

SURVEY AND CONTROL OF *SPARTINA* IN PADILLA BAY
AND SOUTH ALICE BAY, WASHINGTON, IN 2011

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INTRODUCTION

Spartina species are not native to Pacific Northwest coastal regions. They are “ecosystem engineers” that raise the mudflat elevation through slowing the water flow and resulting sediment accretion (Sayce, 1991). They are also taller than our native salt marsh species so tend to out-compete the native plants through competition for nutrients and shading (WSDA, 1993). On open mudflats there is no competition and they spread rapidly via rhizome and seed. In other locations, *Spartina* has the potential to displace shorebirds who need the open mudflat for feeding (Goss-Custard and Moser, 1988; Higman, et al. 1992). It also changes the benthic community that lives among its roots and it provides refuge for other non-native species such as European green crab (Dumbauld, et al. 1997; O’Connell, 2002; Yamada, 2001).

Spartina alterniflora was planted in Padilla Bay in the mid-1940s by a gun club that was trying to control erosion of its long, narrow island (Parker and Aberle, 1979; Frenkel and Kunze, 1984). Perhaps they were also hoping to attract waterfowl. A recent study that included examination of the gastrointestinal tracts of mallards found *Spartina anglica* seed in the gizzard but in no other organs (Johnson, 2008).

Spartina anglica is a more recent arrival, having been planted in Port Susan Bay in 1961 (Parker and Aberle, 1979). The original planting appears to have been *Spartina X townsendii*, a sterile hybrid of *S. alterniflora* and the British *S. maritima* (Parker and Aberle, 1979). *Spartina anglica* occurs through a chromosome doubling event called allopolyploidy and is a fertile plant (Thompson, 1991). It is a hardy plant in the intertidal and can produce copious amounts of seed. This plant has presumably spread by ocean currents throughout the area north of Puget Sound proper and arrived in Padilla Bay by at least the early 1990s.

We have been doing active survey and control of *Spartina* in Padilla Bay NERR since 1996. An early survey for *Spartina* was conducted by Wiggins & Binney (1987). They found 6.675 acres. A 1991 survey found a total of 12.02 acres (Riggs, 1992). Riggs (1994) also conducted a year-long study of the net aerial primary productivity of *S. alterniflora* in Padilla Bay from April 1992-May 1993. Research was also conducted that looked at the effectiveness of Rodeo® (active ingredient glyphosate) in reducing or eliminating *Spartina* (Bulthuis and Scott, 1993; Riggs and Bulthuis, 1995).

A body of research has occurred since these early studies. Simenstad, *et al.* (1996) looked at the effects of using Rodeo® and X-77® spreader to control *Spartina alterniflora* in Willapa Bay, Washington, on benthic microflora and invertebrates. Wu, *et al.* (1999) looked at the potential for using *Prokelisia* spp. as biological control agents of *Spartina anglica*. Hacker, *et al.* (2001) explored potential mechanisms of invasion and control for *Spartina anglica*. Grevstad (2002) studied the biological control of *Spartina alterniflora* using the planthopper *Prokelisia marginata*. Reeder and Hacker (2005) studied how removal regime and habitat type interact to influence removal success of *Spartina anglica*. Their experiments measured re-growth, reinvasion, and restoration potential of invaded habitats. Johnson (2008) studied spread of the plant (through DNA studies) and potential spread of the seed by waterfowl.

Washington State Department of Agriculture oversees *Spartina* control in Washington State and they distribute money for *Spartina* control to the affected County Noxious Weed Boards. The County Noxious Weed Boards have the authority to ensure that weed control is done. Funding for control of *Spartina* in Padilla Bay is from an operations grant Padilla Bay NERR receives from the National Oceanic and Atmospheric Administration (NOAA).

SURVEY AND CONTROL

Survey in Padilla Bay. Survey along the shorelines of Padilla Bay in 2011 was conducted June 27-30, July 5, 11, 12 and 14. We re-surveyed the south end of the bay on August 8, 10 and 11 to locate anything we may have missed or that had come up since the earlier survey. The locations of *Spartina* in Padilla Bay in 2011 are shown in Fig. 1. We located scattered *S. anglica*, mostly along the southern shore (2.51 m²) (see Table 1). The area we did not survey or control this year is clearly shown as a red line. This is shoreline we do not have access to without crossing private property. We also do not survey offshore mudflats and although unlikely, there is a possibility that *Spartina* could exist offshore.

Survey in Alice Bay. Because Ecology owns a portion of mudflat in Alice Bay, we surveyed Alice Bay on June 13 from the Samish Bay Sports Club cabins south and found one small clump (0.07 m²) along the channel that bisects the south end of the bay (Fig.

1). We dug the one small clump that we found on the club's islands (0.07 m²). At the North Puget Sound Task Force meeting on May 4, we requested that Skagit County Noxious Weeds work with Washington Department of Fish and Wildlife to address the remaining shorelines in Alice Bay.

Control in Padilla Bay. *S. anglica* in Padilla Bay was controlled through digging. The plants were bagged and placed above high tide or hauled out and composted. We did not find any *Spartina alterniflora* or *S. anglica* on Dike Island this year.

Control in Alice Bay. We dug and bagged the *S. anglica* in the south end of Alice Bay and on the gun club islands.

DISCUSSION

We have had recurring infestations along the Swinomish Spit, probably due to the fact that *Spartina* has not been completely controlled west of the Swinomish Channel, which has provided an ongoing seed source. The Swinomish tribe sprayed *Spartina* on their lands across the channel again this year (John Boe, pers. comm.). However, at a Skagit Marine Resources Committee meeting on September 11, Rachel Benbrook (People for Puget Sound) indicated *Spartina* was still present on the middle island west of the channel (apparently privately owned) and was in need of treatment and followed up with an email to WSDA and Skagit County Noxious Weeds. Annually, we find limited infestation at the Swinomish Gun Club property, probably due to the same seed source. We also find limited infestation in Telegraph Slough. The small infestation that we find in Big Indian Slough seems to be centered around a "hot" clone that we removed four years ago. This year we found a small sparse clone and four plants on the edge of a clone we dug the year before. Also, *Spartina* seed germinates more easily where the salinity is lower and there is a constant source of freshwater emptying into the slough so the seed, if it is present, is more likely to germinate in the slough than in the higher salinity parts of the bay.

We did not find any infestation between Indian Slough and Joe Leary Slough. However, in the mouth of Joe Leary, there was a shallowly rooted clone (1-m diameter) and three small clumps sprouting from a mostly dead rhizome mass about a meter in diameter. We did not find any infestation at the Padilla Bay Gun Club (of which Ecology

is part owner of the tidelflat) for the second year in a row. In previous reports we referred to this site as “Oswald’s property” and WSDA and/or Skagit County Noxious Weeds have referred to it as “Bayview” or “Bayview-Edison”. There was no *Spartina* found from the mouth of Indian Slough north to the West 90 (property owned by Washington Department of Fish and Wildlife). No survey was done north of the West 90 as only one seedling was found by Skagit County Noxious Weeds (Jill Eelkema, pers. comm.) in that area two years ago.

A comparison of total areas of *Spartina* in Padilla and Alice Bays since 2006 is shown in Table 2. *Spartina anglica* in Padilla Bay declined in 2007, then increased in 2008. That re-infestation was brought under control and declined in 2009 and is holding steady now.

From 2006 to 2008 the *Spartina* on Dike Island was sprayed with Rodeo® (glyphosate) and Habitat® (imazapyr). The plants were mowed to the mud no sooner than two weeks post-herbicide application to further stress the plants. In 2009, we dug any remaining plants post-herbicide application. In 2010, there were so few plants that they could be dug. Since we started control in 1996, this is the first year no *S. alterniflora* was found on Dike Island. This is likely because the root mass is storing insufficient energy to send up shoots (due to lack of aboveground growth), has decayed sufficiently to impede growth, or the soil conditions are not conducive to growth.

There has been a vast improvement in South Alice Bay due to the diligence of Washington Department of Fish & Wildlife, Skagit County Noxious Weeds, and our efforts. We sprayed the remaining infestation on the Sports Club islands in 2008 and the County did the same in 2009, and we were able to dig what we found in 2010. We found one small clump of *S. anglica* on the islands this year, and one small clump in south Alice Bay, both of which we dug (total: 0.14 m²).

Since *Spartina* infestation is still present along the bay’s shorelines, we will continue to do *Spartina* survey and control in coming years to keep the infestation suppressed. We are hopeful that with continued control of *Spartina* with herbicide by the Swinomish tribe and treatment of the “middle” island west of the Swinomish Channel that we will see a decline in new *Spartina* in the bay.

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- Spartina 2011
- Surveyed in 2011
- Not Surveyed in 2011

0 1,250 2,500 5,000 Meters



Figure 1. Locations of *Spartina anglica* in Padilla Bay and Alice Bay as surveyed in 2011.

Table 1 (continued). Area and locations of *Spartina anglica* in Padilla and Alice Bays in 2011. No *Spartina alterniflora* was found.

PADILLA BAY						
DATE	GPS	ACCURACY (+/-)	CODE	AREA (m ²)	CONTROL	LOCATION
7/5/11						Outside Sullivan Minor (tideflat), no <i>Spartina</i>
7/5/11						Sullivian Minor s to Ob Deck, no <i>Spartina</i>
7/14/11						Dike Island, no <i>Spartina alterniflora</i> or <i>anglica</i> found.
8/8/11	1		SDS	0.016	dug	Big Indian west, s of boathouse, 4 plants flowering, on edge of previously dug clone
8/10/11	2	10.2	CP	0.07	dug	Swinomish Spit, west, s of first embayment, flowering
	3	9.9	CP	0.07	dug	Swinomish Spit, north tip bay, flowers
	4	8.9	CP	0.07	dug	Swinomish Spit, east, first bay s of n tip, flowering
	5	10.3	CL	0.19	dug	0.5 m diameter, Swinomish Gun Club, n edge of salt marsh complex in west Telegraph, just n of channel that runs through marsh and back along dike. Not flowering.
8/11/11	6	10.2	CL	0.19	dug	0.5 m diameter, south Telegraph Slough, flowering.
Total				2.512		
ALICE BAY						
DATE	GPS	ACCURACY (+/-)	CODE	AREA (m ²)	CONTROL	LOCATION
7/13/11	76	12.6	CP	0.07	dug	Alice Bay, gun club island, low salt marsh area on west side of island, island closest to cabins (first north of bridge)
7/13/11	77	10.4	CP	0.07	dug	Alice Bay, west side of n-s channel. Lines up with 3rd telephone pole north of gun club gate.
Total				0.14		

Table 2. A comparison of total areas of *Spartina* in Padilla Bay and Alice Bay from 2006-2011.

	2006	2007	2008	2009	2010	2011
<i>Padilla Bay - S. anglica</i>	Area (m ²) 8.1	Area (m ²) 3.5	Area (m ²) 12.6	Area (m ²) 4.5	Area (m ²) 2.6	Area (m ²) 2.5
<i>Padilla Bay - S. alterniflora</i>	243.0	58.7	5.9	3.1	0.8	0.0
<i>Alice Bay, south - S. anglica</i>	2.6	3.7	1.3	3.0	0.1	0.1
<i>Alice Bay, islands - S. anglica</i>	WDFW*	WDFW*	11.9	Skagit Co.*	0.2	0.07

* Control work performed by Washington Department of Fish & Wildlife and/or Skagit County Noxious Weeds.