Humboldt Bay Harbor, Recreation and Conservation District Permit No. 03-03

Annual Report: 2006

prepared by

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Introduction

This report summarizes the activities and accomplishments of the *Zostera japonica* Eradication Project conducted under Humboldt Bay Harbor Recreation and Conservation District Permit No. 03-03 during the period October 22, 2005 to October 21, 2006. Currently the *Z. japonica* Eradication Project employs four people, including one full time UC Sea Grant Research Associate and three part time Student Interns.

Project Background

This ongoing eradication project represents the front line of defense in California against a non-native invasive eelgrass that rapidly colonizes areas of unvegetated mudflat. Native to Asia, *Z. japonica* has become established on tidal flats from Boundary Bay, British Columbia to Coos Bay, Oregon. The only known incidence of the species in California is on Indian Island in Humboldt Bay, first detected in June 2002. After initial detection, we surveyed the perimeter of the bay and found no additional occurrences. Following consultation with a number of seagrass experts, we decided to attempt eradication.

In April 2003, under HBHRCD Emergency Permit No. E-2003-1, a team of volunteers excavated all known *Z. japonica* in Humboldt Bay. UC Sea Grant, in partnership with the California Department of Fish and Game, later acquired grant funding to hire staff specifically to address *Z. japonica* eradication. On October 21, 2003, HBHRCD Permit No. 03-03 was issued to allow continued eradication work for one year, and two 1-yr extensions for the permit have been issued since. Each year, we have intensively surveyed the shoreline of Indian Island and removed all new growth of *Z. japonica*. Additionally, we have continued to search the bay perimeter and to date have not found any other occurrences. We are encouraged by the fact that the amount of material requiring treatment each year has declined dramatically, but we are not in the clear yet. We are requesting that our current permit be extended another year to October 21, 2007.

Methods

For the work period October 22, 2005 through October 21, 2006, our objectives were:

1. Detect new occurrences of *Z. japonica* in Humboldt Bay as early as possible.
2. Eradicate all *Z. japonica* found as quickly as possible.
3. Gather data that will further our understanding of the species and help assess the effectiveness of our eradication methods.
4. Restore affected areas to pre-invasion conditions.

To accomplish these objectives, we used the following methods:

1. Staff intensively surveyed previous infestation sites along the shoreline of Indian Island at low tide from February 10, 2006 to July 14, 2006. Survey tracks were recorded using GPS.
2. The location of each *Z. japonica* patch detected was staked and recorded using GPS, and data were collected on patch meristics, including diameter and cover. A core sample was collected to determine the density of vegetative and reproductive shoots and the weight of aboveground biomass and belowground biomass.
3. All *Z. japonica* was excavated by hand using shovels. Plant material (together with mud) was placed in heavy-gauge plastic bags and transported by boat to the mainland for disposal at a landfill.
4. The location of all *Z. japonica* removed was mapped using GIS, contributing to the existing spatial database. The amount of material removed was quantified and compared to previous years.

5. To search for any other occurrences of *Z. japonica*, we conducted shoreline surveys at 105 randomly selected locations, one within each stratified 1000-meter section around the perimeter of Humboldt Bay.

Results and Discussion

We completed the third set of bay-wide shoreline surveys on October 18, 2006. We did not encounter *Z. japonica* at any new location in Humboldt Bay. The extent of the *Z. japonica* population appears to remain limited to the upper intertidal mudflats of the west and northwest margin of Indian Island (see attached map).

Early detection of *Z. japonica* is challenging because the habitat it occupies is only exposed at tides of 2.0 ft MLLW or lower, these intertidal mudflats are not easily traversed, and the very narrow blades of the eelgrass make it easy to miss. The surveys are therefore quite labor-intensive. Excavation is also labor-intensive, as the heavy bags of mud and plant material must be hauled out by boat.

This "early detection, rapid response" strategy has had promising results thus far, with an area of 284 m^2 occupied by *Z. japonica* prior to initial removal in April 2003 reduced to only 6.6 m^2 of new patches requiring removal in 2006 (figures 1 and 2, table 1). We expect the downward trend to continue with persistent eradication efforts. A scientific paper documenting the detection and initial excavation of *Z. japonica* is in press and a second paper documenting subsequent eradication efforts is in preparation. No other known attempts have been made to eradicate this species.

The benefits of our work include removal of an introduced, intertidal eelgrass, passive restoration of native eelgrass habitat, detailed mapping of *Z. japonica* removed, and monitoring of revegetation in affected areas. The mud and sand flats that we are restoring are important feeding grounds for resident and migrating shorebirds such as whimbrel, long-billed curlews, willets, and marbled godwits.

The project will be determined successful when no *Z. japonica* can be found anywhere in Humboldt Bay. Pending acquisition of additional grant funds, we will continue to monitor the shoreline of Humboldt Bay to enable early detection of any new occurrences of *Z. japonica* should they arise.

Proposed Scope of Work for 2007

All proposed work will be carried out by UCCE Humboldt-Del Norte Sea Grant staff and student interns working in partnership with California Department of Fish and Game staff. Our objectives remain the same as previously stated, and the proposed work will follow the same methods as outlined in steps 1-5 of the "Methods" section of this report, with the following addition:

6. Each staked location where *Z. japonica* was removed in 2005 will be monitored to determine which plant and algae species colonize the excavated areas.

To accomplish this important work, we are requesting that HBHRCD permit #03-03 be extended for another year to October 21, 2007.

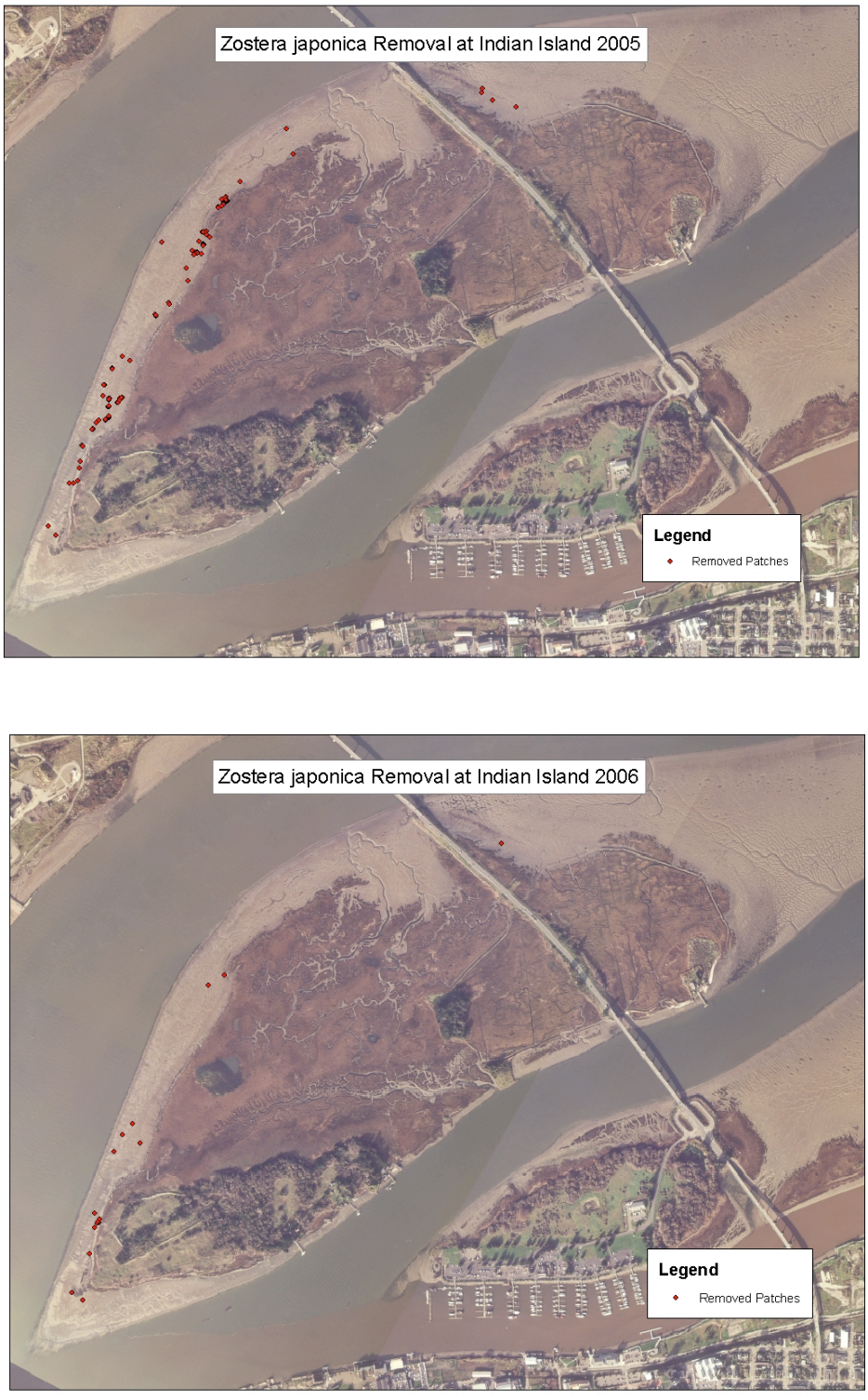

Figure 1. Areas where *Zostera japonica* patches have been located and removed on Indian Island in Humboldt Bay during surveys conducted in 2005 and 2006.