

The Cooperative Volunteer Invasives Monitoring Program

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Introduction

The spread of invasive species is one of the greatest challenges faced in the National Wildlife Refuge System (NWRS), impacting nearly half of the species currently listed as threatened or endangered under the U.S. Federal Endangered Species Act. In 2004, the Cooperative Volunteer Invasives Monitoring Program was launched by the NWRS to train refuge volunteers to map invasive plants on refuges. National partners include the Nature Conservancy, U. S. Geological Survey, and the National Wildlife Refuge Association. The ultimate goal of the program is to generate information which guides successful invasive plant control, especially in scenarios when resources for inventory, monitoring, and treatment are limited. One of the first refuges to participate in the program was the San Pablo Bay National Wildlife Refuge. The focus here is on invasive pepperweed (*Lepidium latifolium*) in tidal marsh of San Pablo Bay.

Lepidium latifolium

Lepidium latifolium is an invasive plant species that was introduced into the U.S. in the 1930's and is now found throughout the western United States. The US Bureau of Land Management and 10 western states classify *L. latifolium* as a noxious weed (Chen et al. 2005). It is ranked "high", a composite scoring of ecological impact, invasive potential, and distribution, by the California Invasive Plant Council (2006), and is listed among the Class B noxious weeds by the California Department of Food and Agriculture due to its highly invasive and ubiquitous nature.



Project Area

The San Pablo Bay National Wildlife Refuge is one of seven refuges comprising the San Francisco Bay National Wildlife Refuge Complex. The 13,190 acre refuge occurs in the northern portion of the San Francisco Estuary along the Pacific coast of northern California. Environments of the refuge include tidal marsh, tidal mudflat, sub-tidal open bay, and seasonal freshwater wetland.



Methods

An inventory of pepperweed was conducted during 2005. Patches were mapped using a Trimble GeoXT global positioning system and the Weed Information Mapping System (WIMS). WIMS is a relational access database that keeps track of weed assessments and treatments through time within a defined area. Weed patch characteristics that were recorded included location, vegetation association, cover class (5 classes), distribution type, and landform of where the patch was located (e.g., levee, roadside, channel edge). The data was imported to the desktop, edited, and exported into a geographic information system (GIS). Spatial patterns of pepperweed were analyzed and examined relative to other environmental layers and prioritized for treatment.



Results

Over 1,700 acres of tidal marsh was surveyed for *Lepidium latifolium* in 2005. Results presented here include tidal marsh along the perimeter of San Pablo Bay, extending from the mouth of the Petaluma River to Sonoma Creek. More than 90% of survey efforts were completed by refuge volunteers. A total of 67.91 gross acres and 30.32 infested acres of *L. latifolium* were found. The majority of patches and greatest acreage of *L. latifolium* were observed for the 51-100% cover class (Table 1). Examination of *L. latifolium* cover by tidal marsh feature showed the greatest gross acreage among patches located in the transition zone (Table 2). The transition zone here refers to areas where tidal marsh intergrades with upland. Any patch containing area within the transition zone was assigned an association with 'transition'. The highest levels of infestation occurred in the transition zone (Table 2). The lowest level was found in the marsh plain.

Management Implications

It is clear from our data that *Lepidium latifolium* is strongly associated with areas of tidal disturbance (e.g., tidal deposition areas). Fewer patches were observed in undisturbed marsh plain, suggesting these environments have lower potential for invasion. These findings, in combination with best available information on treatment methods, have been used to develop a draft control plan that will guide treatments on the refuge in 2007 and 2008. A prioritization scheme is in integral part of the process, identifying those areas which are of highest priority to treat. Among the highest priority areas are restoration sites. Our surveys showed all marsh restoration sites on and adjacent to the refuge have been invaded by *Lepidium*. Lastly, the plan outlines methods to assess different treatment options through time so that future actions are as successful as possible.

Volunteers spent over 300 hours mapping *Lepidium* on the refuge. Investment of time in training volunteers resulted in a set of data that would likely not otherwise be created given limited resources.

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Table 1. Gross acres of *Lepidium latifolium* by cover class

Cover class	# <i>Lepidium</i> Patches	Gross Acres	% of Total
<1%	14	0.7	1
1-10%	106	3.9	6
11-25%	152	10.9	16
26-50%	169	23.8	35
51-100%	98	28.6	42

Table 2. Gross and infested acres of *Lepidium latifolium* by marsh feature

Marsh Feature	Gross Acres	% of Infested Acres
Marsh plain	3.44	13.96
Sloughs and channels	12.54	18.13
Wrack line	21.23	22.34
Transition zone	30.70	53.11