

**Final Progress Report:
Monitoring of Efficacy and Restoration of Spartina Eradication in Palix River,
Washington**

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Introduction

The Palix River Spartina meadow has spread rapidly. Based on 1993 aerial surveys, the meadow was confined to a few small patches covering less than a few acres. In 2004 the entire intertidal area was solid *Spartina*. Research plots established by WSU from 1997 through 2003 indicated that control of *Spartina* at this site was feasible using the herbicide Habitat. WSDA applied for and received an LIP grant to treat this meadow in 2004.

Application Background:

2004: WSDA treated the Palix River Spartina meadow with Habitat on 8/18/2004 and 8/19/2004 by air. The outer meadow received 6 pt/ac of Habitat + 1% Competitor surfactant and the higher inner meadow received 5 pt/ac + 1% Competitor surfactant. The application had good dry time (all > 12 hrs). Plant height was 5-6'. The canopy had fallen over and was lying down in 20 to 30% of the treated area. Plants were at full anthesis, early seed fill. Application conditions were overcast but dry.

2005: WNWR re-treated the Palix meadow using their amphibious boom sprayer and airboats with Habitat at 5pt/ac with a 3% glyphosate and 1% competitor. Also, in October 2005, WSDA crushed strips of Spartina within 4 plots to compare its effect on bird usage (if any) with adjacent non-crushed plots

Visual Observations:

2005: Based on visual observation, the overall efficacy at the site was ~ 85 to 90%. The upper region showed excellent control (95%); the low area near the river and channels showed mixed control (50 to 75%), especially along channels. Patchy control corresponded with bridge photos of plants lying down and of areas missed by the boom sprayer. There was regrowth on the edge of some of the sloughs, and the outer edge of the meadow.

2006: Overall, good control (~85 to 90%) of Spartina was achieved. However, some locations treated by hand application or with the boom sprayer demonstrated variable control due to unknown factors.

2007: Little Spartina remains, other than spots that were skipped or only partially treated in 2006.

Methods

Spartina Assessment: On July 7, 2006, stem and seedling density data were collected from six transects located along the south and west banks of the meadow and headed inward toward the center of the meadow. These transects were the same ones used in 2005. Each transect was approximately 500' long with 20 quadrats collected per transect (one every 25'). GPS start points and transect directions are noted in Table 1. All quadrat data (stem density, seedling number, native plant species) were collected using a 0.25 meter square along the transect.

Migratory Shorebird and Waterfowl Survey: Visual observations of shorebird and waterfowl usage were conducted during fall 2005, spring 2006, summer 2006, fall 2006, and spring 2007. The two spring observation days, April 28, 2006, and May 12, 2006, were timed to coincide with the peak migration period. Bird usage was determined using a spotting scope and binoculars at five locations of approximately one hectare each within the meadow. Each site was observed for 10 minute counts, which coincided with tidal periods 0.25-1 hour prior to tidal submergence or after tidal withdraw.

Results and Discussion

Spartina Control:

In 2005, seedling density ranged from 0.45 to 18.3 with an average of 4.3. In 2006 and 2007 the average was 0 and 0.3, respectively (Tables 1, 2 and 3). The initial pre-count stem density at this site, based on previous experiments, was above 50 to 60 stems per 0.25m². In 2005, stem density post treatment averaged 2 stems per 0.25m², while in 2006 and 2007 stem density numbers were 2 and 1.2 per 0.25m², respectively. The percentage of *Spartina*-free quadrats in 2005 increased from just 36% in 2005 to 73% in 2006, and to 86 in 2007.

Native Plants: No native marsh plants were observed within any of the quadrats during the 2005 survey. In subsequent years native marsh plants increased slightly (Tables 4 and 5). There appeared to be a slight effect of crushing on native plant density in 2007 (Table 3), but this difference is not biologically significant.

Table 1. *Spartina* monitoring assessment of Palix River meadow, June 2005

Site (GPS / Transect direction)*	Seedling density (#/0.25m ²)	Stem Density (#/0.25m ²)	% <i>Spartina</i> - free quadrats
# 1 (N 46.36.912/W123.55.056/Northeast)	3.6	2.6	0
# 2 (N 46.61572/W123.92213/Northwest)	18.3	0.84	0
# 3 (N 46.61887/W123.93588/North)	1.75	0.05	45
# 4 (100' east of #5/Northeast)	0.23	0.15	69
# 5 (N 46.62614/W 123.94058/Northeast)	0.45	0.35	75
# 6 (N 46.37.567/W 123.56.433/East)	1.8	8.3	25
Average	4.3	2.0	36

Table 2. Spartina monitoring assessment of Palix River meadow, July 2006

Site (GPS/Transect direction)*	Seedling density (#/0.25m ²)	Stem Density (#/0.25m ²)	% <i>Spartina</i> - free quadrats
# 1 (N 46.36.912/W123.55.056/Northeast)	0	2.05	80
# 2 (N 46.61572/W123.92213/Northwest)	0	3.74	60
# 3 (N 46.61887/W123.93588/North)	0	1.35	75
# 4 (100' east of #5/Northeast)	0	1.2	90
# 5 (N 46.62614/W 123.94058/Northeast)	0	1.35	80
# 6 (N 46.37.567/W 123.56.433/East)	0	2.85	55
Average	0	2.09	73

Table 3. Spartina monitoring assessment of Palix River meadow, July 2007

Site (GPS/Transect direction)*	Seedling density (#/0.25m ²)	Stem Density (#/0.25m ²)	% <i>Spartina</i> - free quadrats
# 1 (N 46.36.912/W123.55.056/Northeast)	1.1	2.5	73
# 2 (N 46.61572/W123.92213/Northwest)	0.2	1.8	86
# 3 (N 46.61887/W123.93588/North)	0	0.6	93
# 4 (100' east of #5/Northeast)	0.2	1.3	87
# 5 (N 46.62614/W 123.94058/Northeast)	0	0	93
Average	0.3	1.24	86

Table 4. Effect of post-treatment crushing on mudflat vegetation

Treatment	Vegetation cover of Palix River Spartina control site on 7/18/07 (# plants/0.25m ² - mean / standard error*)							
	Pickle weed	Arrow grass	Brass buttons Cotula coronopifolia	Spergularia seedlings	Spergularia mature plants	Spartina Seedlings	Spartina Stem established plants	% vegetation cover all species
Crushed	2.95	1.32	0.23	0.09	0.82	0.43	1.70	10.23
	1.50	1.14	0.23	0.06	0.51	0.25	0.73	3.23
Not Crushed	0.61	0.00	0.00	0.00	0.23	0.10	0.65	4.03
	0.35	0.00	0.00	0.00	0.12	0.10	0.45	1.47

*Standard error is below the mean in each data box.

Table 5. Number of native plants found in quadrats in 2005, 2006 & 2007

Native Plants	Pickleweed <i>Salicornia pacifica</i>	Sea Arrow Grass <i>Triglochin maritimum</i>	<i>Spergularia canadensis</i>
2005	0	0	0
2006	9	1	0
2007	15	3	8

Bird usage: Bird usage in the Palix meadow increased dramatically following the *Spartina* control (400 fold increase) Ground bird surveys in the spring of 2005 yielded no shorebirds or waterfowl present, while the aerial survey (spring 2005) showed a very small number of shorebirds and waterfowl. However, shorebird surveys of the Palix River in 2006 and 2007 show a marked increase in shorebird usage (Figure 1). Crushed areas of *Spartina* initially demonstrated a higher usage of shorebird foraging than non-crushed areas, but after 18 months there were no treatment differences (Figure 2).

Conclusion: Our results definitively prove that shorebirds will utilize *Spartina*-covered tideflats within one to two years following a success control effort. These data confirm results previous obtained in Willapa Bay following a *Spartina* control effort (Patten and O’Casey, 2007) and elsewhere (Evans, 1986). Crushing appears to provide an initial boost in shorebird utilization in the year following treatment. By year two there is no difference in shorebird utilization between crush and uncrushed sites. This is similar to our results obtained with tilling at Porter Pt. Willapa Bay (unpublished data). During the time course of this study, crushing also did not appear to provide any advantage in removing all *Spartina* from within the treatment area compared to not crushing.

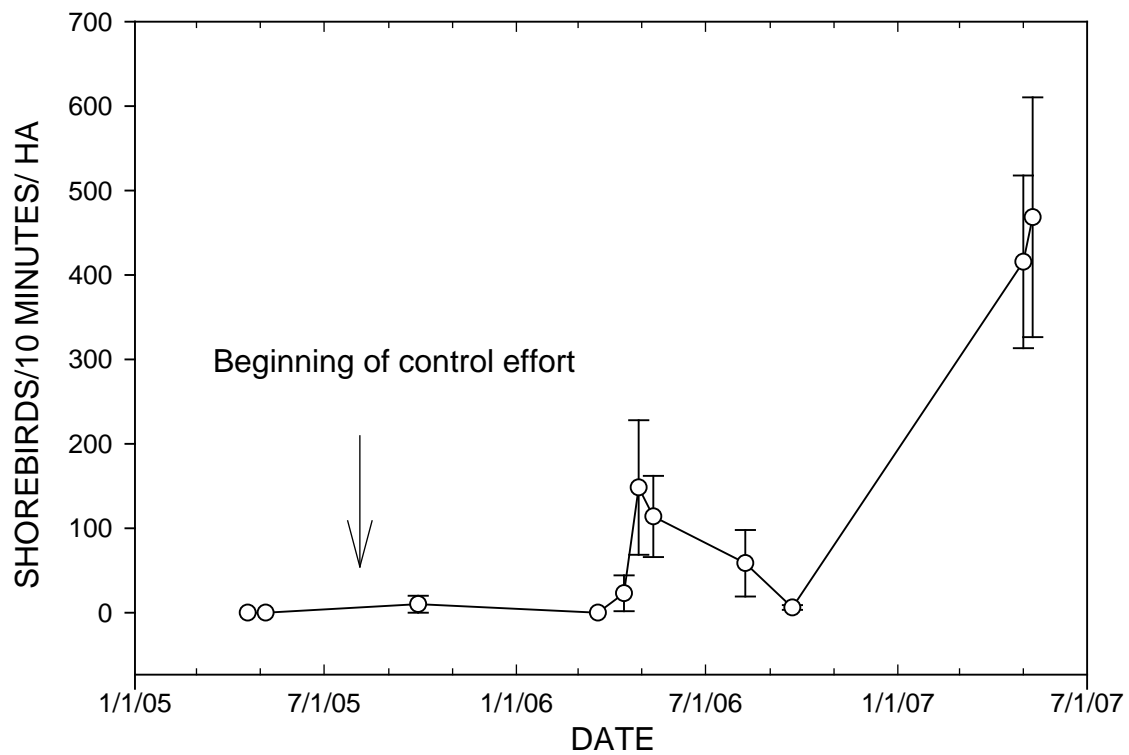


FIGURE 1. Shorebird foraging density at the Palix river Spartina meadow as a function of time from Spartina control.

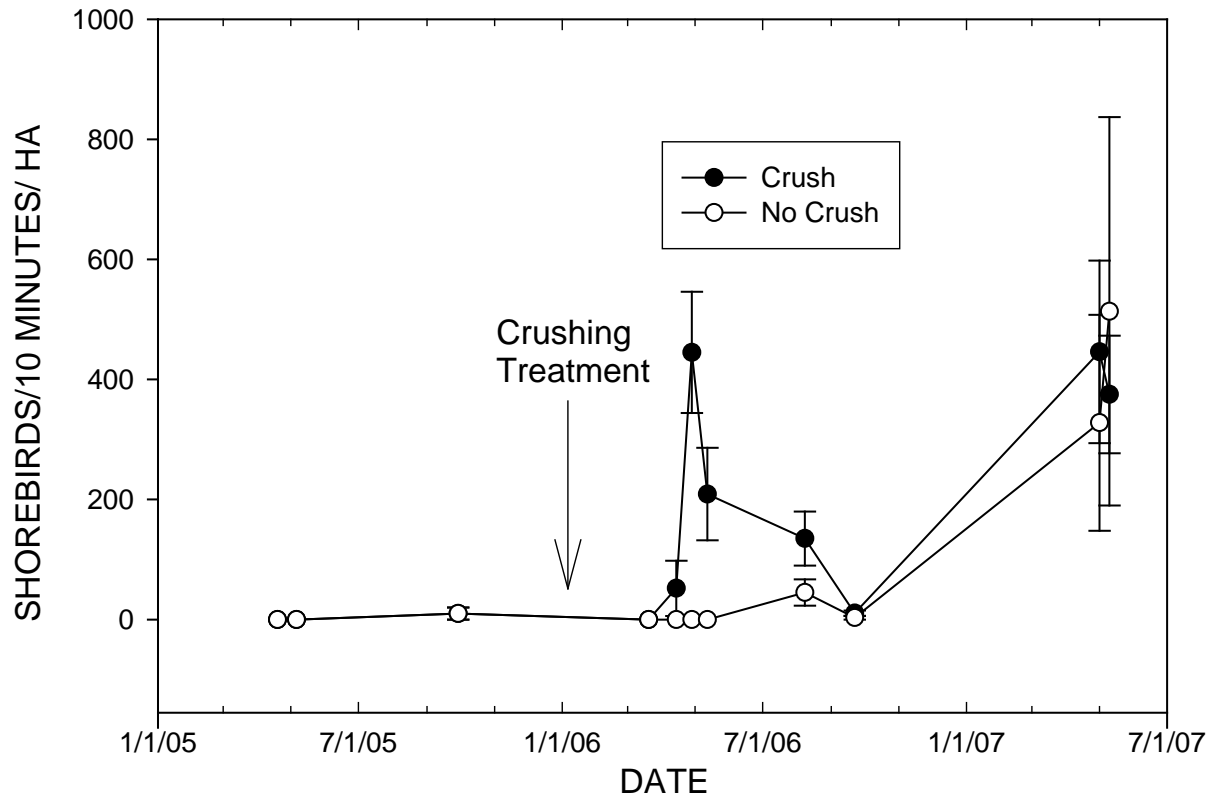


FIGURE 2. Shorebird foraging density at the Palix river *Spartina* meadow as a function of stem crushing.

REFERENCES

Evans, P.R. 1986. Use of the herbicide dalapon for control of *Spartina* encroaching on intertidal mudflats: beneficial effects on shorebirds. *Colonial Waterbirds* 9:171-175.

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