Implementation of the Oregon Spartina Response Plan in 2005
Final Report to the Oregon Department of Agriculture

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Introduction

Several *Spartina* species threaten to invade Oregon estuaries. Large populations of Spartina, spreading across thousands of acres, have altered mudflat and salt marsh habitat in multiple bays and estuaries in both California and Washington. Each year, these existing populations produce large amounts of seed that may travel via ocean currents to new safe sites and start new infestations. Pfauth et al. (2002) estimated that about 33,600 acres of Oregon estuaries are colonizable by *Spartina*. Based on an ODA-funded report (ODA 2000), *Spartina* costs are anticipated to be about $666/acre. Therefore, potential cost of a *Spartina* invasion of Oregon estuaries exceeds $22 million per year.

Resources spent on prevention, early detection and rapid response are sound investments, since infestations found early have higher chances of being eradicated or controlled, while simultaneously using fewer funds and less effort. The Oregon *Spartina* Response Plan, created by Portland State University (PSU) Center for Lakes and Reservoirs with ODA funding, stresses early detection of new infestations, rapid response to any findings of Spartina and education of the threat and potential losses so as to increase public awareness. This report describes the results of *Spartina* detection and outreach and education efforts conducted by PSU 2005/2006 project period.

Priority Tasks for 2005-2006

Task 1. Revise Spartina Response Plan

Updating of the Response Plan to reflect the scope and findings of work undertaken in the past three years is not yet complete. The draft revision (Attachment A) still requires additional editing and formatting corrections. The final revision will include:

- Update management techniques and current infestation estimates for:
  - Washington
  - California
  - Oregon
  - British Columbia
- The extent, methods and findings of surveys since 2003
- Results of the drift card study and potential dispersal ranges for propagules
- Findings and implications of greenhouse study into vegetative propagule survival
- Revision of the estimated susceptible habitat to include two categories
  - Mudflat/intertidal habitat (susceptible to S. alterniflora & S. anglica)

- Existing salt-marsh habitat (susceptible to *S. alterniflora, S. densiflora* & *S. patens*)

- Availability & revisions of *Spartina* keys, including:
  - "Key to West Coast *Spartina* Species: based on vegetative characteristics"
  - Newly developed keys for wrack identification and commonly misidentified coastal grasses

Task 2. Surveys

We surveyed all the major high-risk estuaries and creek mouths north of the Coquille River up to and including Newport between late June and early mid October (Table 1) We also surveyed the "limited at risk" creek mouths between Hunter Creek, just south of Gold Beach, and Beaver Creek, just south of Newport.

Two small populations of *S. alterniflora* were discovered during these surveys, one in Florence and the other in Coos Bay, near Barview. The sighting in Florence appears to have been re-growth from a previous infestation in the same location, which was treated between 1990-94 and deemed eradicated in 1997 after three years of surveys revealed no signs of re-growth. The regrowth found last year was one solitary clone surrounded by dense high-marsh vegetation in an area with a sandy substrate. Port of Siuslaw representative, Tom Kartrude, helped us determine the solitary clone was on private property. The owners, Don & Norma Saxon, were informed of the situation; Don Saxon visited the site with Vanessa Howard, and agreed to the clone's manual removal. The clone was dug; the soil sorted; and all material bagged and disposed of on August 19, 2005.

The Barview site is located on Oregon Department of Transportation property north of the Charleston Bridge and east of the marina. The site was a former dredge-material disposal site that ODOT graded and restored to salt marsh habitat between 1993-94. Staff at the South Slough National Estuarine Reserve conducted monitoring between 1994 and 1998. By 1996 two clones of an aggressively spreading grass were noted and samples sent to Oregon State University for identification. OSU tentatively identified the grass as *Phragmites australis,* although a definitive determination was not made due to the lack of inflorescences. Neither South Slough nor OSU informed ODA of the strange, un-identified grass. However, South Slough staff did organize manual removals in 1998, 2003 and 2004 with an Oregon Youth Conservation Crew, working under the assumption that this was an invasive bio-type of Phragmites. The plants were likely transplanted unintentionally in 1994 from native plant plugs harvested from the Siuslaw River, Port of Siuslaw property.

When we discovered the Barview site, there were approximately 60 clones (net area of 26 $m^{2)}$, spread over less than half an acre. Although we were confident of our genus-level identification, morphologically ambiguous characteristics made species determination difficult. The plants had some characteristics of *S. alterniflora* and *S. anglica*. Samples sent to UC Davis for genetic testing showed both the Siuslaw River and Barview samples were *S. alterniflora.*

Table 1: Summary of water bodies surveyed for Spartina in 2005.

Bay	Method	Time (days)	Notes
Yaquina Bay	Ground, Kayak, Scope	2	Ample roadside access to many areas. Boat launch at Hinton Point is very steep at low tide.
Alsea Bay	Boat, Ground	1.5	Ground surveys of Lint slough, boat surveys of flats/vegetation near main river channel. Smaller island tide channels very shallow – recommend kayak/canoe
Siuslaw River	Boat, Ground	2	Ground surveys of entire Port of Siuslaw property & the Saxon property. Boat/ground surveys of south river fringe marsh & south slough. South Slough is very high marsh
Umpqua	Boat, Ground	1	Smith River, East Gardiner, Scholfield Creek, The Point, scoped by boat the Henderson, Hunt, Macey and Jerden Coves (archeological sites present – do not walk w/o permission from BLM)
Coos Bay	Boat, Ground, Helicopter, Scope	2	Joe Ney Slough South of Charleston on east side of the south slough is very shallow at low tide, with very soft substrates. Recommend kayak/canoe only.
Coquille River	Kayak, ground, scope	1	Large dike breach planned by USFWS just east of the Hwy 101 bridge – 400 acres of marsh to be created from former pasture land (see attached map).
Stream Outlets	**Method**	**Time (days)**	**notes**
Beaver Creek	Ground, Scope	< 0.5	
Reynolds Creek	Scope	< 0.5	
Siltcoos River	Ground	0.5	High marsh, easy access from road. Plover habitat.
Tahkenitch Creek	Kayak, Ground	1.0	A long paddle upstream if working against the tides! Plover habitat.
Tenmile Creek	Kayak, Ground	0.5	Area west of Hwy 101, only partial survey completed – still need to survey downstream of N 43.57047 W 124.22022. Plover habitat.
Floras Creek/New River	N/A	N/A	Ground surveys not feasible due to high stream bank vegetation. Channel not deep enough to accommodate. Plover Habitat.
Euchre Creek	Ground	0.5	Coarse to sandy substrate, ample Leymus mollis
Rogue River	Boat, Ground, Scope	1	Large substrate, many channels shifted since 1997 floods, NZ mudsnails collected in filamentous green algal strands in backwater east of Wedderburn and SW of the quarry.
Hunter Creek	Ground	< 0.5	

We conducted delimiting surveys of surrounding areas and found no additional *Spartina* populations in either water body. Survey methods included ground and boat surveys in both locations, and a helicopter flight of the Coos Bay region, with the assistance of the North Bend Coast Guard. During the flight, we noted twelve suspect spots that were all later determined to be stands of *Typha*, *Scirpus maritimus*, or *Triglochin maritima.* Infestations in both places were situated in low-energy locations and neither was ever

observed flowering. It is therefore unlikely that they spread to other areas via natural seed or rhizome dispersal. We are still trying to determine if any additional plant material harvested from the Siuslaw River site was moved to any other locations.

Task 3. Outreach and Education

After finding the Spartina, we organized a "*Spartina* Training Session" in August 2005 at the Oregon Institute of Marine Biology. Despite sending notice to pertinent agencies, preserves, shellfish grows and others, no one attended. This low turnout may have been due to lack of advance notice, since we notified people by email only approximately 1 ½ week prior to the session. Additionally, the training session was scheduled on a Friday afternoon during business hours; so many people probably could not justify taking the afternoon off from work. In the future, we will aim to have evening or weekend workshops, tours or presentations.

Talks discussing the threat of Spartina and its potential dispersal from neighboring states were presented at WSU – Vancouver, the Pacific Estuarine Research Society's annual meeting, and the October Oregon Invasive Species Council meeting. Education and outreach efforts were largely achieved through the drift card study, which involved participation of more than 1,800 people – 93 of whom found cards on Oregon shores. Additionally, various CLR staff noted efforts regarding Oregon's *Spartina* management in talks to numerous agencies and public audiences.

Task 4. Drift Card Study

Monthly drift card releases, conducted for the *Spartina* Dispersal Study, concluded in August 2005. Cards were released from Willapa Bay (WB), Washington and Humboldt (HB) and San Francisco (SF) bays in California. While other infestations are known on the west coast of the United States, these three are the largest and most likely sources for ocean-transported seed into Oregon waters.

We have analyzed all the card recoveries reported as of February 1, 2006. Results are limited to cards found within one year of the release date since *Spartina* seeds are reportedly viable for that period (Pfauth et al 2003). We also limited our analysis to those cards that escaped their bay of origin since we were interested in long-distance transport of seeds. Figures 1 a-c show the seasonal ranges for recovered cards by their release location.

<u>Willapa Bay Released Cards</u> (Figure 1 a):
Local deposition was the most common recovery pattern with 87% found within 50 km of the release site. Of those cards carried further, over 84% were transported north to British Columbia or Alaska while the remaining 16% were recovered on the northern Oregon coast between Fort Clatsop and Florence. All Oregon recoveries were released between March and August of 2005 and found an average of 51 days after release. During the fall and winter months, when *Spartina* wrack containing seeds is likely in great abundances, long distance transport was exclusively northwards with the predominant California Current. The winds that normally drive the southward Davidson current in the summer months began late in 2005 and these results may therefore underestimate the frequency, distance, and/or velocity of transport south from Willapa Bay.

Humboldt Bay Released Cards (Figure 2 b):
Most recoveries (77.5% of the 620 reported cards) again occurred within the 50 km north and south of the jetty mouth. Of these, 86.4% were transported north and were found from Brookings to Fort Stevens State Park on the Oregon coastline, and in Washington, British Columbia, and even as far as Kodiak Island, Alaska. Long-distance northward transport occurred mostly during fall and winter releases (higher number of occurrences and greater velocities), but also with some spring releases as well. Oregon recoveries were found an average of 87 days after release. Cards from Humboldt Bay were found as far south as Lompoc, California. But due to the anomalous wind conditions seen last year, these results may again underestimate southward ocean transport. Of highest relevance to Oregon's preventative efforts however is the repeated demonstration of potential material transport from the highly infested and currently un-controlled *Spartina* population in Humboldt Bay.

San Francisco Released cards (Figure 3 c)
Releases from this site showed higher rates of local deposition, with less than 10% of recovered cards reported at distances greater than 50 km. Approximately 82% of long distance transport was to the north, although the extent of this transport only once reached as far as Cape Arago just south of Coos Bay. More common deposition sites included Bodega Bay, Fort Bragg, and Cape Mendocino in California and Brookings and Bandon in Oregon. Oregon recoveries were reported an average of 90 days after release and occurred almost exclusively during the fall releases.

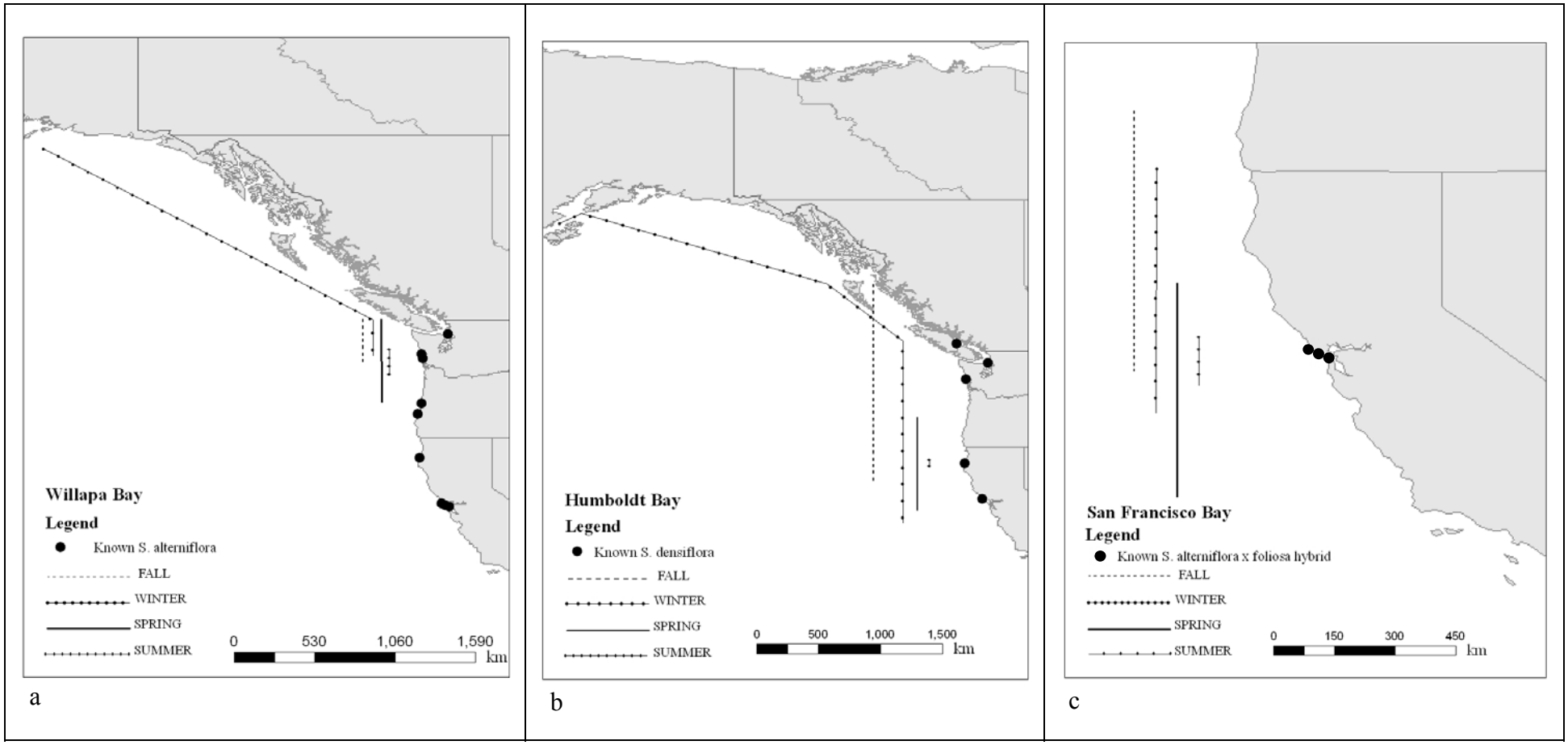

Figure 1: Distribution of recovered drift cards released from Willapa Bay, WA (a), Humboldt Bay, CA (b) and San Francisco Bay, CA (c) grouped by season of release. Fall releases performed Sept-Nov. 2004; winter releases performed Dec. 2004 – Feb. 2005, spring releases performed March-May 2005 and summer releases performed June-Aug. 2005. Each of these release locations is infested predominantly with one Spartina species. The known locations for each of these species are noted on each map. Populations in the San Francisco Bay area are represented by a single dot, but are in fact spread across much of the bay region.

Conclusions and Recommendations

The potential economic and environmental losses that could occur in Oregon if large-scale infestations became established are reinforced through continued communication with neighboring states and experience in implementing the Spartina Response Plan. The threat to Oregon's productive estuaries and bays is evident. New infestations have been noted in novel locations across the west coast, with evidence pointing to both natural transport (Gray's Harbor, Copalis River in Washington) and human-mediated movement (as in the Barview mitigation site within Coos Bay). Additionally, British Columbia is now known to have three of the four invasive *Spartina* species.

Continued early detection efforts and timely updates to the Response Plan will allow Oregon to maintain the highest level of efficacy in preventing spread when feasible, understanding likely vectors and safe sites, and mounting efficient reactions to infestations when they occur. Last year's work demonstrated that current survey methods are effective at detecting *S. alterniflora* clones, even when quite small. This is encouraging, since results from the drift card study suggest that even in years when North winds are inconsistent, seed from Willapa Bay is likely capable of reaching Oregon's coastline. The drift card study also implied that Oregon may face a higher probability of invasion by *S. densiflora* than previously recognized. The infestation in Humboldt Bay, California covers nearly 1000 acres and there are no current or planned control measures. Thus, honing our detection image and methods for this species is critical.

Recent marked improvements in treatment efficacy have been demonstrated when efforts have been unrelenting and size-appropriate. Populations in Cox Island, Willapa Bay and Puget Sound are considerably lower than they were just three years ago. However, the persistence of rhizome material for over a decade, as demonstrated in the Port of Siuslaw site, suggests that long term monitoring - far beyond the previous three-year criteria – will be critical to any control programs. Continued yearly monitoring at all known Oregon sites should therefore be planned for a minimum of ten years.

Lastly, education and outreach efforts should emphasize ODA as the lead agency on noxious weed issues. Numerous organizations and individuals failed to report to ODA when an unidentified, aggressively spreading plant was found in Coos Bay over a decade ago. Timely reporting of suspected invasives to ODA should be reinforced to such groups. Increased education and outreach efforts should aid that goal, through well-scheduled and publicized events as well as increased distribution of identification materials and the Response Plan itself.

References

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Attachment A. Draft revision of the Oregon Spartina Response Plan