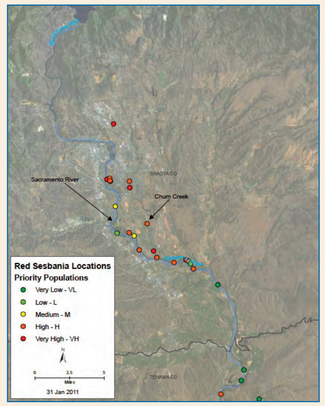


Figure 3. Churn Creek Red Sesbania Priority Scores

WHIPPET Methods

The data types collected during mapping were based on WHIPPET's input needs as well as other information useful for developing a management strategy. The GPS field data were processed using Arc GIS 9.3, priority scores were assigned for each criterion in the WHIPPET model using geoprocessing tools in ArcGIS, and the results were run through the WHIPPET Excel spreadsheet to calculate overall priority scores (Figure 2). Detailed methods are available (Robison and others 2011, Skurka Darin 2008).

WHIPPET Results

WHIPPET was developed as a population-level prioritization tool for land managers to identify areas for prioritizing weed eradication or management (Skurka Darin and others 2011). While WHIPPET was developed to prioritize populations of different species, in this study it was used for prioritizing populations of a single species. The WHIPPET model evaluated 348 red sesbania populations for eradication prioritization. Within each management unit, all populations were ranked by priority (Figure 2).

The Overall Priority Score from the tool was compared with five expert opinions to determine how closely the tool score matched the expert assessments for red sesbania populations evaluated. The expert assessments demonstrated a positive but non- significant correlation with WHIPPET results. One explanation for the discrepancy between the experts and the model is that experts did not have the level of detail for important red sesbania population factors such as propagule pressure and distance to dispersal vectors that WHIPPET was able to utilize. The experts relied upon their knowledge of weed biology and management to assign scores to the individual populations. While more subjective, this approach allowed them to consider factors such as unidirectional dispersal along rivers that WHIPPET did not consider. These differences may account for the weak correlation between WHIPPET results and expert opinion.

The major model criterion within WHIPPET were shown to be significantly and positively correlated with each other. Thus, for WHIPPET to be statistically powerful, the three primary criteria should vary independently, as was the case when the model utilized species-level and population-level criteria for several species (Skurka Darin and others 2011). The interdependence of the major criteria for the analysis of a single species indicates that only including population-level criteria in WHIPPET may reduce its power and performance. Although the model does not have a built- in directional propagule flow criteria, it did prioritize many upstream propagule sources with higher priority.

Churn Creek Management

Based on WHIPPET and expert opinions, Churn Creek in Redding was selected for red sesbania management due to its upstream location, size of infestation and engagement of community groups. ICF met with the Western Shasta Resource Conservation District (RCD) and the Shasta County Agriculture Commissioners Office (CAC) to discuss the management for red sesbania and how the treatment could be accomplished at a meeting of the Stillwater-Churn Creek Watershed Alliance. The crew of Western Shasta RCD was contracted to spray 40 acres within Churn Creek from the Victor Avenue Bridge to the Sacramento River, which they completed in August 2011. The Agriculture Commissioner's Office recommended the use of Imazapyr for treatment and the second application on the re-growth will occur in fall 2011. Funds were also made available to private landowners along Churn Creek who wanted to treat their infestations. Additionally, a program will be established where citizens and volunteers can help maintain the treated areas.

Acknowledgements

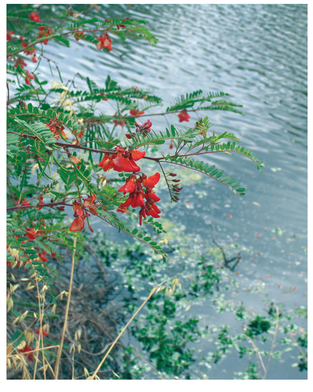
We acknowledge the American Recovery and Reinvestment Act (ARRA), administered through United States Forest Service (USFS) and CDFA, who funded this project, and Ducks Unlimited for their administrative support. We would also like to thank many local weed experts, Weed Management Areas and County Agriculture Departments for their continued assistance with the project.

Literature Cited

Robison, R., C. Owens, N. Barve, G. Skurka Darin and J.M. DiTomaso. 2011. Mapping and modeling prioritization of red sesbania *(Sesbania punicea)* populations for eradication. Journal of Environmental Management (submitted).

Skurka Darin, G. 2008. Prioritizing weed populations for eradication at a regional level: the California Department of Food and Agriculture's A-rated weeds. M.S. thesis. University of California, Davis

Skurka Darin, G., S. Schoenig, J. Barney, F. Panetta, and J. DiTomaso. 2011. WHIPPET: A novel tool for prioritizing invasive plant populations for regional eradication. Journal of Environmental Management, 92(1): 131-139.



Red sesbania plant and flowers

GET_PST_0911_0343