2008 Progress Report to the USFW – Willapa Wildlife Refuge

SHOREBIRD USAGE IN WILLAPA BAY IN RESPONSE TO *SPARTINA* CONTROL EFFORTS

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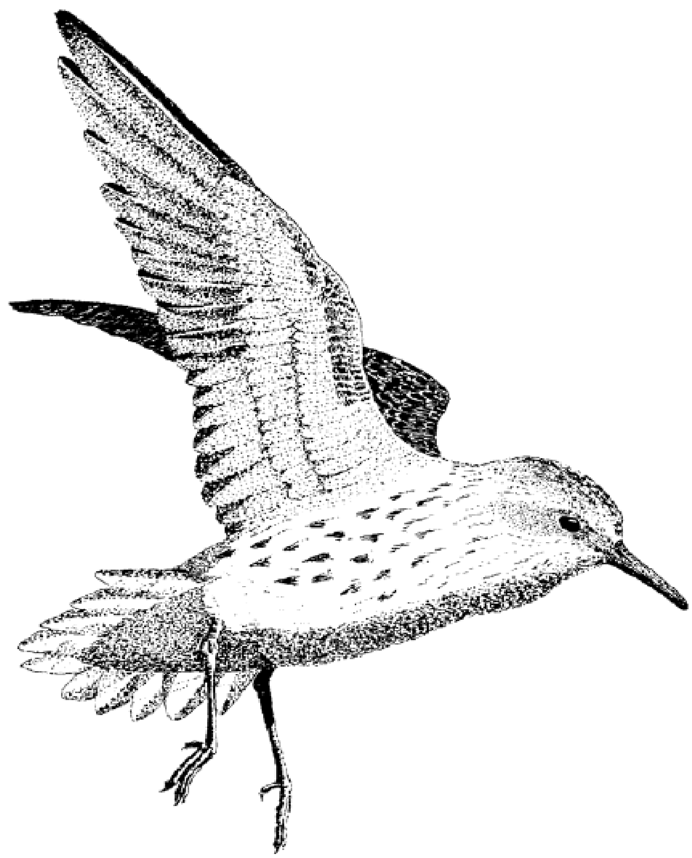


Introduction

Spartina is a perennial, deep-rooted saltmarsh grass, which re-sprouts each year from a dense, persistent root mass. It has colonized and eliminated much of the upper part of the wide expansive intertidal mudflats of Willapa. The long-term ecological impacts of this colonization include major declines in shorebirds (Goss-Custard and Moser 1988; Gray et al. 1997; Millard and Evans 1984; Jaques 2002, Patten & O'Casey 2007). There are over 30 species of shorebirds that rely upon Willapa Bay's 47,000 acres of tideland for food and shelter during annual migrations to and from the Arctic (Paulson 1993; Gray 1997). Peak winter and spring shorebird usage in sections of the bay declined over 60% between 1990 and 2002 as *Spartina* meadows replaced the tidal mudflats (Jaques 2002). Once these sites solidified into large Spartina meadow, all shorebird usage ceased (Patten and O'Casey, 2007). Early monitoring data following a successful chemical or mechanical control indicated that shorebird usage begins to return once the tideflats have been clear of most of the Spartina (Patten & O'Casey, 2007). What happens to these sites over the long term, however, has yet to be assessed. In addition, little is known about the efficacy of various mechanical methods to expedite restoration for shorebirds. Can follow-up tilling, crushing or disking promote more rapid usage of Spartina-affected tideflats by birds?

The objectives of this study were to 1) monitor long-term changes in shorebird usage of *Spartina*-affected mudflats following *Spartina* control, 2) assess if post-control mechanical methods can be used to expedite restoration for shorebird usage, and 3) establish baseline shorebird data for several new monitoring sites in Willapa Bay.

Methods

Eight sites in Willapa Bay were monitored (Figure 1). The treatment & monitoring history for each of these sites is provided in Table 1.

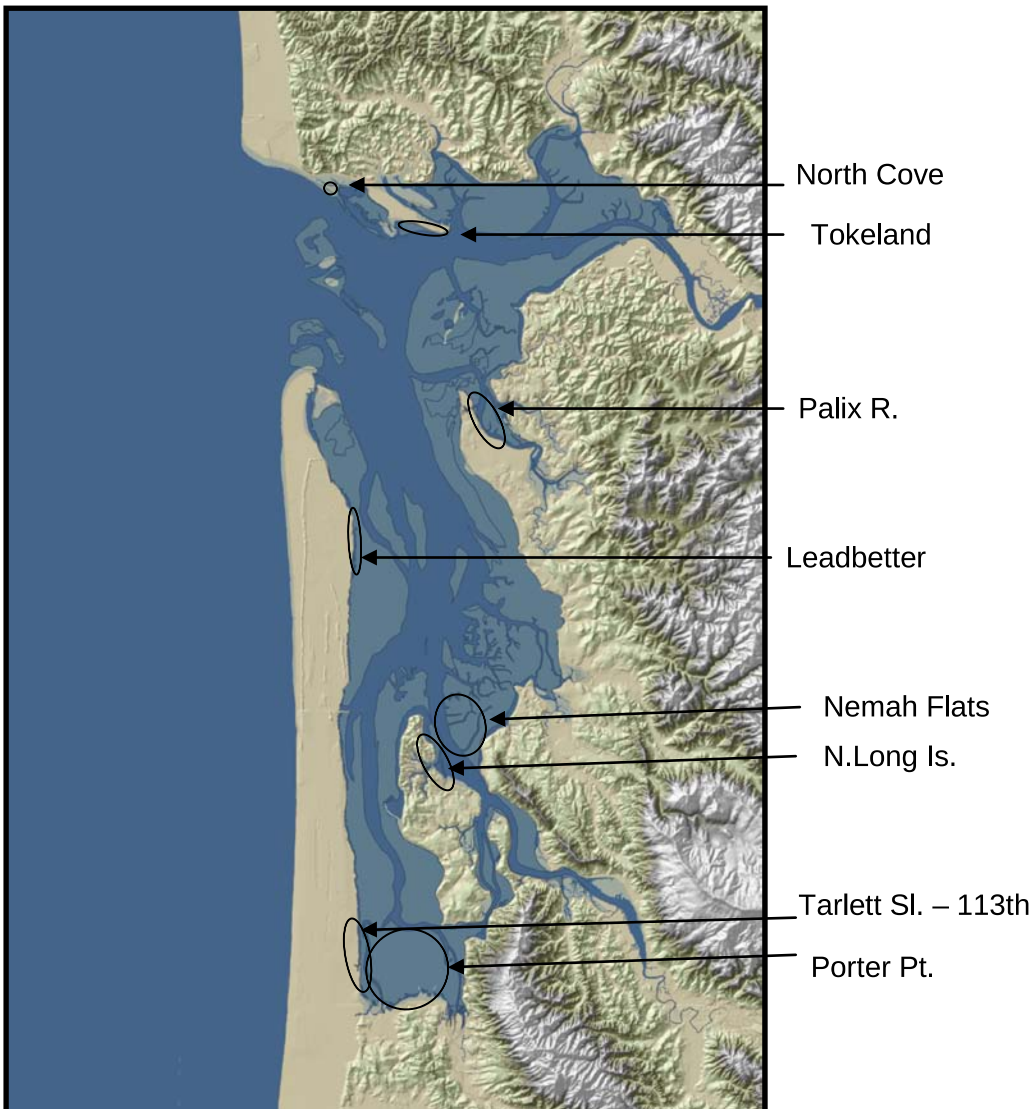


Figure 1. Shorebird monitoring sites in Willapa Bay, WA

Table 1. Monitoring site size, treatment and monitoring history			
Site	~ Size (acre)	Treatment history	Bird monitoring history
Porter Pt.	3,000[+]	Select tilling 2000-2002, spraying 2003 to 2008, replicated plots tilled January 2005 by WNWR	2003 to 2008
Tarlett Slough/ 113th	300	Spraying 2005 to 2008, replicated plots crushed fall 2005 by WA DNR	2003 to 2008
Leadbetter	20	Spraying 2005 to 2008, replicated plots disked January 2008 by WA DNR	2008
North Long Island	600	Sprayed 2004 to 2008	2008
Nemah Flats	500	Sprayed 2004 to 2008	2008
Palix River	500	Sprayed 2004 to 2008, replicated plots crushed fall 2005 by WSDA or disked January 2008 by WDFW & WA DNR	2005 to 2008
Tokeland	10	Sprayed 2006 to 2008	2008
North Cove	3	Sprayed 2006 to 2008	2008

Three of these sites have had long-term monitoring programs associated with them: Porter Point, Tarlett Slough and Palix River. Four of them have replicated experiments assessing post-control restoration methods: Porter Point, Tarlett Slough, Leadbetter, and Palix River) and four have only recently been monitoring to establish baseline shorebird data. The monitoring protocol used at each of these sites is listed in Table 2.

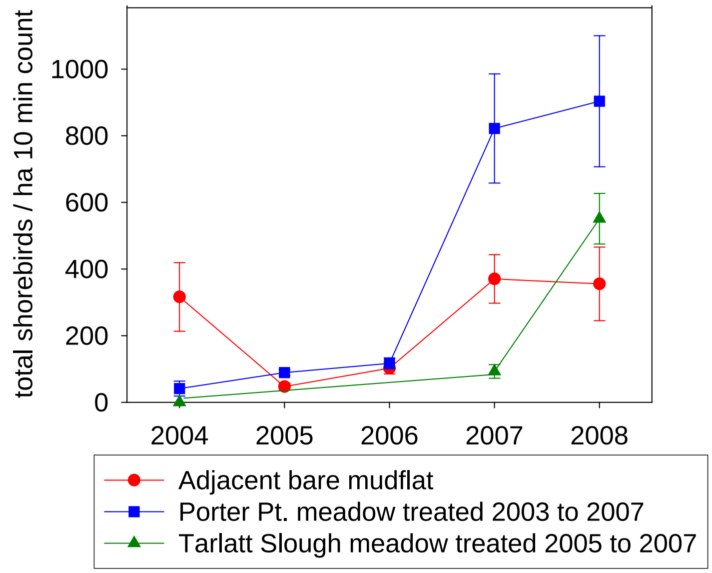
Table 2. Monitoring protocol used on each of the data collection sites.		
Site	Data type	Monitoring protocol
Porter Pt., Tarlett Slough/ 113th & Palix R.	Long term monitoring	Bird counts taken 3 to 8 times during peak spring migration from 2004 to 2008, on 3 one ha monitoring sites within each location for a given time (3 or 10 minutes depending on location)
North Long Island, Nemah Flats, Tokeland & North Cove	Short term monitoring	Bird counts taken 2 to 3 times for the entire site during spring migration 2008
Porter Pt.	Tilling experiment	Bird counts taken 3 to 8 times during peak spring migration from 2005 to 2008 on 3 one ha subplots within each 3 ha treatment plot over 3 minutes.
Tarlett Slough	Crushing experiment	Bird counts taken 3 to 8 times during peak spring migration from 2005 to 2008 on one ha treatment plots over 3 minutes.
Leadbetter & Palix River	Disking experiment	Bird counts taken 3 to 8 times during peak spring migration in 2008 on one ha treatment plots over 3 minutes.

A single observer, Carol O'Casey, was used for all the long-term monitoring sites during the duration of this project. Observations were made with spotting scope or, when feasible, a high-power binocular. Observations were timed to coincide with peak usage at each site, which coincided with tidal periods 0.25-1 hour prior to tidal submergence or after tidal withdraw. Observation frequency was at least once a week. Monitoring data used for this report were collected between mid-April to mid-May. Bird species and behavior were noted. For shorebirds and waterfowl, usage was counted any time a landing occurred. For birds of prey, usage was counted when a bird flew over the plot. In all observations, the recorded data were for the total birds sighted within the plots during the time period.

Results and Discussion.

Long term monitoring: The results from the three long-term monitoring sites all indicate dramatic and continued increase in shorebird utilization following Spartina control (Figure 3 & 4). The longer a site has been Spartina- free, the greater the usage by shorebird. After two years of being essentially Spartina-free, the Porter Point Meadow site appears to have reached a plateau of shorebird usage. Shorebird utilization of the site was three times that of the adjacent Spartina-free mudflat, whereas the shorebird usage of the Palix River tideflat continues to increase linearly and shows no indication of reaching a plateau.

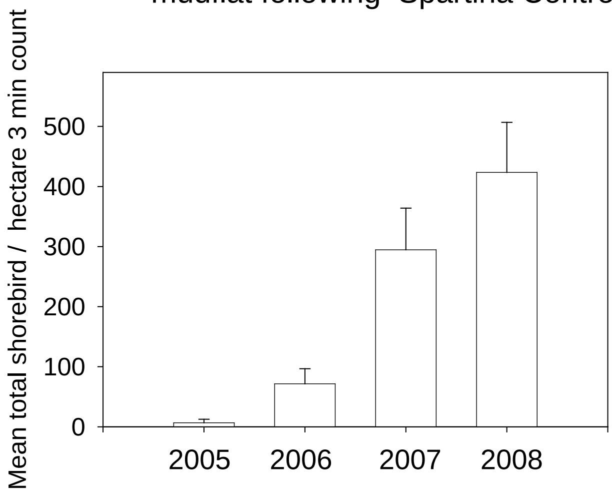
Figure 3. Change in shorebird usage during peak spring migration at the Willapa National Wildlife Refuge following Spartina control.



The Porter Point meadow was essentially Spartina free by Spring 2007.
The Tarlatt Slough meadow was essentially Spartina free by Spring 2008.
Bars = mean shorebird (all species) with standard error

No direct data was taken to assess the total seasonal increase in bird usage across the 4000 acres of previously affected Spartina tideflats of Porter Point and Tarlett Slough within the WNWR. However, if we assume the previous shorebird usage was restricted to approximately 300 acres of adjacent unaffected bare mudflat and if that usage is averaging 300 shorebirds/ ha, the total pre-control bird usage for those areas of the WNWR would be ~ 40,000 shorebirds. If we assume an average shorebird usage of ~600 birds/ha on the ~ 4,000 acres of the now Spartina-free treated meadows at South Bay Units of WNWR, then the total post-control bird usage for the sites could potential be ~ 1,000,000 shorebirds. This would be a 25-fold increase in total shorebird usage of the Refuge. Since our monitoring sites were near shore and we consistently note higher counts outside our field of view, this estimation may be conservative. It might also be an over estimate since not all of those 4,000 acres will be covered with shorebirds at anyone time.

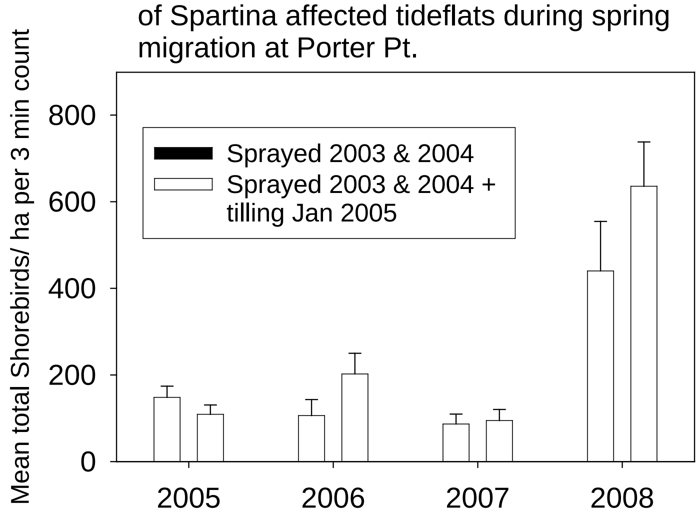
Figure 4. Shorebirds ulitization of the Palix River mudflat following Spartina Control.



Palix River meadow was ~ 600 acre of solid Spartina.
The meadow was treated with imazapyr by air in fall 2004,
boom sprayed in 2005, and spot sprayed in 2006 to 2008.
Data are mean total shorebird species ± standard error.
Counts were taken on 3 to 5 days during peak spring
migration on 6 -1 ha plots just prior to tidal coverage.

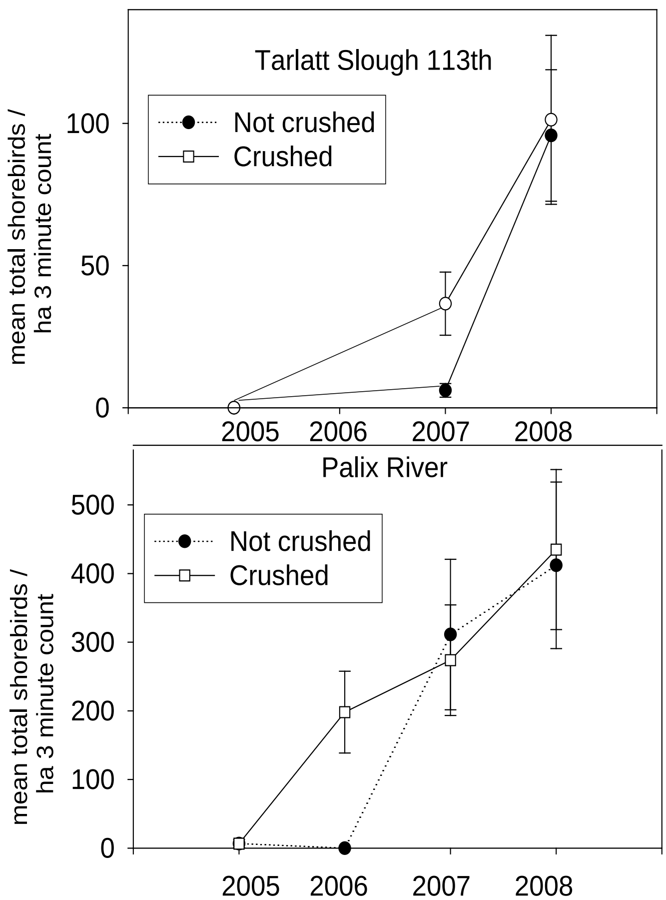
Restoration methods: Tilling, crushing and disking were assessed for their ability to expedite shorebird usage following the successful control of Spartina with herbicide (Figure 5, 6 & 7). None of the methods resulted in any permanent improvement in shorebird usage of affected tideflats. Crushing of the residual stubble, however, increased bird usage for a short time period after the initial treatment. There was no short-term rise in bird usage with tilling or disking. The initial crushing benefit is likely the result of removing tall standing dead stubble that inhibits shorebird access to the mudflats. The benefit would only be expected on sites with lots of dead stubble and would only be short- term. Based on these four sets of data, post-treatment mechanical crushing, tilling or disking control is not an effective restoration practice.

Figure 5. Effect of post-spraying tilling on shorebird usage of Spartina affected tideflats during spring migration at Porter Pt.



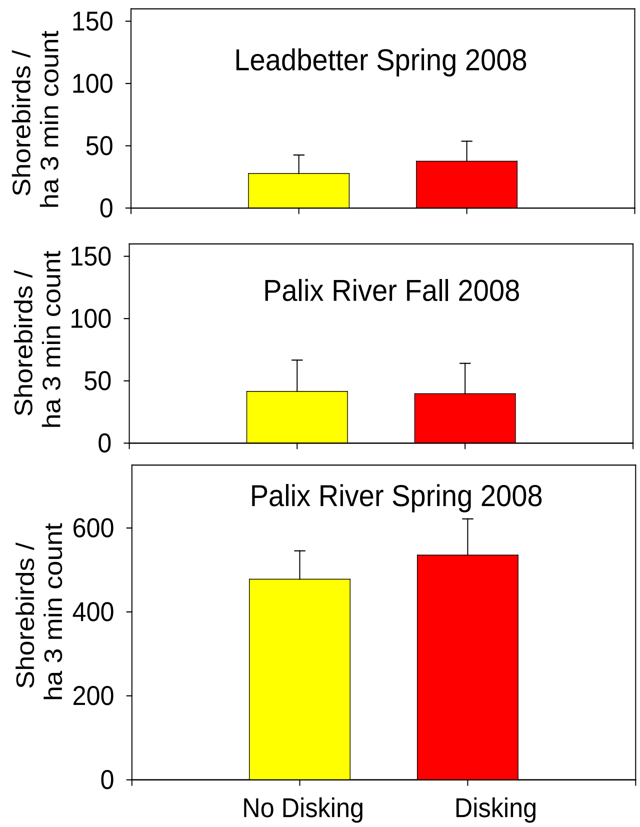
There were 3 pairs of matched 3 hectare tilled and untilled plots. Data were collected from 3 -1 ha subplots with each plot 4 to 5 times during the peak spring migration. Data are mean total shorebirds species ± standard error.

Figure 6. Shorebirds ulitization of Palix River & Ta
slough mudflats following Spartina Con



Palix River and Tarlett Slough meadows were treated with imazapyr starting 2004. 3 replicated 1 ha blocks where crushed by the Marsh Master II in the fall of 2005. Data are mean total shorebird species ± std err.

Figure 7. Effects of Post-control disking on
shorebird usage of Spartina Meadows.



Spartina Meadows at these sites were controlled starting in 2004 & 2005. Disking occured Jan. 2008

Baseline monitoring: A baseline for bird usage at North Long Island, Nemah Flats, Tokeland and North Cove was recorded. The location and size of each monitoring site is provided in Figures 8 & 9, and Table 3. The Long Island and Nemah sites were fairly large, while the Tokeland/North Cove sites were small. Bird density at a few of these selected sites, such as Kaffee Slough, was high, and for others very low. No inferences can be made from these data as they are just preliminary. However, two data points indicate a strong species preference for some sites. Black Bellied Plover congregated in high density at Kaffee Slough in Long Island and Marbled Godwit at site 3 in Tokeland, 4^{th} and Kindred Ave.

Conclusion. Shorebirds rapidly utilized Spartina-affected tideland following a successful control effort. Long-term data across three sites indicate shorebird counts increased from zero to >400/ ha within a few years of treatment. It was estimated that overall shorebird usage of Porter Point and Tarlett Slough areas of South Bay, which was formally 4000 acre of solid Spartina meadow, has potenially increased from ~40,000 shorebirds to ~1,000,000 following WNWR's successful control effort. Mechanical treatment to expedite site restoration for shorebird following control appears to be of minimal value.

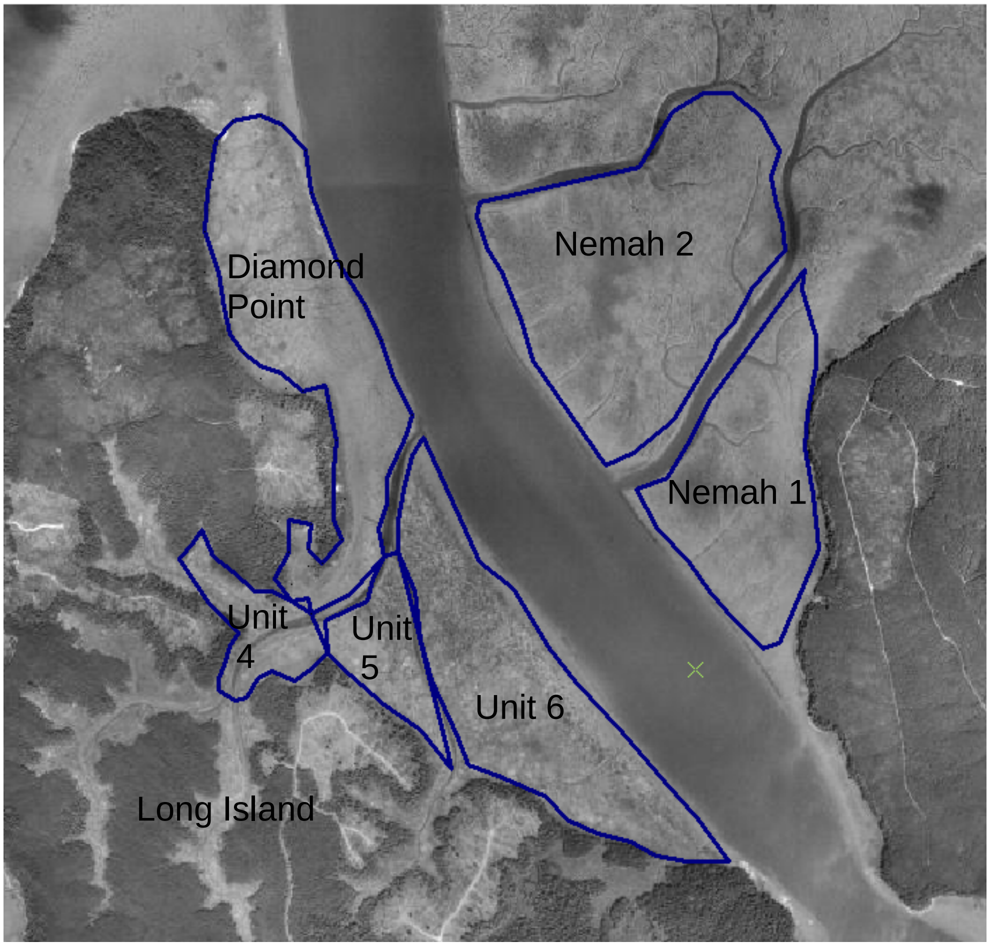


Figure 8. Monitoring location for North Long Island and Nemah Flats fall 2008

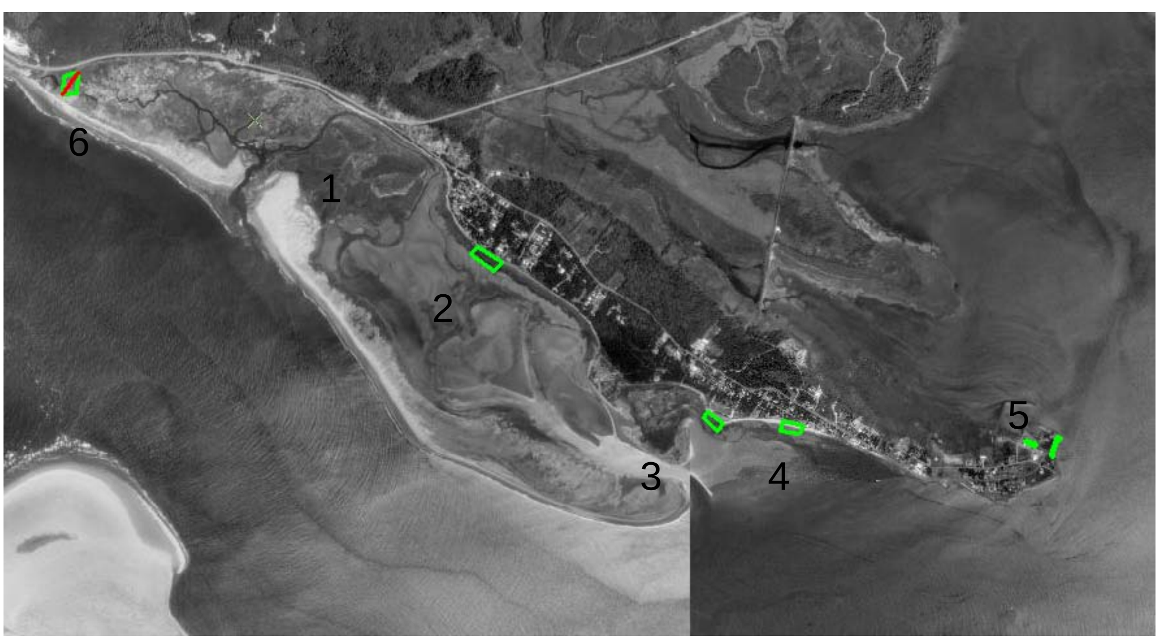


Figure 9. Monitoring location for Tokeland and North Cove fall 2008

Table 3. Mean Shorebird and Waterfowl density of North Long Island, Nemah Flats, North Cove and Tokeland during peak fall migration 2008

Site	Subplot	Acreage	Total shorebird /acre	Total Waterfowl /acre
Long Island	Unit 4	54	0.04	0.5
Long Island	Unit 5	58	1.5	0
Long Island	Unit 6	240	32.5	9.3
Long Island	Diamond pt	244	0.3	0.8
Nemah Flats	Nemah 1	190	0	4.3
Nemah Flats	Nemah 2	244	2.4	0
Tokeland	1	1.4	0.7	0
Tokeland	2	3.2	1.6	0
Tokeland	4	1.6	429	0
Tokeland	4	2	1	5
Tokeland	5	0.2	595	10
Northcove	6	2.8	0	0.7

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Table 4. Shorebird and Waterfowl usage of North Long Island and Nemah flats during peak fall migration 2008.

Site	Subplot	Western Sand-piper	Dunlin	Dowich-ter	Semi-palmated Plover	Black bellied plover	Red-necked Phalar-ope	Ruddy Turn-stone	Marb-led God-wit	Wil-let	Whim-brel	Yel-low-legs	Non-inden-tified shore-birds	Total shore-bird	Birds of Prey	Total water-fowl
Long Island	Unit 4	5	1	0	0	0	0	0	0	0	0	0	5	10	0	110
Long Island	Unit 5	0	0	0	0	19	0	0	0	0	0	0	68	87	0	0
Long Island	Unit 6	0	0	0	0	179	0	0	0	0	0	0	1579	1758	0	500
Long Island	Diamond pt	26	0	0	36	0	0	0	0	0	0	0	0	62	0	200
Long Island	Average	8	0	0	9	50	0	0	0	0	0	0	413	479	0	203
Nemah Flats	Nemah 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	820
Nemah Flats	Nemah 2	0	0	0	0	43	0	0	0	0	0	0	538	581	0	0
Nemah Flats	Average	0	0	0	0	22	0	0	0	0	0	0	269	291	0	410
Long Island + Nemah Flats	Average	4	0	0	4	49	0	0	0	0	0	0	427	483	0	249

Table 5. Shorebird and Waterfowl usage of North Cove and Tokeland during peak fall Migration 2008.

Site	Sub-plot	West-ern Sand-piper	Dun-lins	Dow-ichter	Semi-palmated Plover	Black bellied plover	Red-necked Phalar-ope	Ruddy Turn-stone	Marbled Godwit	Wil-let	Whim-brel	Yel-low-legs	Non-iden-tified shore-birds	Total shore-birds	Birds of Prey	Total water-fowl
North Cove	6a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
North Cove	6b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Cove	ave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Toke-land	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Toke-land	3	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0
Toke-Land (Marina)	5	0	0	0	0	0	0	0	680	7	1	0	0	687	0	0
Toke-Land (Tradewind)	4	0	0	0	0	2	0	0	0	0	0	0	2	2	0	10
Toke-land	2	6	10	1	4	36	1	0	0	0	0	0	70	119	70	0
Toke-land	aveg	1	2	0	1	8	0	0	136	1	0	0	14	163	14	2
North Cove &Toke-land	Ave g	1	2	0	1	7	0	0	52	1	0	0	11	72	11	2