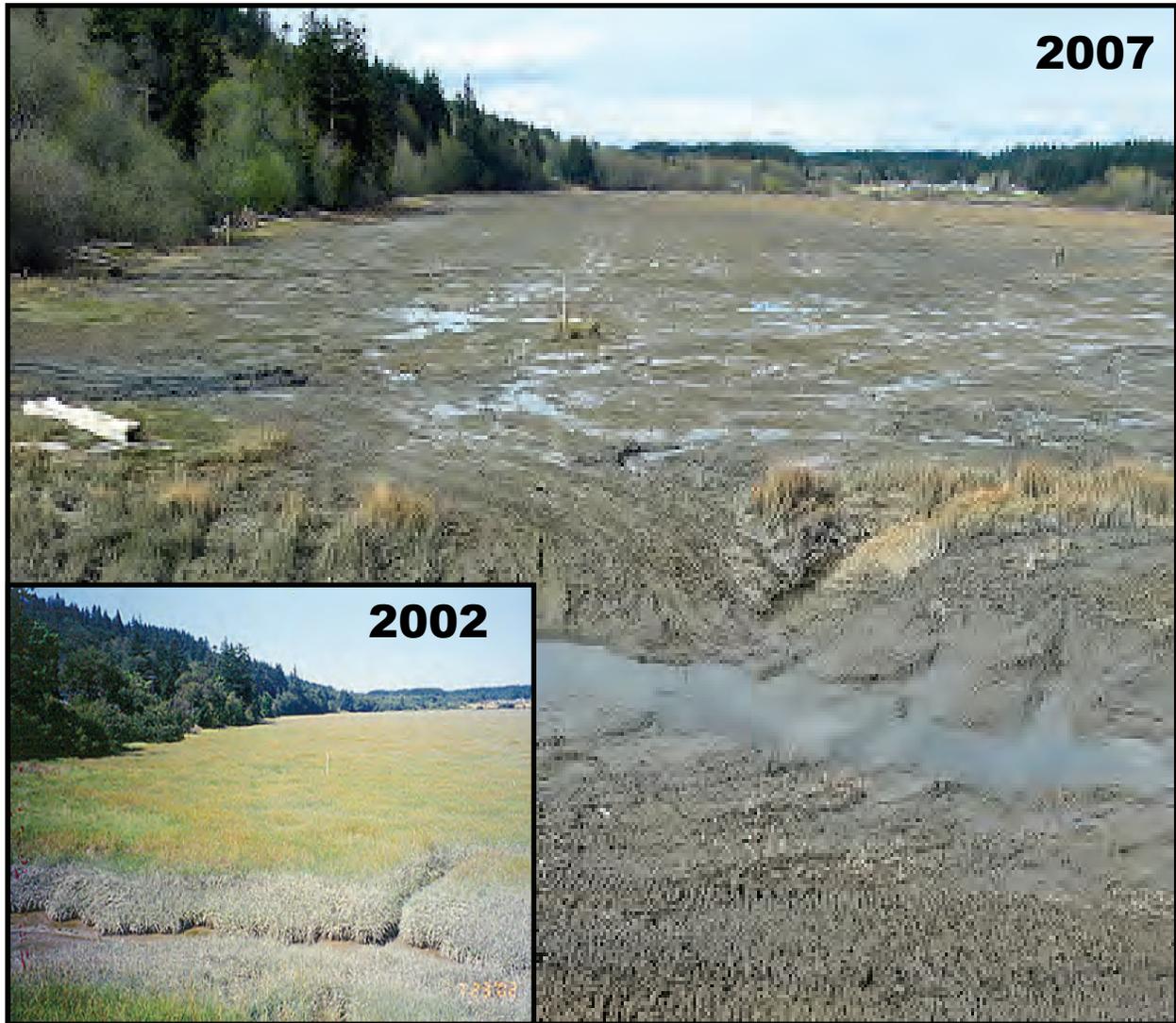


# *Spartina* Eradication Program 2007 Progress Report



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**Photos provided by Justin Haug, Dave Heimer, Les Holcomb (WDFW),  
Wendy Brown (DNR), Kevin D. Anderson and Tanner Ketel (WSDA).**

**Cover Photos:** Triangle Cove on Camano Island before major *Spartina* treatment in 2002  
and in the spring of 2007.

**AGR PUB 850-214 (N/1/08)**

Extreme care was used during the compilation of the maps in this report to ensure accuracy. However, due to changes in data and the need to rely on outside sources of information, the Department of Agriculture cannot accept responsibility for errors or omissions, and, therefore, there are no warranties which accompany this material.
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**PROGRESS OF THE 2007 *SPARTINA* ERADICATION  
PROGRAM**

January 2008

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**Acronyms used in this report:**

ALEA	Aquatic Lands Enhancement Account
DNR	Department of Natural Resources, Washington State
GPS	Global Positioning System
NPDES	National Pollutant Discharge Elimination System
PSP	Puget Sound Partnership
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
WSDA	Washington State Department of Agriculture
WDFW	Washington State Department of Fish and Wildlife
WSU	Washington State University

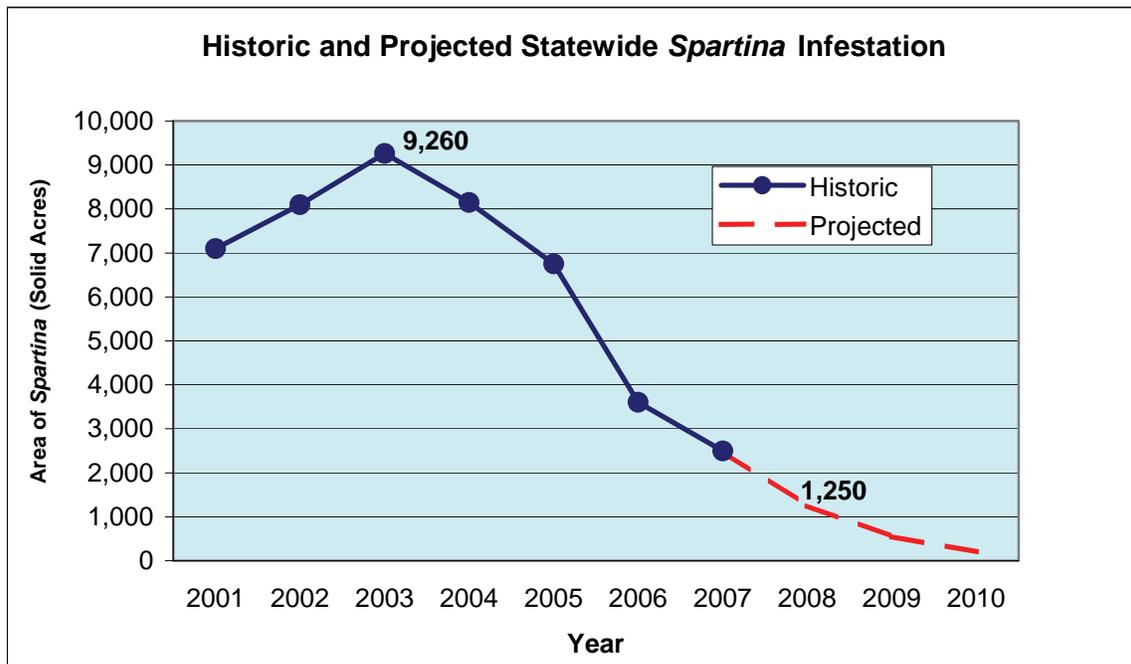
# Executive Summary

*Spartina*, commonly known as cordgrass, is an aggressive noxious weed that severely disrupts the ecosystems of native saltwater estuaries in Washington State. *Spartina* out competes native vegetation and converts mudflats into monotypic *Spartina* meadows, destroying important migratory shorebird and waterfowl habitat, increasing the threat of flooding, and severely impacting the state's shellfish industry.

Since 1995, the Washington State Department of Agriculture (WSDA) has served as the lead state agency for the eradication of *Spartina*. In this role, WSDA facilitates the continued cooperation of local, state, federal and tribal governments; universities; interested groups; and private landowners.

Over the past five years, the combined statewide effort to eradicate *Spartina* from the marine waters of Washington State has been extremely successful. WSDA estimates that the effort has successfully reduced the overall statewide infestation from a high of more than 9,000 solid acres in 2003 to fewer than 1,250 solid acres projected in 2008. That is an unprecedented reduction of more than 85%.

With the success of the past five years, and the large reductions of *Spartina* continuing throughout the state, continued funding and support are more important than ever. The effort has shown that large reductions of *Spartina* are possible and that eradication is an attainable goal. Figure 1 is a projection of *Spartina* reduction within Washington State over the next three years with sustained funding.



**Figure 1: Area (solid acres) of *Spartina* by year statewide, based on WSDA estimates.**

### **Willapa Bay**

Monitoring of the program's 2006 Willapa Bay effort indicated that approximately 2,310 solid acres of *Spartina* remained in the Bay during the 2007 season. This was a significant reduction from approximately 3,250 solid acres in Willapa Bay during the 2006 season. Over the course of the 2007 season, an estimated 2,310 solid acres, more than 99% of the *Spartina* in Willapa Bay was treated. 2007 saw the beginning of the transition from large-scale treatments of meadows to smaller-scale treatments of scattered infestations. This transition allowed the cooperators to conduct treatments with exceptional attention to detail. WSDA expects that fewer than 1,150 solid acres of *Spartina* will be present in Willapa Bay during the 2008 treatment season.

### **Grays Harbor**

2007 was a successful year for *Spartina* survey and eradication in Grays Harbor. WSDA, Washington Department of Fish and Wildlife (WDFW) and the U.S. Fish and Wildlife Service (USFWS) worked together to treat all known infestations and to survey the susceptible 32,000-acre intertidal area of Grays Harbor three times. A total of 2.51 solid acres of *Spartina* distributed throughout the Harbor was located and treated during the 2007 season. Additionally, 330 miles of coastline was surveyed by foot and air, leading to major new finds in north Grays Harbor and Clallam County. This effort was possible due to \$322,000 made available to the cooperators through USFWS, specifically for treatments in Grays Harbor and the coastal survey.

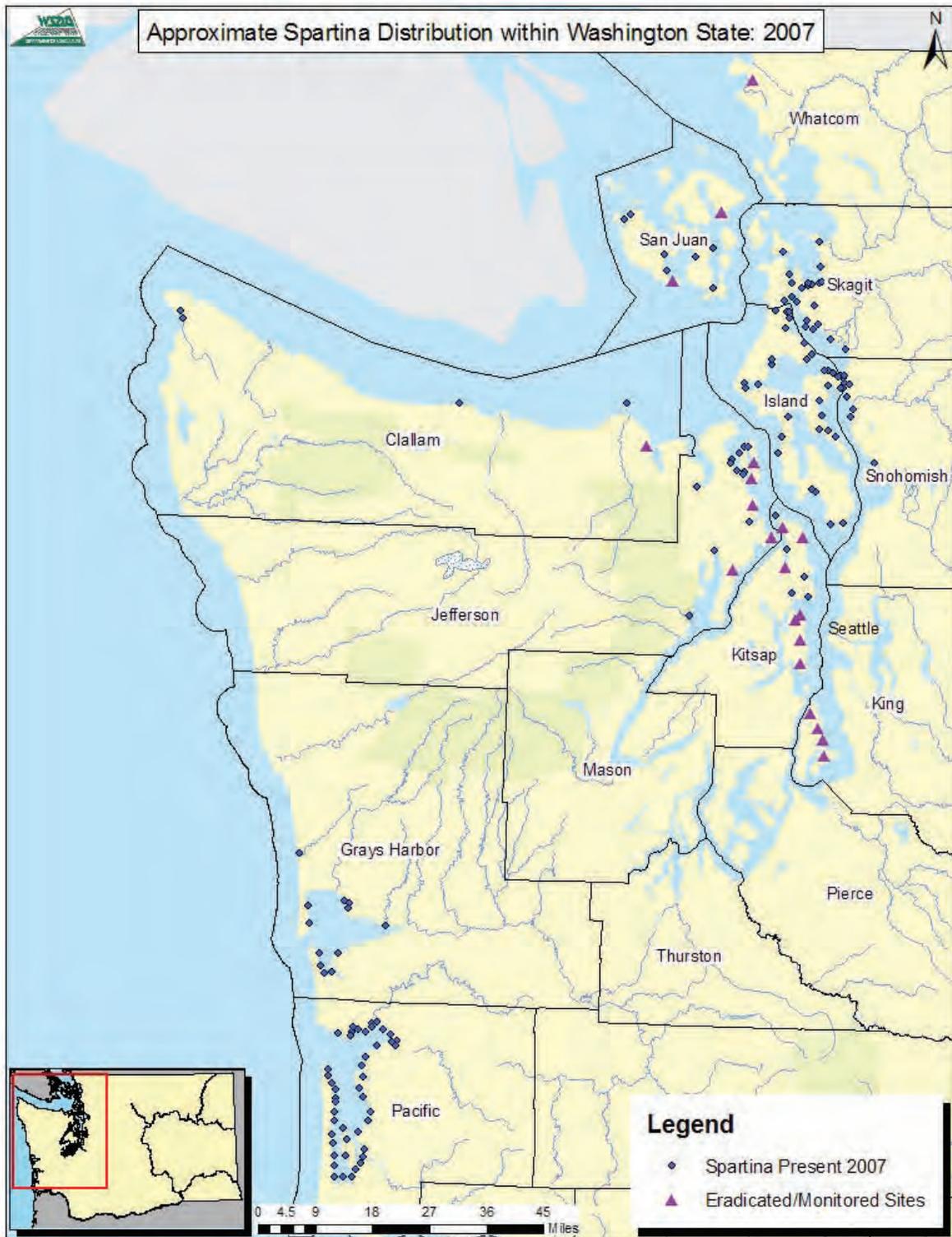
### **Puget Sound**

Fewer than 175 solid acres of *Spartina* remained in Puget Sound, the Strait of Juan de Fuca, and Hood Canal in 2007. This is a 47% reduction from 2006. WSDA estimates that fewer than 90 solid acres of *Spartina* will remain in 2008. Increased effort and cooperation between partner groups made this reduction possible. Continued surveys revealed five new infestations in the San Juan Islands, Strait of Juan de Fuca and Kitsap Peninsula. Restoration and monitoring efforts increased in 2007. Further cooperation between partners and emphasis on control, survey, and outreach will ensure the continued success of the Puget Sound *Spartina* program.

### **2007 Trends**

These efforts were a result of the continued level of state funding provided to WSDA, WDFW, and the Department of Natural Resources (DNR), as well as federal funding provided to USFWS. Central to this success is continued cooperation of WSDA, WDFW, DNR, and other state agencies, universities, USFWS, counties, tribes, private organizations and private landowners.

With the largest of the state's infestations significantly reduced, the eradication effort is transitioning to the remaining scattered infestations that are found throughout the affected acreage. This requires more personnel on the ground to give individual attention to the same areas that helicopters or large machines were previously able to cover in a relatively short amount of time. The amount of herbicide needed to treat the infestations is declining, bringing supply costs down. However, the number of personnel needed is increasing labor costs. As a result, to meet the program's goal of eradicating *Spartina*, funding requirements will hold steady over the next three years. Figure 2 illustrates the current distribution of *Spartina* in Washington State.



**Figure 2: Distribution of *Spartina* in Washington.** The diamonds represent locations with *Spartina* present in 2007. The triangles represent sites where *Spartina* has been eradicated or requires further monitoring before eradication can be declared.



# *Spartina* Eradication Program

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## *Spartina* in Washington State

### **Why is *Spartina* a problem?**

The invasive noxious weed *Spartina* is found in various intertidal areas of Washington State. *Spartina* can modify the hydrology of estuaries, causing increased flooding. It out competes native vegetation, forming monotypic meadows that accumulate sediment. This disturbance can lead to reduced plant diversity, elevated intertidal areas and displacement of invertebrates, which are a major food source for shorebirds and juvenile salmon. *Spartina* can destroy valuable shorebird, waterfowl and salmon habitat. *Spartina* also has the ability to threaten both the natural and commercial shellfish beds that are important to the economy of Washington State.

### **Which species of *Spartina* occur in Washington State?**

There are currently four species of non-native *Spartina* known to occur in Washington. *Spartina alterniflora* is most widely found in Willapa Bay, with approximately 1,150 solid acres currently infesting the Bay. *Spartina alterniflora* is also known to occur in Skagit, Clallam, Jefferson and Grays Harbor counties.

*Spartina anglica* is present in Skagit, Snohomish and Island counties. It has also been found in San Juan, Whatcom, King, Kitsap, Clallam and Jefferson counties in small infestations. It currently infests approximately 90 solid acres in the Puget Sound region.

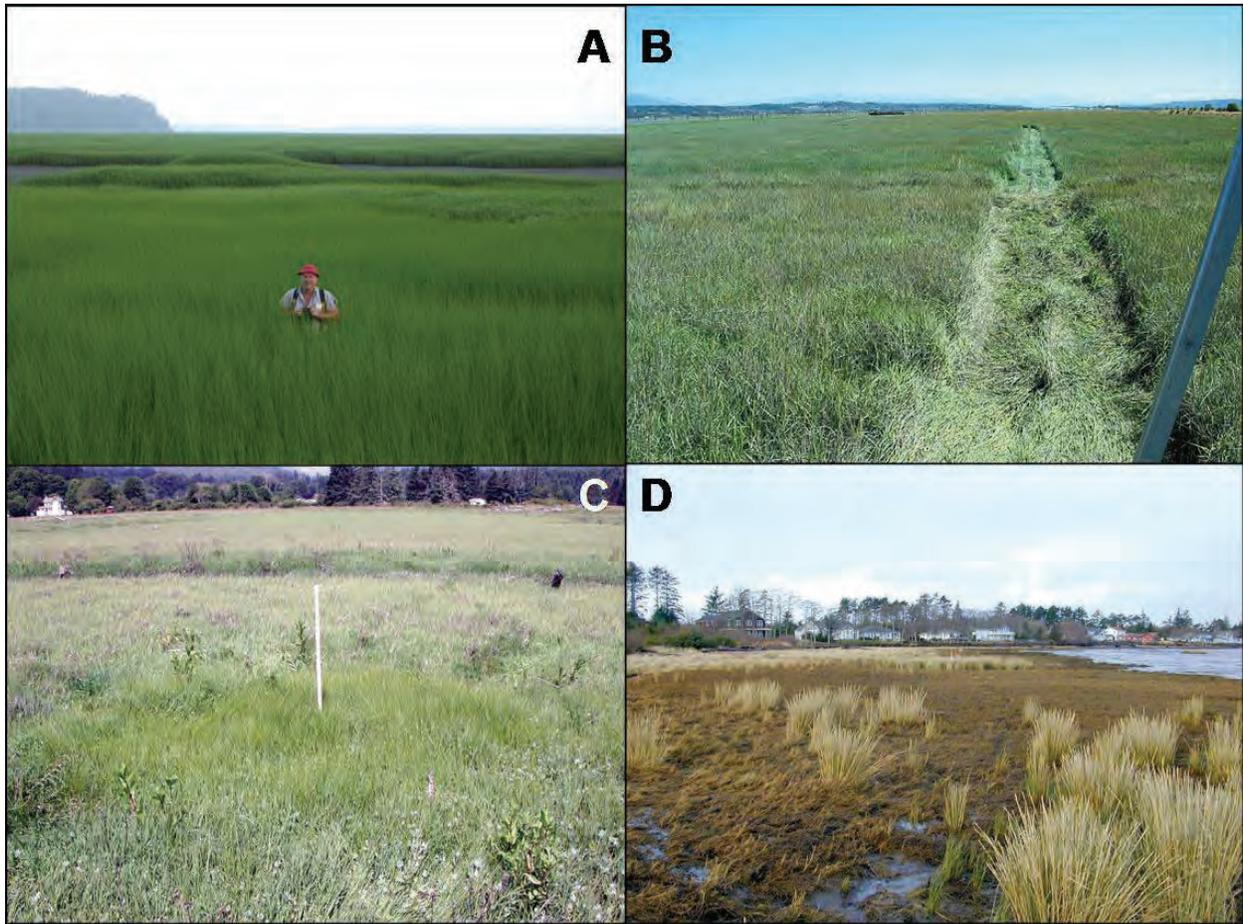
*Spartina patens* is known to occur at only one location in the state: Dosewallips State Park in Jefferson County. This infestation is controlled with yearly surveys, digging and herbicide applications, as needed. The current infestation size is less than one solid acre.

*Spartina densiflora* is a South American species that was discovered in 2001 in Grays Harbor County and in Island County. The species currently infests less than a quarter acre solid in Grays Harbor.

Figure 3 shows each of the four species.

### **How was *Spartina* introduced into Washington State?**

*Spartina alterniflora* was unintentionally introduced to Willapa Bay as packing material for oysters shipped from the east coast during the late 1800's. In Puget Sound, various landowners introduced *Spartina alterniflora* in an effort to stabilize shorelines. *Spartina anglica* was similarly introduced into Puget Sound at a farm located in Port Susan in the early 1960's to serve as bank stabilization and as a potential source of feed for cattle. The modes of introduction for both *Spartina patens* and *Spartina densiflora* are unknown.



**Figure 3: The four species of *Spartina* present in Washington. A) A meadow of *S. alterniflora* in Willapa Bay, B) A meadow of *S. anglica* in Skagit Bay (2003), C) *S. patens* at Dosewallips (2001), and D) clones of *S. densiflora* in Grays Harbor County.**

### **How do we eradicate *Spartina*?**

*Spartina* spreads quickly and is difficult to eradicate. A successful eradication program involves four steps:

- 1) Preventing an existing infestation from producing seed;
- 2) Treating an existing infestation for several consecutive years using integrated pest management (IPM) techniques (including mechanical, chemical or manual control, or a combination of these methods);
- 3) After eradication is achieved, monitoring the area and removing new seedlings to ensure no re-establishment occurs; and
- 4) Continuing to survey shorelines, educate the public, and follow-up on possible sightings of new infestations.

## **WSDA *Spartina* Program**

In 2007, the WSDA *Spartina* Eradication Program worked collaboratively with partner agencies to continue *Spartina* eradication.

WSDA hired, equipped and coordinated a crew to treat infestations in Clallam, Jefferson, and Kitsap counties; assisted the Swinomish, Suquamish, Makah and Tulalip tribal communities and the noxious weed control boards in San Juan, Clallam, and Jefferson counties with eradication work; worked cooperatively with Washington Department of Fish and Wildlife (WDFW) and the U.S. Fish and Wildlife Service (USFWS) in Grays Harbor; and worked cooperatively with the Department of Natural Resources (DNR), WDFW, USFWS, The Nature Conservancy (TNC), The Shoalwater Tribe, Pacific County, the aquaculture industry and University of Washington and Washington State University on infestations in Willapa Bay.

WSDA continued to work cooperatively with the Department of Ecology to administer coverage under the National Pollutant Discharge Elimination System (NPDES) general permit for aquatic noxious weed control, facilitating the control programs of federal, state and local governmental agencies and other entities.

WSDA provided resources through interagency agreements, contracts and cost-share to state and local government agencies and private landowners. WSDA organized and facilitated the exchange of *Spartina* eradication information through regional planning and informational meetings, and continued to explore more efficient and cost-effective ways to eradicate *Spartina* with partner agencies.

In 2007, WSDA continued to allocate funding for resources and *Spartina* work crews in the counties with the majority of the infestations. WSDA provided these resources, totaling \$130,000, by entering into interagency agreements with the noxious weed control boards in Skagit, Island and Snohomish counties. WSDA also continued to provide \$10,000 annually to the Swinomish Tribal Community to help fund its *Spartina* eradication effort. WSDA staff participated in field activities throughout the control season and facilitated coordination meetings to ensure contract priorities were adequately addressed.

During the 2007 season, WSDA continued working with WDFW, DNR, WSU and USFWS to explore the potential for restoration of once-infested tidelands back to functioning shorebird and waterfowl habitat.

### **Budget**

WSDA has allotted \$1.79 million of its appropriation from the Aquatic Lands Enhancement Account (ALEA) for statewide *Spartina* activities during the 2007-2009 biennium. Table 1 illustrates how WSDA budgeted this appropriation.

**Table 1: WSDA ALEA Budget Activity by Area – FY08 and FY09**

Activity	Puget Sound/ Olympic Peninsula		Willapa Bay		Grays Harbor		Total
	FY08	FY09	FY08	FY09	FY08	FY09	FY08&09
<sup>1</sup> WSDA Eradication & Coordination Activities	\$160,000	\$220,000	\$370,000	\$340,000	\$80,000	\$100,000	\$1,270,000
<sup>2</sup> Cost Share & Herbicide Purchases	\$15,000	\$12,000	\$75,000	\$80,000	\$2,500		\$184,500
<sup>3</sup> Purchased Services							\$335,000
Pacific Co.				\$35,000			
Skagit Co.	\$30,000	\$30,000					
Island Co.	\$50,000	\$50,000					
Snohomish Co.	\$50,000	\$50,000					
Swinomish Tribe	\$10,000	\$10,000					
WDFW	\$10,000	\$10,000					
<b>Total</b>	<b>\$325,000</b>	<b>\$382,000</b>	<b>\$445,000</b>	<b>\$455,000</b>	<b>\$82,500</b>	<b>\$100,000</b>	<b>\$1,789,500</b>
<b>Biennial Total</b>	<b>\$707,000</b>		<b>\$900,000</b>		<b>\$182,500</b>		

**Notes for Table 1:**

1. WSDA Eradication and Coordination Activities: These expenses include WSDA eradication, survey and restoration activities including salaries and benefits, herbicide, equipment, travel, legal fees, public notification expenses and other goods and services.
2. Cost Share & Herbicide Purchases: These are the costs of herbicide and equipment purchased to support WSDA's cooperators.
3. Purchased Services: WSDA enters into a variety of contracts, interagency agreements and intergovernmental agreements to accomplish *Spartina* eradication goals.

In addition to the WSDA ALEA funding, WSDA and the other agencies have additional funding for *Spartina* activities during the 2007-09 biennium. This funding is from ALEA, federal agreements, grants and other sources. Table 2 illustrates where these funds are budgeted.

**Table 2: Other Agency Budget Activity by Area – FY08 and FY09**

Agency	Puget Sound/ Olympic Peninsula		Willapa Bay		Grays Harbor		Total
	FY08	FY09	FY08	FY09	FY08	FY09	FY08&09
WSDA					\$36,000		\$36,000
WDFW	\$275,000	\$110,000	\$230,000	\$240,000	\$236,000		\$1,091,000
DNR			\$350,000	\$350,000			\$700,000
USFWS			\$1,100,000	\$990,000	\$50,000		\$2,140,000
<b>TOTAL</b>	<b>\$275,000</b>	<b>\$110,000</b>	<b>\$1,680,000</b>	<b>\$1,580,000</b>	<b><sup>1</sup>\$322,000</b>		<b>\$3,967,000</b>
<b>Biennial Total</b>	<b>\$385,000</b>		<b>\$3,260,000</b>		<b>\$322,000</b>		

**Note for Table 2:**

1. USFWS received \$322,000 for use in Grays Harbor of which \$272,000 was awarded to WSDA and WDFW and \$50,000 was used for activities conducted by USFWS.

## 2007 Noteworthy Activities and Developments

In 2007, WSDA, state and federal partner agencies, local governments, tribal entities, and private landowners treated approximately 2,500 solid acres of *Spartina* throughout Puget Sound, Grays Harbor and Willapa Bay. In addition to the significant program results from treatment activities, there were several noteworthy activities or developments in 2007.

### **Supplemental Funding Provided For Increased Effort in Grays Harbor**

Throughout the winter of 2006 and spring of 2007, WSDA coordinated with USFWS and WDFW to identify and pursue supplemental funding for Grays Harbor. The funds acquired for work in 2007 included: \$40,000 of federal funding remaining after the 2006 Grays Harbor effort; \$232,000 received in a cooperative agreement from the Nisqually National Wildlife Refuge Complex; and approximately \$50,000 expended by the Nisqually Refuge for its own activities in Grays Harbor.

With this level of supplemental funding, WSDA and its partners were able to conduct the most aggressive survey and eradication effort in Grays Harbor to date. Three extensive surveys of its intertidal zone were conducted and all infested areas of Grays Harbor were treated.

### **Restoration of *Spartina*-Impacted Nearshore Habitat**

The Washington State Legislature clearly recognized the environmental and economic threat that *Spartina* poses to the remaining nearshore habitat and, in response, has funded a vigorous *Spartina* eradication effort. Agencies are eliminating record amounts of *Spartina*. However, many questions remain concerning the long-term ecological recovery of eradicated *Spartina* meadows.

The agencies have secured modest grant funding (Landowner Incentive Program, National Fish and Wildlife Foundation, and Washington Wildlife and Recreation Program) to establish a set of interrelated research projects that monitor sediment dynamics, vegetation change, invertebrate change, and bird and fish use to gauge the effectiveness of different restoration methods. The long-term goal of this project is to restore previously treated *Spartina* meadows and return ecological functionality to this highly altered mudflat where dense root masses and accreted sediment remain. Restoration activities have focused on techniques for breaking up the dense root masses and monitoring the ecological response.

Bird Usage: Research conducted in Willapa Bay finds bird usage within large untreated *Spartina* meadows, regardless of species, is virtually non-existent. Control of the *Spartina* meadows has resulted in increased use by shorebirds and waterfowl. The level of bird usage appears to be related to the amount of vegetative cover on the site. For example, sites that had no standing *Spartina*, like mud flats and tilled meadows, had higher bird densities than areas with *Spartina*.

Fish Usage: In Puget Sound, fish sampling work by the Skagit River System Cooperative on a *Spartina* restoration project indicates that juvenile salmon utilized habitat within treated *Spartina* marshes. Juvenile chum and Chinook salmon were captured in both reference (flooded mudflat,

blind tidal channels within native marshes) and treated *Spartina* marsh (flooded and blind channel) habitats. However, comparison of fish density results suggests that juvenile salmon may prefer reference habitats associated with native marsh. In addition, the sampling showed that other fish species utilize habitat within treated *Spartina* marshes including these dominant nearshore species: surf smelt, shiner perch, and staghorn sculpin.

Invertebrate Change: For invertebrates in Puget Sound, data collected in this study suggest that invasion by *S. anglica* produces long-lasting effects on invertebrate communities, even after the plants have been removed. The above-ground portions of *Spartina* reduce water flow, increasing sedimentation; the compact below-ground root matrix consolidates the sediments and may inhibit habitat use by burrowing invertebrates.

Control efforts remove the *S. anglica*, but the results indicate that recovery to pre-invasion conditions occurs slowly. Removing the above-ground plants does not eliminate the root mass; organic content of sediments remains high even in areas from which *S. anglica* has been removed for two to three years. The invertebrate community in control mudflats is distinctly different from that in the *Spartina*-impacted areas. Removal of the *Spartina* has not yet restored the community to that seen in the mudflats, but there are indications that progress is being made. Sites that have received mechanical treatment, but still hold some *S. anglica* continue to resemble the *S. anglica*-covered areas. Where the *Spartina* has been largely removed for several years (i.e., in the near-eradication area), the communities are becoming similar to the mudflat samples and moving away from the *S. anglica*-covered areas. This suggests that, in general, removal of the *Spartina* is allowing the community to move back toward the natural mudflat condition.

It is clear that infestation of intertidal mudflats by *S. anglica* strongly affects invertebrates on and below the surface. Eradicating *Spartina* allows the habitat to begin moving back to the natural condition, but the process is slow, probably due to persistent plant material in the sediments. Further study will be necessary to see if the system converges on the mudflat condition or settles into some alternate state.

These examples of restoration and monitoring demonstrate how agencies are beginning to transition to the next phase in the *Spartina* effort.

### **Cross-Border Drift Card Study Wraps Up**

Following the success of the 2004-05 drift card study on the Washington and California coasts, WSDA and partners conducted a similar study in North Puget Sound and Canada. The results of this project will help managers understand where *Spartina* seeds drift and recruit.

The year-long drift card release study, jointly funded by WSDA, the Puget Sound Partnership (formerly Puget Sound Action Team), The Nature Conservancy, Ducks Unlimited Canada, and Environment Canada, began in June 2006 and finished in May 2007. Each month during this period, 100 cards were released at major infestation sites. These cards, moved by tides, winds, and currents, mimic the spread of *Spartina* seeds. Whenever a card was recovered on beaches or

shorelines, its unique identity number and location were reported. These data were compiled into a database and used to generate maps.

Ducks Unlimited Canada, Environment Canada, and the Puget Sound Partnership are compiling these data into a report due to be published during early 2008. The data are also being used to develop a risk map of areas at highest risk for *Spartina* infestations based on habitat, substrate, and plant development. WSDA used early versions of this map to locate a new infestation along the Strait of Juan de Fuca. Further refinements to this risk map will make it a useful tool for allocating *Spartina* survey resources. Researchers from Pacific Northwest National Laboratory hope to expand upon these data to create a set of modeling and predictive tools to assist management in Puget Sound and the Strait of Georgia region.

### **Increased Use of GPS Technology by Field Crews**

During the 2007 eradication season, increased use of global positioning system (GPS) technology was implemented in Grays Harbor. With a small amount of *Spartina* spread over a vast area, the cooperators identified a need to better characterize the survey, control, and distribution of *Spartina* within the Harbor. Grays Harbor was also the perfect place to test GPS equipment prior to increasing its use in other areas of the *Spartina* program. During the season, Grays Harbor field crews carried a GPS unit, and all finds and treated *Spartina* were logged. In addition, the GPS units were used to record track-lines for use in determining which areas had been surveyed and which still needed to be surveyed.

At the end of field operations, GPS units were collected and point data was downloaded into a geographic information system (GIS) mapping program where data was displayed on detailed maps. These points were used to record the location of *Spartina* within the Harbor (presence or absence) and not as a way to measure the size of individual clones. The method worked efficiently in confusing areas such as those containing sloughs and islands. It aided crews in tracking where previous survey and treatment had occurred. A total of 860 points were collected during the 2007 season, representing the most complete characterization of the distribution of *Spartina* in Grays Harbor to date.

The increased use of GPS technology proved to be a useful tool in the field as well as aiding project managers in their decisions about crew deployment. The cooperators are looking forward to continued development of these systems in the 2008 season. Eventually, the increased use of GPS technologies by field crews may prove useful as other areas within the *Spartina* program approach eradication.

### **2007 Biological Control Program**

In 2007, the cooperating agencies in the *Spartina* Eradication Project chose to chemically treat the last of the former bio-control release sites in Willapa Bay. The site is a 40-acre area on the DNR portion of the North Cove meadow at the north end of Willapa Bay. The cooperators chose to treat the North Cove bio-control site for two primary reasons. First, the performance of the insect *Prokelisia marginata*, though promising for control, was not attaining eradication in this area. Second, while most of the rest of Willapa Bay has broken up into smaller infestations, North Cove continued as a 40-acre seed source capable of re-infesting other areas of the Bay.

# Program Results by Geographic Area

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## *Spartina* Eradication Effort in Willapa Bay

For programmatic purposes, this geographic region includes the mouth of Willapa Bay, Willapa Bay, and all the rivers, streams and creeks that feed into the Bay.

### **Extent of the Infestation in Willapa Bay**

WSDA estimates that, during the 2007 season, a total of 2,310 solid acres were infested in Willapa Bay. This estimate is based on a compilation of the treatment data reported by each of the cooperators involved in the Willapa Bay effort. Figure 4 is a map showing an overview of the 2007 treatment sites in Willapa Bay.

All sites within Willapa Bay were treated during the 2007 season with very little *Spartina* missed. This season saw the beginning of a transition from large-scale treatments of meadows to efforts aimed at eradicating the scattered infestations remaining throughout the Bay. This transition allowed the cooperators to conduct the 2007 treatments with exceptional attention to detail. After consulting with the cooperators, WSDA estimates that less than one percent of Willapa Bay went untreated during the 2007 season. Therefore, the acreage information obtained from treatment data provides a reasonably accurate total solid acre estimate for the 2007 treatment season.

### **Roles of Willapa Bay Cooperators in 2007**

WSDA coordinates Technical Committee meetings as well as Advisory Committee meetings, which focus on developing work plans for the upcoming season. In 2007, the cooperators used a variety of herbicide application systems and mechanical control tools to combat *Spartina*. The following outlines the role each cooperator assumed in Willapa Bay during the 2007 eradication season.

- **WSDA** – Continued to work with the Department of Ecology to ensure NPDES coverage was extended to qualified applicators. Provided resources, equipment and herbicide to WDFW, DNR, USFWS and private property owners to ensure proper treatment of all sites. Conducted eradication activities on the Long Beach Peninsula including a 60-acre aerial treatment in cooperation with DNR, USFWS, and property owners. Administered the Landowner Incentive Program grant for eradication activities in Tokeland. Conducted mechanical restoration activities in Tokeland in cooperation with WDFW.
- **DNR** – Conducted control work in Pot Shot, Stanley Point, Naselle River, Rose Ranch, Stony Point, South Willapa River and the Natural Area Preserves as well as Long Beach Peninsula in cooperation with USFWS and WSDA. Provided herbicide to USFWS for treatment of North Cove. Continued conducting *Spartina* control monitoring program in

cooperation with WSU, WSDA and WDFW. Mapped *Spartina* infestation using aerial infrared photography.

- **WDFW** – Conducted control operations in cooperation with USFWS in North Bay including aerial broadcast applications at the Tokeland LIP and Horse Ranch/North River sites. Conducted mechanical restoration activities in Tokeland in cooperation with WSDA. Collected data for efficacy monitoring program.
- **USFWS** – Conducted control work in North Bay in cooperation with WDFW, including two aerial broadcast applications. Treated Ellan Sands by air and ground. Treated all areas from the mouth of Bay Center south to the northern boundary of the Tarlatt Slough treatment area, including Long Island. Conducted eradication activities on Long Beach Peninsula, including a 150-acre aerial application in cooperation with WSDA and DNR.
- **Pacific County** – Worked closely with the cooperators in the Advisory and Technical Committees. Provided staff time to enforce Class B Select Noxious Weed designation for *Spartina alterniflora*.
- **Shoalwater Tribe** – Worked closely with the state and federal partners. Provided staff time to evaluate previous treatments and consult with regarding 2007 activities. Allowed USFWS to conduct all necessary treatments to tribal-owned lands and lands within the reservation boundaries.
- **University of Washington Olympic Natural Resources Center (UW-ONRC)** – Consulted with the project partners on treating the last of the biological control release sites. Continued to develop tidal elevation prediction maps of various treatment sites to predict the dry time that plants receive on specific days.
- **Washington State University (WSU)** – Continued research to improve efficacy and efficiency of control tools. Continued research on impacts of *Spartina* to shorebirds and waterfowl.
- **The Nature Conservancy (TNC)** – Worked closely with the cooperators in the Advisory and Technical Committees. Cooperated with DNR to treat Ellsworth Slough in the Naselle River.

Table 3 identifies the areas of the Bay treated and who conducted the treatments. Figures 5 and 6 are maps of North Willapa Bay and South Willapa Bay respectively, including area names.

### **Highlights of the 2007 Season in Willapa Bay**

In 2007, the cooperative *Spartina* eradication effort resulted in treatment of approximately 2,310 solid acres spread throughout more than 24,000 affected acres of Willapa Bay. The acreage treated encompassed more than 99% of the overall infestation.

During the winter and spring of 2007, WSDA worked cooperatively with WDFW, DNR, USFWS, Shoalwater Tribe, TNC, WSU, UW and the Willapa Bay/Grays Harbor Oyster Growers Association (WBGHOGA) to develop a 2007 work plan that focused on detailed re-treatment of the previous years' treatment sites.

Over the past five years, the combined effort in Willapa Bay has been extremely effective and has reduced the overall infestation from a high of about 8,500 solid acres in 2003 to approximately 2,310 solid acres in 2007. This is an overall reduction of 73% achieved in four treatment seasons. If the 2007 treatment season meets expectations fewer than 1,150 solid acres of *Spartina* are expected in Willapa Bay during the 2008 treatment season. This would be a reduction of more than 86% achieved in five treatment seasons.

Cooperation between the various agencies and entities involved has continued to improve. During the 2007 season, WSDA, USFWS, DNR and WBGHOGA combined efforts to ensure thorough treatment of the Long Beach Peninsula. Also, WDFW, USFWS and DNR combined efforts and resources to ensure thorough treatment of the entire North Willapa Bay area. The 2008 plan, if successful, will result in the continued treatment of all infestations in Willapa Bay with emphasis placed on conducting multiple rounds of survey and treatment utilizing the most effective control techniques. The effort also continues to focus on restoration potential for successfully eradicated sites. Ongoing research in this area will help managers determine how best to proceed with restoration projects in the Bay.

WSDA feels confident that reductions will continue in 2008 and eradication will become more of a reality in Willapa Bay. Table 4 compares the treatment data from several sites over the past five years.



**Figure 4: Approximate Location of 2007 Interagency Willapa Bay Treatment Sites.**

**Table 3: Summary of 2007 Willapa Bay *Spartina* Eradication Effort**

Site	Estimated Solid Acreage Treated	Approximate Acres Treated	Entity Conducting Treatment
<b><u>North Willapa Area</u></b>			
Willapa Meadow/Smith Creek	404.64	2,000	USF&W, WDFW
North Shore/Cedar River	182.49	1,000	WDFW
Tokeland/North Cove	261.62	750	WDFW, USF&W, ST
Bruceport /Rose Ranch	29	350	DNR
S. Willapa River/Rose Ranch	12.5	400	WDFW
South Bend/Raymond	4.75	650	WDFW, USF&W
Mailboat Slough	62.5	400	WDFW, USF&W
Niawiakum Natural Area Preserve	7.35	240	DNR
Bone River Natural Area Preserve	10.75	260	DNR
South Stony Point	1.7	160	DNR
Wilson Point	1.5	100	DNR
Ellan Sands	58.6	1,500	USF&W
Bay Center/Palix	93.95	1,500	USF&W
Nemah Beach	23.43	750	USF&W, Private
North Nemah	124.78	1,600	USF&W
<b><u>South Willapa Area</u></b>			
O'Meara Point – Bear River	6.55	250	USF&W
O'Meara Cove	1.15	100	USF&W
Pot Shot	0.45	180	DNR
East Long Island/North Pot Shot	14.65	750	USF&W
South Long Island	4.25	40	USF&W
Stanley Point	3.2	50	DNR
Naselle	12.08	400	DNR, TNC
Porters Point/Tarlatt Slough	243.28	3,400	USF&W
Kaffee Lewis Slough	204.15	1,200	USF&W
South Nemah/Seal Slough	85.75	2,200	USF&W
West Long Island	46.7	900	USF&W, WBOGA
Long Beach Peninsula	407.25	3,100	DNR, WSDA, USF&W, WBOGA
<b>Total</b>	<b>2,310</b>	<b>24,230</b>	
WSDA = Department of Agriculture, WDFW = Department of Fish and Wildlife, DNR = Department of Natural Resources, WBOGA = Willapa Bay Oyster Growers Association, USFWS = U.S. Fish and Wildlife Service, TNC = The Nature Conservancy, ST = Shoalwater Tribe			

**Table 4: Reduction in Acres Treated By Major Site, 2007**

Site	Solid Acres Treated					Base Year	Reduction as of 2007
	2003	2004	2005	2006	2007		
N. Willapa Meadow/Smith Creek*	925	815.7	620	285	404.64	2003	<b>56%</b>
S. Willapa River/Rose Ranch	177.88	196.2	52	48.8	12.5	2004	<b>94%</b>
North Shore/Cedar River*	None	150	242	75.1	182.49	2005	<b>25%</b>
South Stony Point	25	25	67.5	17.3	1.7	2005	<b>97%</b>
Bruceport to Rose Ranch*	None	57	54	16.8	29	2004	<b>49%</b>
Wilson Point	None	64	90	12.6	1.5	2005	<b>98%</b>
Bay Center/Palix	None	573	387.33	234.2	93.95	2004	<b>84%</b>
North Nemah	None	860	474.25	227.9	124.78	2004	<b>85%</b>
Pot Shot	137	26	1.58	1.5	0.45	2003	<b>99%</b>
Naselle	200.06	193	48.45	31.5	12.08	2003	<b>94%</b>
Stanley Point	114	87.5	13	11.8	3.2	2003	<b>97%</b>
O'Meara Cove	75	56	11	6	1.15	2003	<b>98%</b>
E. Long Island/N. Pot Shot	258.3	295.1	164.7	134	14.65	2004	<b>95%</b>
Porters Point/Tarlatt Slough	2,425.30	844	786.9	325.9	243.28	2003	<b>90%</b>

\*The 2007 season was the first time that priorities allowed for the complete treatment of these infestations.

### **2007 *Spartina* Monitoring Program, Willapa Bay**

In 2007, DNR created a dataset of high-resolution orthophotos of Willapa Bay and Grays Harbor. The orthophotos, which are geographically referenced, were created from aerial infrared photographs taken of Grays Harbor and Willapa Bay in June 2006 and show where *Spartina* remained in the estuaries. For Willapa Bay, a GIS layer of *Spartina* was also created from the photos. This newest *Spartina* layer, mapping the abundance and distribution of *Spartina* in June 2006, was used by field crews and managers to track field operations. DNR is also in the process of analyzing nine GIS datasets of *Spartina* in Willapa Bay, collected between 1963 and 2006, to better understand how *Spartina* has changed in abundance over time. A trend analysis report using the nine datasets will be produced later this year. Preliminary results of the analysis show systematic increases in abundance from 1963 to 2000, followed by sharp decreases in abundance beginning in 2003 and continuing in 2006. More specific trends, by region, will be discussed in the report.

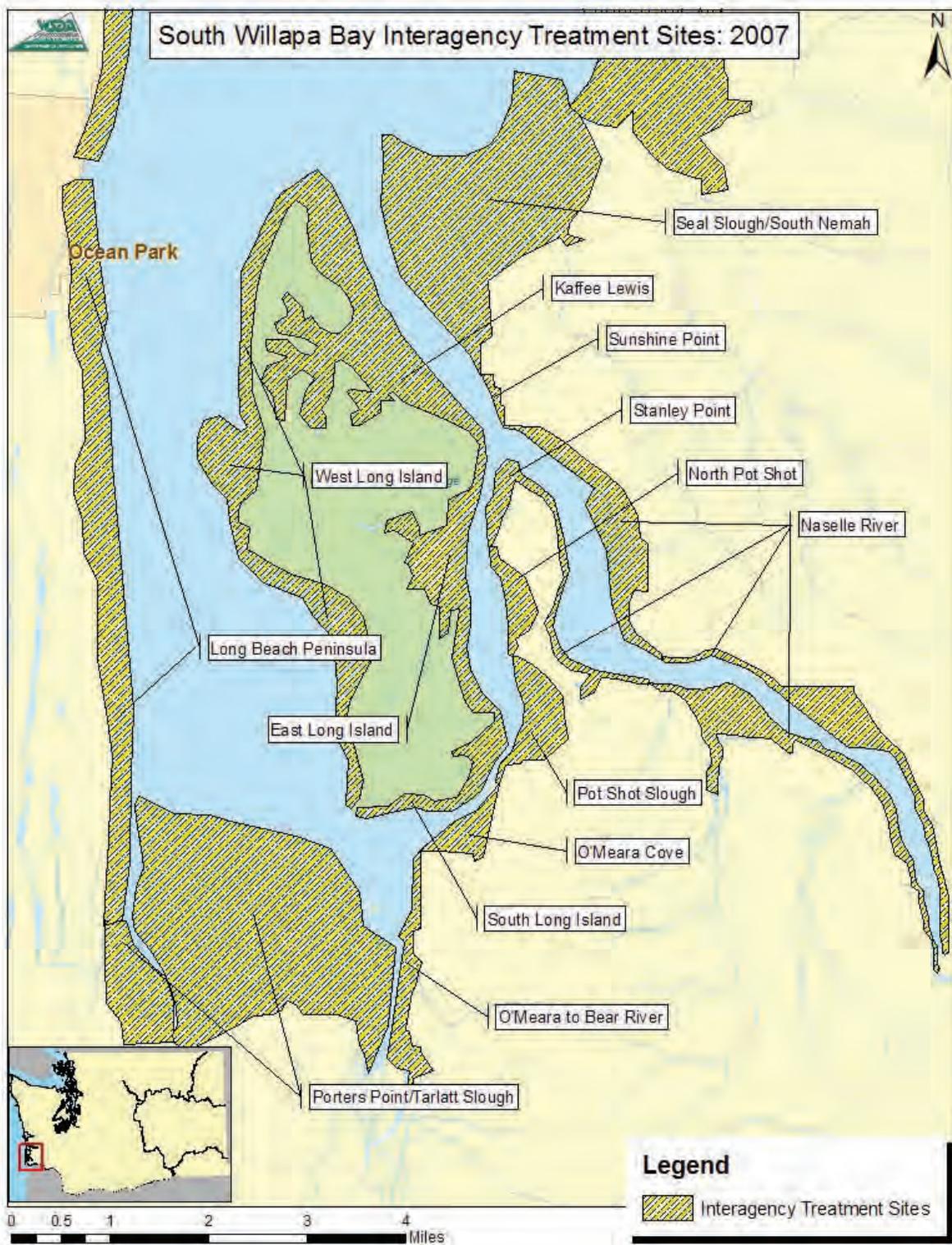
On-the-ground monitoring of stem density in control sites continued in 2007. Data collected showed a decrease in stem density from 2006 to 2007 at most monitored sites (Table 5). The exception was the Cedar River control site, where there was a minor increase in stem density from 1.4 stems per quadrat in 2006 to 2.9 stems per quadrat in 2007. This area was prioritized in the 2007 plan and solid reductions are expected in 2008.

**Table 5: Stem count reductions at major Willapa monitoring sites.**

Site	Number of Stems per Quadrat			Reduction, 2005-2007
	2005	2006	2007	
North Willapa River, west	11.5	2.8	0.8	93.0%
Stony Point	19.2	4.3	1.3	93.2%
Disney	29.3	6.1	0.7	97.6%
North Willapa Meadow, middle	52.0	3.5	0.1	99.8%
Cedar River, west	66.0	1.4	2.9	95.6%



**Figure 5: 2007 North Willapa Bay Interagency Treatment Sites.**

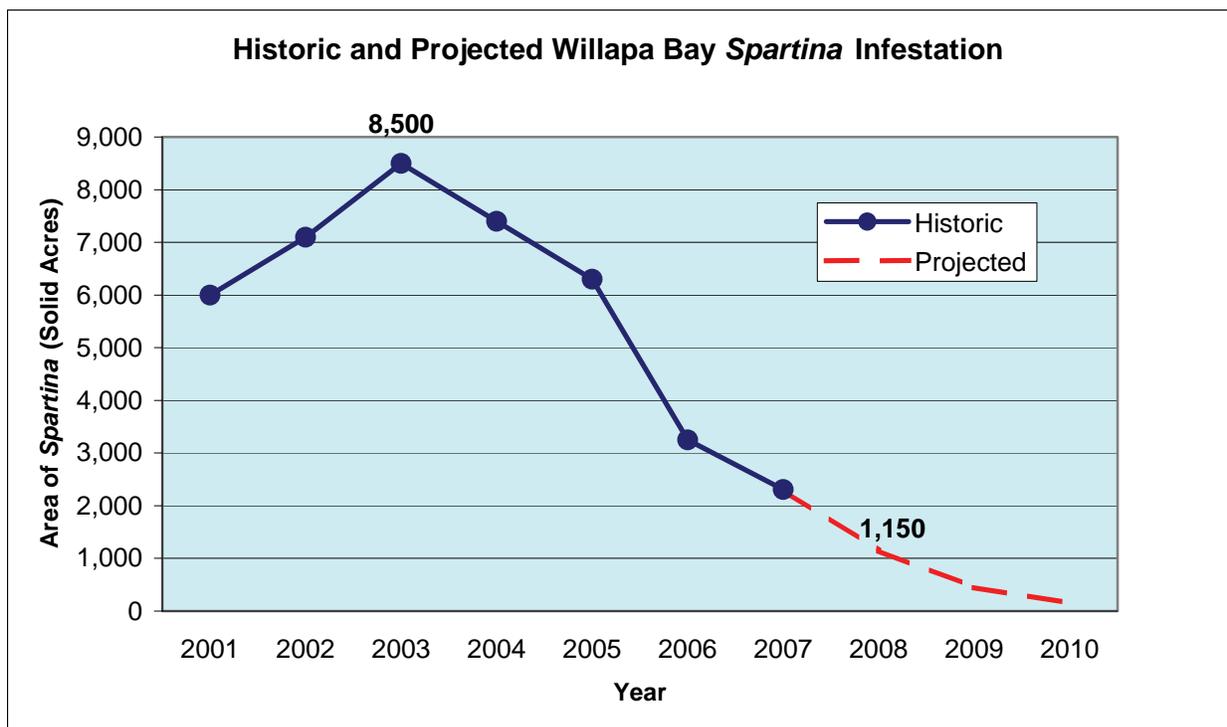


**Figure 6: 2007 South Willapa Bay Interagency Treatment Sites.**

## Recommendations for the Future

With the successes of the past five years and the sizable reductions of *Spartina* in Willapa Bay, continued support and funding are more important than ever. The 2007 treatment season in Willapa Bay saw the beginning of a transition from large-scale treatments of meadows to smaller-scale treatments of scattered infestations found throughout the Bay. This transition allowed the cooperators to conduct treatments with exceptional attention to detail. This transition requires an increased number of personnel on the ground to give individual attention to the same areas that helicopters or large machines were previously able to cover in a relatively short amount of time. As the large meadows continue to break up into small, scattered plants under the pressure of eradication, the amount of herbicide needed to treat the infestation is declining. This change is resulting in lower supply costs and higher labor costs. Under this regime, WSDA anticipates that the overall cost for re-treating scattered infestations will not significantly differ from the cost of conducting the recent large-scale applications.

WSDA expects that fewer than 1,150 solid acres of *Spartina* will be present in Willapa Bay during the 2008 treatment season. With the successful eradication of several thousand solid acres of *Spartina* in Willapa Bay over the past five years, it is critical that program focus and funding continue. Figure 7 illustrates the current projection that *Spartina* can be largely eradicated from Willapa Bay in three more seasons.



**Figure 7: Area (solid acres) of *Spartina* in Willapa Bay by year, based on WSDA estimates. Projected area assumes sustained funding.**

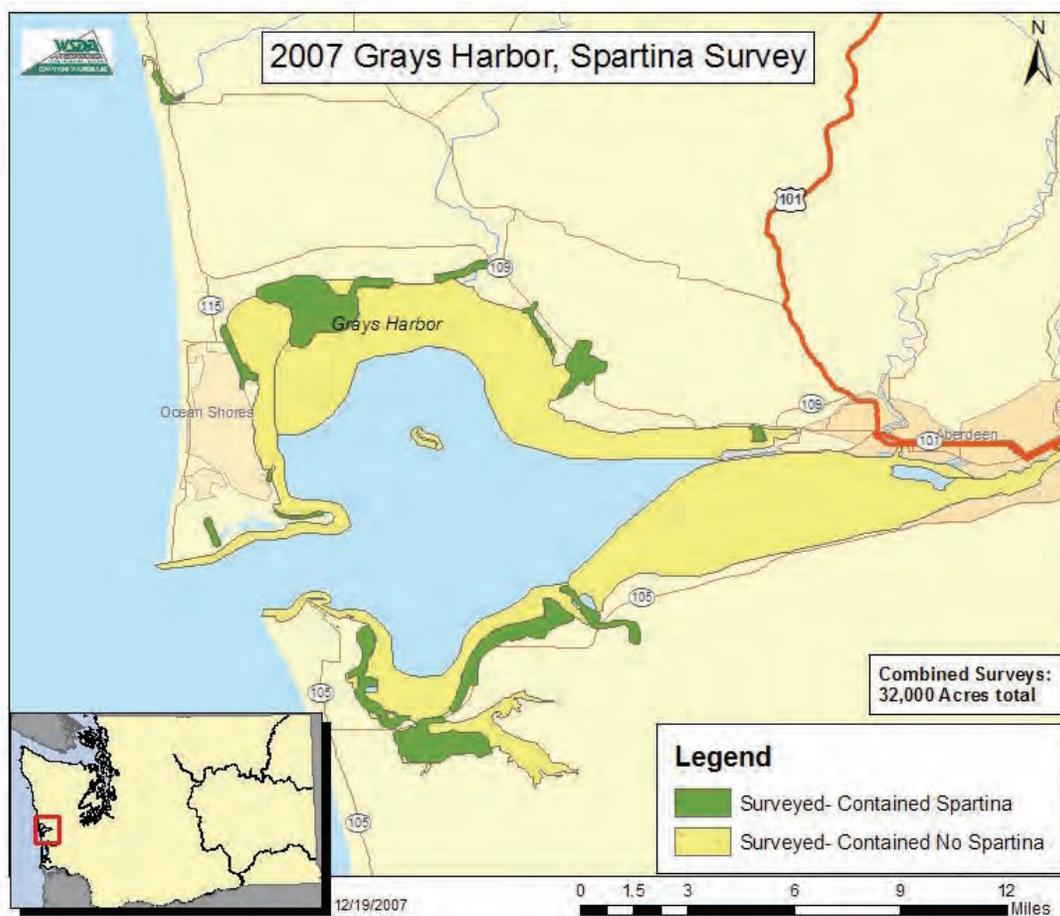
## ***Spartina* Eradication Effort in Grays Harbor**

For programmatic purposes, this geographic region includes Grays Harbor, its surrounding tributaries, and the coast from the mouth of Grays Harbor to Cape Flattery.

Two species of *Spartina* exist in Grays Harbor. The most prevalent in the region is *Spartina alterniflora*. This species makes up about 94% of the infestation in Grays Harbor. The other 6% is *Spartina densiflora*, a species that tends to grow in higher intertidal zones, and blends in well with the native grasses.

### **Extent of the Infestation in Grays Harbor**

During the 2007 season, 32,000 acres of intertidal lands in Grays Harbor and its tributaries with the potential for *Spartina* infestation were surveyed. Most of this acreage was surveyed three or more times during the course of the treatment season. In the 32,000 acres surveyed, either *S. alterniflora* or *S. densiflora* was found within 5,200 acres. Figure 8 shows the surveyed areas in Grays Harbor.



**Figure 8: Grays Harbor Survey Results, 2007**

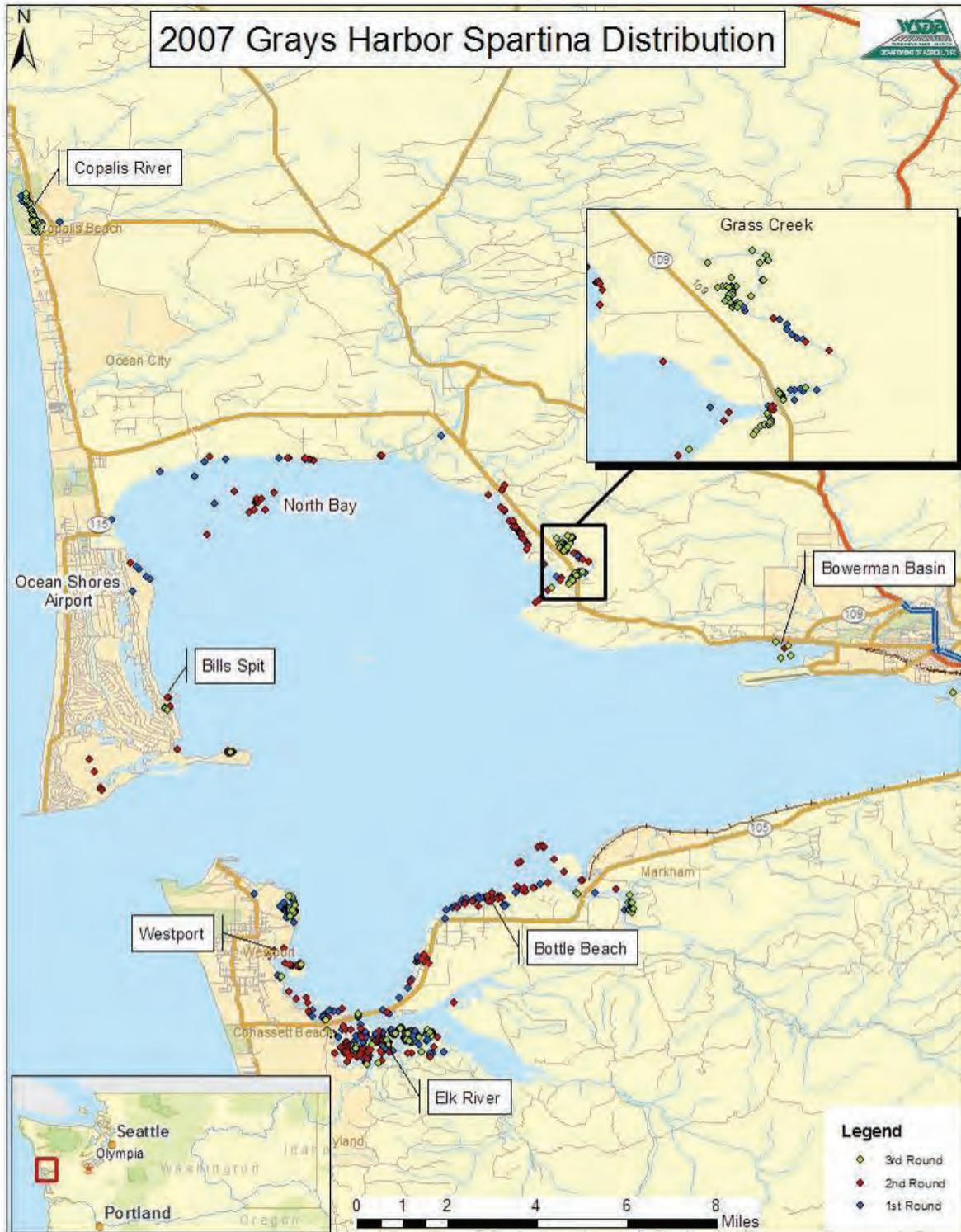
Regular survey and control work has occurred in Grays Harbor since 1995. However, due to the overwhelming size of the *Spartina* infestation in Willapa Bay, resources to do a comprehensive survey of Grays Harbor have not been available. An aerial survey in late summer 2005 located an estimated 10 solid acres of *Spartina* and spurred an effort to undertake a more thorough survey and treatment program.

Of the 10 solid acres located through the aerial survey, 6.5 acres were treated during what remained of the 2005 treatment season. Survey and treatment activities occurred throughout the 2006 season. WDFW conducted the control work in Grays Harbor and treated 3.5 solid acres, including all known infestations. The experience gained during the 2005 and 2006 treatment seasons led the project partners to conclude that a much more aggressive effort would be needed to achieve eradication in Grays Harbor.

With the opportunity furnished by increased funding from the Nisqually National Wildlife Complex, the cooperators came up with three primary goals heading into the 2007 treatment season:

- Achieve an unprecedented three rounds of survey and treatment throughout Grays Harbor.
- Perform a coastal survey targeting areas that have not previously been inspected.
- Increase the use of Global Positioning Systems (GPS) technology to help track *Spartina* distribution and treatments.

These three goals were achieved and a total of 2.51 solid acres of *Spartina* were found and treated in Grays Harbor during three rounds of survey in 2007. Of the 2.51 solid acres treated, 0.15 acres were *S. densiflora* and 2.36 acres were *S. alterniflora*. The coastal survey took place in October, locating three new finds, including two discoveries along the coast south of Cape Flattery. GPS data was collected through the season detailing *Spartina* distribution and treatments within Grays Harbor. Figure 9 shows where the *Spartina* was located during the three rounds of survey. All located *Spartina* in Grays Harbor was treated during the 2007 season.



**Figure 9: Distribution of 2007 Grays Harbor treatment sites**

## Highlights of the 2007 Season in Grays Harbor

In a unique partnership, staff from WSDA, U.S. Fish & Wildlife Service and the Department of Fish and Wildlife worked in joint crews during the season. Grays Harbor crews were usually transported into the field using airboats. On a typical day, anywhere from two to four crewmembers surveyed and treated *Spartina*, using either backpack sprayers or a high-pressure system mounted to an airboat. Frequently, to accomplish a thorough survey and treatment in remote areas, it was necessary for crews to work on foot where airboats could not navigate.

An observation made during the 2007 spray season was the reoccurrence of *Spartina* in previously treated areas. Areas that were treated in the first round contained *Spartina* within feet of the treated site in the second round. This was noticed throughout the Harbor from round to round and was variously attributed to late seed set and late emergence of the *Spartina*. There were even some areas that had small seedlings toward the end of October. This observation supported the cooperators' decision to conduct multiple rounds of survey and treatment in the 2007 season.

Of the 2.51 solid acres located and treated in Grays Harbor during 2007, 1.05 solid acres were treated in the first round. Round two resulted in 0.51 solid acres of treated *Spartina*. During round three, 0.95 solid acres of *Spartina* were treated. The increase in acreage during round three was due to the October 12th aerial survey that found a previously unknown 0.70 acres of *Spartina* infesting Grass Creek in a hidden slough.

Grays Harbor hosts the largest infestation of *Spartina densiflora* in the state. *Spartina densiflora* is a South American species of *Spartina* that was discovered in Grays Harbor in 2001. Unlike the other species in Washington, *S. densiflora* does not spread through the production of rhizomes. Apparently *S. densiflora* spreads solely through the dispersal of seeds. Surveying for *S. densiflora* can be very challenging due to its habit of growth in higher intertidal zones where it becomes intermixed with native vegetation. The plants tend to grow in clusters, giving them almost a shrub-like appearance. Figure 10 illustrates how effectively *S. densiflora* can blend in with native vegetation. In this figure, *Spartina* has been treated using blue-marker dye.



Figure 10: *Spartina densiflora* near Damon Point in Grays Harbor

The Integrated Pest Management (IPM) efforts to eradicate *S. densiflora* in 2007 included mechanical and chemical techniques. In May, crews dug *S. densiflora* plants around Bills Spit and Ocean Shores Airport. In this area, an estimated 1,000 plants were removed and properly disposed. All remaining *S. densiflora* plants (0.15 solid acres) were chemically controlled during the spray season. Table 6 represents the sites and acres treated of *S. alterniflora* and *S. densiflora* based on treatment records.

**Table 6: Summary of 2007 *Spartina* Eradication Effort in Grays Harbor**

Site	Acres Treated	Species of <i>Spartina</i>
Bills Spit	0.09	<i>S. densiflora</i>
Bottle Beach	0.02	<i>S. alterniflora</i>
Bowerman Basin (Grays Harbor National Wildlife Refuge)	0.02	<i>S. alterniflora</i>
Chenios Creek	0.01	<i>S. alterniflora</i>
Copalis River	0.10	<i>S. alterniflora</i>
Damen Point	0.06	<i>S. alterniflora</i>
Elk River	0.83	<i>S. alterniflora</i>
Grass Creek	0.81	<i>S. alterniflora</i>
Humptulips River	0.03	<i>S. alterniflora</i>
Johns River	0.15	<i>S. alterniflora</i>
North Bay	0.14	<i>S. alterniflora</i>
Ocean Shores	0.06	<i>S. densiflora</i>
Point Brown	0.01	<i>S. alterniflora</i>
Rennie Island	0.01	<i>S. alterniflora</i>
Westport (Fire Cr Pt)	0.17	<i>S. alterniflora</i>
<b>Total Acres Treated</b>	<b>2.51</b>	

## Coastal Survey

Project cooperators conducted an aerial survey of the coast on October 12. The survey departed from Grays Harbor and ended in Port Angeles. The survey was thought necessary, based on:

- Previous success of locating *Spartina* aerially.
- Drift card evidence that *Spartina* seed may have been flushing from Willapa Bay and moving north along the coast.
- The lack of survey data for the majority of tributaries along this coastline.

As part of this survey, 273 miles of coastline and tributaries were thoroughly examined, resulting in three new finds. The first was in Grass Creek off a hidden slough. This find prompted treatment during the next favorable tide cycle on October 23rd resulting in control of 0.70 solid acres of *Spartina alterniflora*. The other two substantial finds on the aerial survey were south of Cape Flattery on the Waatch and Sooes rivers. This was the first time *Spartina alterniflora* had been discovered this far north along the coast. Figure 11 depicts the new discoveries resulting from the coastal aerial survey.



**Figure 11: Major new finds of the 2007 Coastal Aerial Survey**

The find on the Sooes River was one large and one small clone, twelve feet and three feet in diameter, respectively. The quantity of *Spartina* on the Waatch River was more abundant, ranging from twenty-five foot clones to scattered seedlings, totaling approximately 0.6 solid acres. After the aerial discoveries, WSDA and Makah tribal biologists visited these sites in late October and determined the finds to be *Spartina alterniflora*. Figure 12 shows one of the larger finds.



**Figure 12: *Spartina alterniflora* on the Waatch River**

Over the winter, an eradication plan will be put in place to treat these new infestations. WSDA will continue to work cooperatively with the Makah Tribe and its representatives.

In addition to the aerial survey, 60 miles of coastline were surveyed on foot in areas extending from Grayland to the Clallam River. The ground survey allowed the crew to get a close look at the coastline and check for small seedlings that might have been missed during the aerial survey. This ground surveyed did not find any new *Spartina* infestations.

### **Recommendations for the Future**

The 2007 survey and treatment season in Grays Harbor was extremely productive. The cooperators did a thorough job of aligning the resources needed to achieve a detailed survey and complete treatment during the 2007 season. Three survey rounds were completed in the Harbor with all known infestations treated.

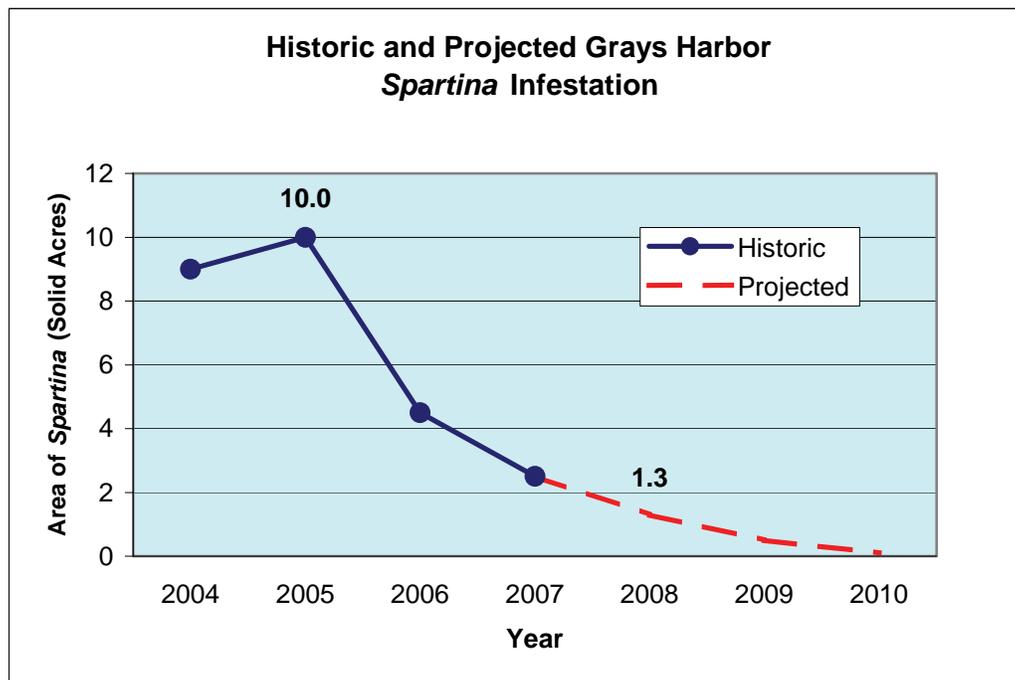
The use of GPS systems is a promising addition, not only in the survey and treatment of *Spartina* in Grays Harbor, but also as a tool for the future in places such as Willapa Bay where the program is transitioning to scattered acreages similar to those found in Grays Harbor.

After the success of the 2007 season, WSDA expects that less than 1.3 solid acres of *Spartina* will be present in Grays Harbor during the 2008 treatment season.

Specific recommendations for the 2008 Grays Harbor survey and treatment season include:

- Hire crews in April to allow time for equipment and chemical safety training, as well as obtaining herbicide application licenses.
- Incorporate digging of *S. densiflora* plants where practicable.
- Continue to survey coastal sites that may harbor unknown *Spartina* infestations.
- Most importantly, conduct a minimum of two rounds of survey and treatment throughout Grays Harbor.

With continued funding and a sustained cooperative effort, the *Spartina* infestation in Grays Harbor will continue to decline over the next three years (Figure 13).

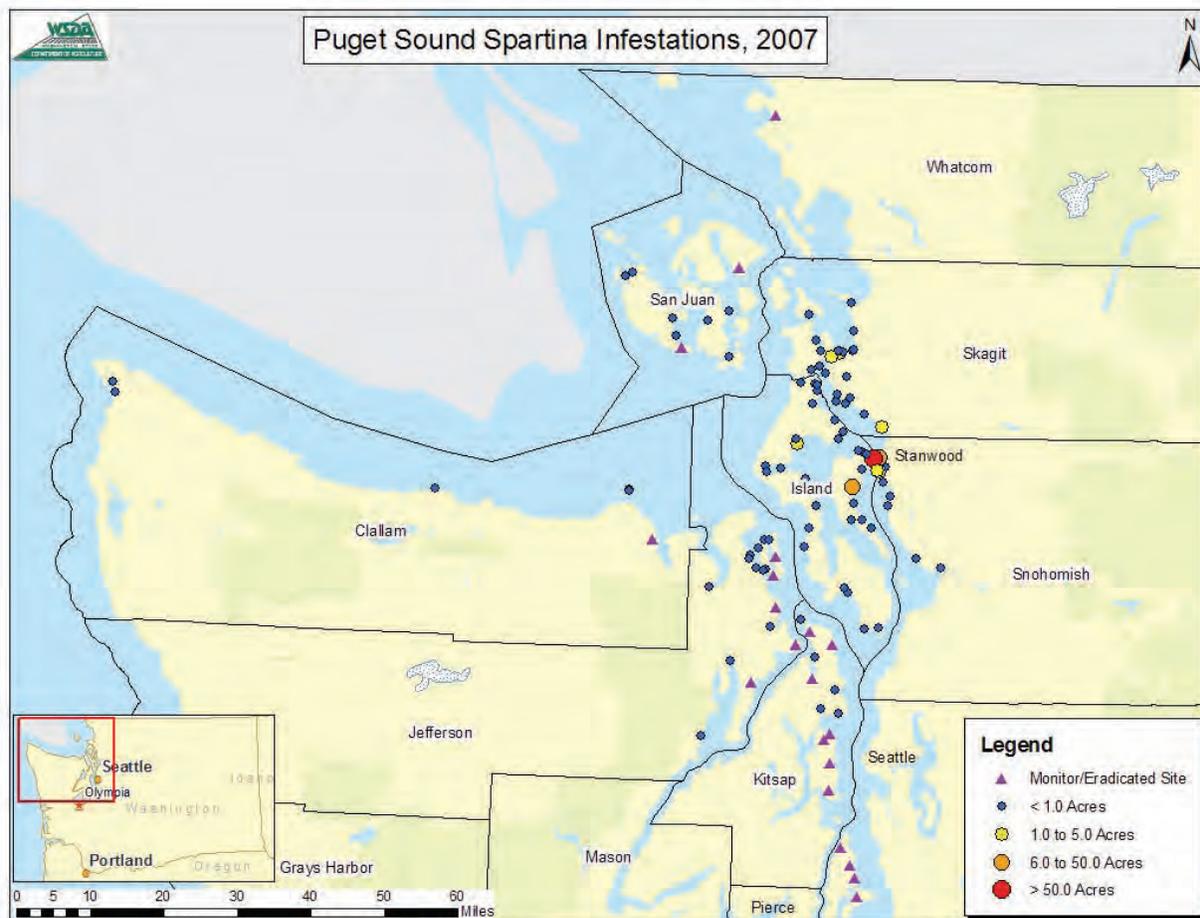


**Figure 13: Area (solid acres) of *Spartina* in Grays Harbor, based on WSDA estimates. Projected area assumes sustained funding.**

## *Spartina* Eradication Effort in Puget Sound

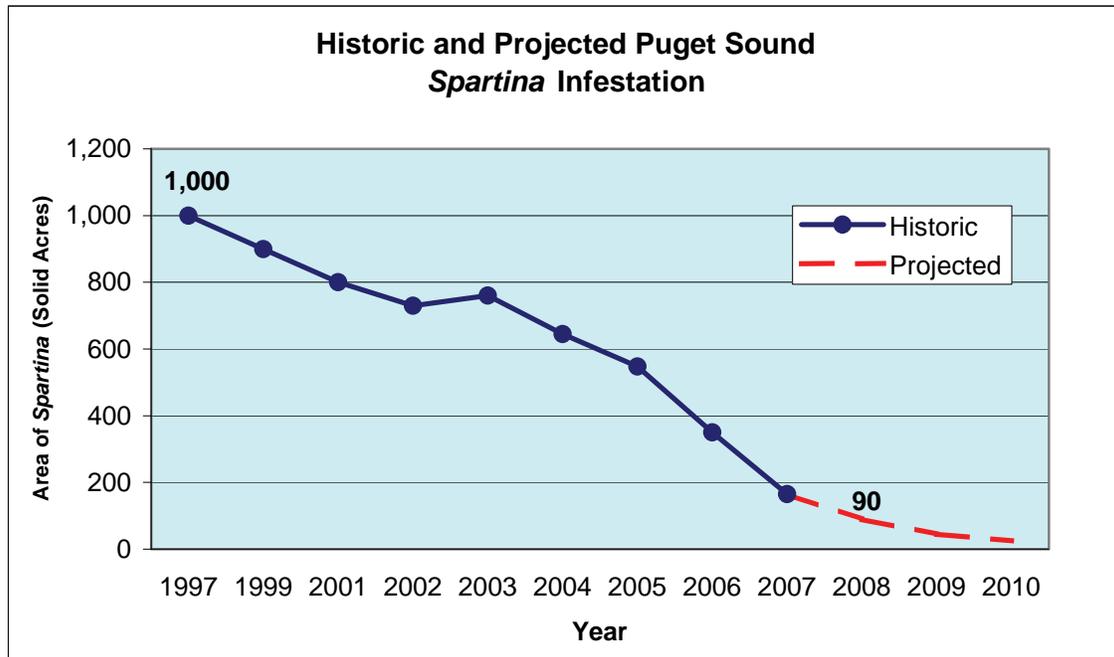
### Puget Sound Overview

For programmatic purposes, this geographic region ranges west to Neah Bay and north to Whatcom County and includes all of the waters in the Puget Sound basin. There are more than 2,500 miles of shoreline in these waters. Along Puget Sound's shores, three species *Spartina* are found: *Spartina anglica*, *Spartina alterniflora* and *Spartina patens*. Of these three species, *S. anglica* is the most abundant and accounts for more than 99% of the infestation. *S. anglica* was introduced to Snohomish County in 1961 and grew to an infestation of more than 1,000 acres at its peak in 1997. *S. alterniflora* and *S. patens* are limited in distribution and extent; these two species account for less than one solid acre throughout Puget Sound.



**Figure 14: Extent and Size of Known Infestations in the Puget Sound Region. The largest infestations remain near the original introduction site of *S. anglica* in Snohomish County.**

WSDA estimates that there were 175 solid acres of *Spartina* spread throughout the Puget Sound region in 2007. This is a 47% reduction from the 325 acres reported in the region by WSDA in 2006. Figure 14 shows the approximate extent and size of known *Spartina* infestations in the Puget Sound region. WSDA estimates that fewer than 90 solid acres of *Spartina* will remain during 2008. WSDA predicts, that with sustained funding and effort, *Spartina* will be nearly eliminated from the Puget Sound region by 2010. Figure 15 illustrates the decline in the amount of *Spartina* in Puget Sound since 1997 and the projected decline through 2010.



**Figure 15: Area of *Spartina* in Puget Sound, reported in solid acres and based on WSDA and cooperator records. Projected area assumes sustained funding.**

### Highlights of the 2007 Season in Puget Sound

The 2007 control season was highly successful in spite of inclement weather during the summer. Noteworthy achievements include:

- 164 acres of *Spartina* were treated throughout the region during the 2007 season; this encompasses 95% of the known sites in Puget Sound.
- A 25-acre aerial treatment controlled the last remaining solid meadow of *Spartina* in southeast Skagit Bay.
- Triangle Cove and Price/Emrick's sites in Island County were treated completely for the first time this season; more than 90 acres of *Spartina* were controlled.
- More than 40 miles of shoreline were surveyed for unknown infestations.

Table 7 shows the estimated area of *Spartina* controlled this season by county. Details of the work are included in the county and multi-county sections of the report.

In addition to progress towards the eradication of *Spartina*, 2007 saw inroads to other areas of the management of this noxious weed. As the majority of the large meadows of *Spartina* have been controlled, managers have begun to think about restoration of *Spartina*-impacted nearshore habitat. In Skagit Bay and Port Susan, WDFW, The Nature Conservancy and the Snohomish County Noxious Weed Control Board conducted a set of studies to monitor sediment dynamics, plant communities, and changes to bird and invertebrate populations. The results of these studies will provide managers with information about the success of restoration regimes.

Ducks Unlimited Canada, the Puget Sound Partnership, and WSDA partnered to finish the cross-border drift card study in 2007. This study was designed to determine how *Spartina* is distributed by tides, currents and winds. Ducks Unlimited Canada will publish the results of this study in 2008. 2007 also saw an increase in volunteer interest in *Spartina*-related projects in Puget Sound. Local kayak clubs, WSU Beachwatchers, People for Puget Sound and many other groups have partnered to augment agency survey efforts throughout the region.

**Table 7: Estimated Solid Acres of *Spartina* Treated in 2007 by County as reported by WSDA and records from *Spartina* cooperators.**

County	Estimated Solid Acres of <i>Spartina</i> Treated
Island	96.98
Snohomish	60.43
Skagit	6.16
San Juan	0.1
Kitsap	0.06
Jefferson	0.02
Clallam	<0.01
<b>Total</b>	<b>163.73</b>

### Island County

Island County contained the largest infestations of *Spartina* in Puget Sound in 2007. The Island County Noxious Weed Control Board (ICNWCB), WDFW, and ICNWCB's contractor, Wildlands Management, conducted the *Spartina* eradication work in the county. WSDA provided ICNWCB with \$50,000 to eradicate *Spartina* within Island County.

A total of 97 acres of *Spartina* were treated in the 2007 control season in Island County, about the same number of acres treated in 2006. WDFW conducted large-scale treatments of Triangle Cove and Price/Emrick's meadows, treating 92 acres. 2007 was the first year that these sites were completely treated within a season. During the 2006 season, 64 acres of *Spartina* were controlled in Triangle Cove; in 2007, only 29 acres of *Spartina* remained and were treated in the cove due to the successes that program cooperators have had with previous control work. WDFW estimates that fewer than 15 solid acres will remain in Triangle Cove in 2008.

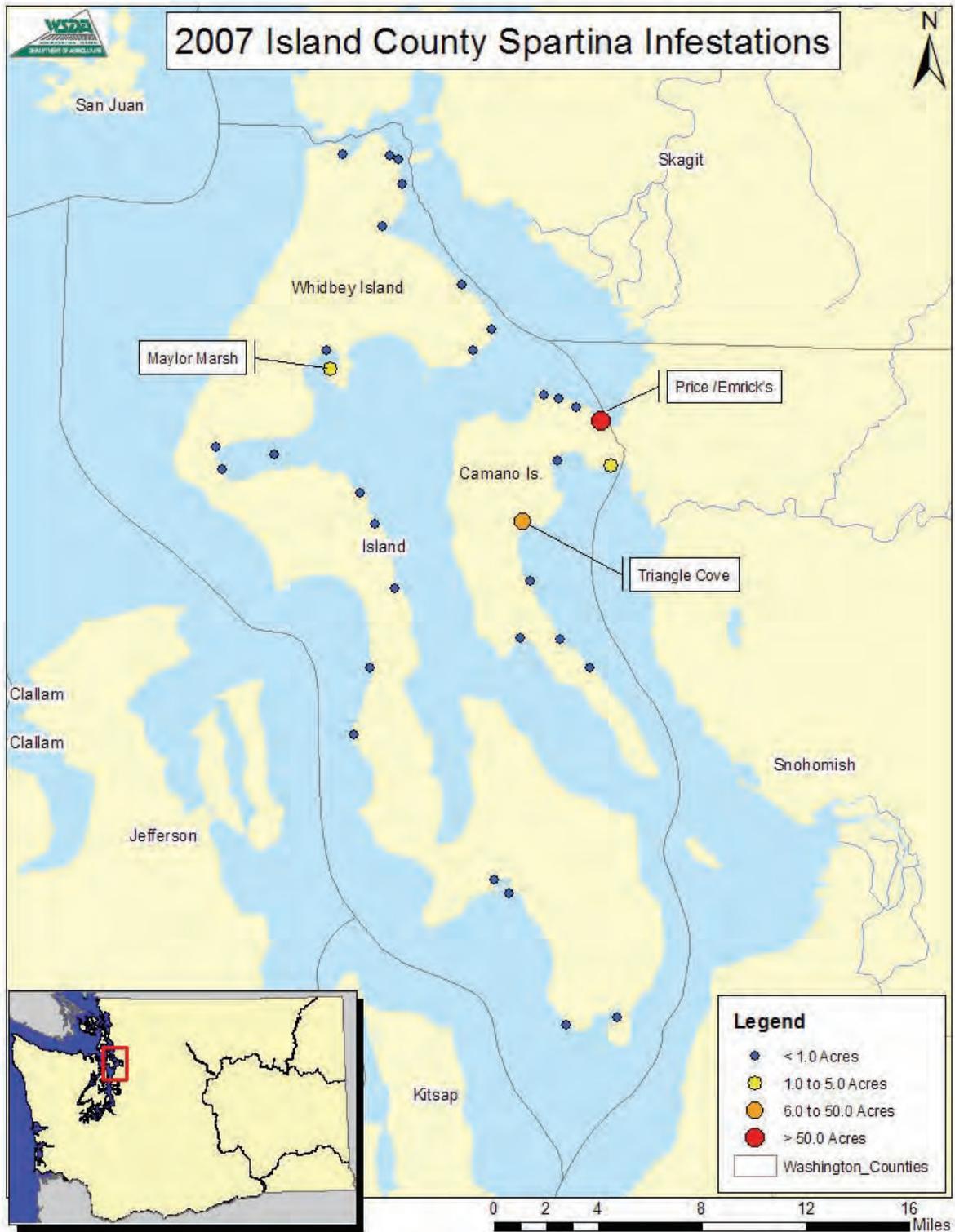
With an increase in the effort in 2007, a total of 64 solid acres of *Spartina* were controlled at the Price/Emrick's sites. This is more than double the 30 acres treated at these sites in 2006. The two sites were completely treated with herbicide in 2007. In previous years, these infestations were primarily controlled using mechanical methods, a slower method of controlling *Spartina*.



**Figure 16: Triangle Cove before major treatments in 2002 and in 2007. In 2002, there were approximately 160 solid acres of *Spartina anglica* in the cove. During 2007, all 29 acres of *Spartina* in the cove were treated. WSDA estimates that fewer than 15 acres will be present in 2008.**

ICNWCB and Wildlands Management controlled the major *Spartina* infestations and seed sources on Whidbey Island in 2007 but were unable to treat five of the smaller outlier sites. In total area, the missed sites are less than 0.5 acre in size. The contractor missed the sites this season due to inclement weather and a late start.

Table 8 summarizes the Island County *Spartina* eradication effort in 2007. Figure 17 shows the approximate size and extent of the *Spartina* infestation in Island County. With continued treatment, WSDA expects the large seed-producing infestations to decline in size during the next three years. During this period, eradication of the smaller outlier populations in Island County is possible.



**Figure 17: Extent and Size of Known *Spartina* Infestations in Island County.**

**Table 8: Summary of 2007 *Spartina* Eradication effort in Island County.**

Site	Estimated Solid Acreage Treated	Entity Conducting Treatment	Treatment Method
Price/Emrick's	64.07	WDFW	Herbicide
Triangle Cove	28.95	WDFW, WM	Herbicide
Maylor's Marsh	2.5	WM	Herbicide
Cultus Bay	0.9	WM	Herbicide
Elger Bay	0.225	WM	Herbicide
Arrowhead Beach	0.075	WM	Herbicide
Livingston Bay	0.075	WM, WDFW	Herbicide
Twin Lagoons, Kennedy Lagoon	0.032	WM	Herbicide
Deer Lagoon	0.025	WM	Herbicide
Juniper Beach	0.025	WM	Herbicide, Dig
Glenwood Lagoon	0.02	WM	Herbicide
Ala Spit	0.015	WM	Herbicide
Dugualla Bay	0.015	WM	Herbicide
Race Lagoon	0.015	WM	Herbicide
English Boom	0.014	WM	Herbicide
Mariner's Cove	0.007	WM	Herbicide
Cornet Bay	0.005	WM	Herbicide
Eagle Tree	0.005	WM	Herbicide
El Capitan Lagoon	0.005	WM	Herbicide
Harrington's Lagoon	0.005	WM	Herbicide
Utsalady Bay	0.001	WM	Dig
Hope Harbor*	0	-	<i>Not treated</i>
Scatchet Head*	0	-	<i>Not treated</i>
Mt. View Lagoon*	0	-	<i>Not treated</i>
Hancock Lake*	0	-	<i>Not treated</i>
Fawn Bluff*	0	-	<i>Not treated</i>
<b>Total Solid Acres Treated</b>	<b>96.98</b>		
WDFW = Washington Department of Fish & Wildlife, WM = Wildlands Management * Not treated because of inclement weather and time constraints			

## Snohomish County

Snohomish County has the second largest *Spartina* infestation in Puget Sound and is an epicenter for large-scale eradication activities. The Snohomish County Noxious Weed Control Board, WDFW, and The Nature Conservancy (TNC) worked in concert to treat *Spartina* in Skagit Bay and Port Susan. Approximately 60 solid acres, including all known sites, were treated in Snohomish County in 2007. WSDA provided support to cooperators to eradicate *Spartina*. In addition to providing agency staff to participate in cooperative *Spartina* projects, WSDA contributed funding to cooperators for *Spartina* eradication. In 2007, WSDA supplied \$50,000 and herbicide to Snohomish County Noxious Weed Control Board to control *Spartina*.

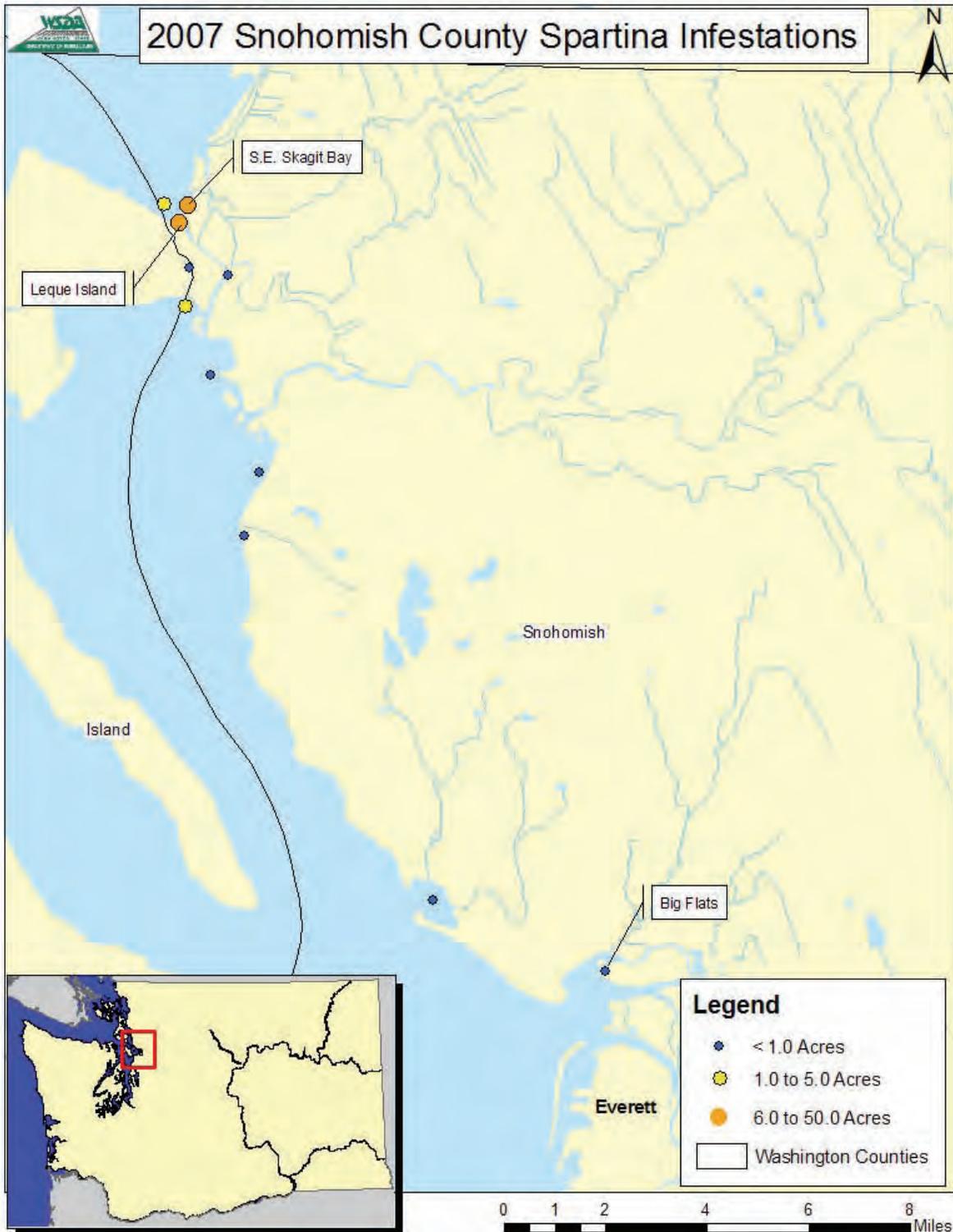


Figure 18: Size and Extent of known *Spartina* Infestations in Snohomish County.

The major focus in Snohomish County was treating the major populations in Skagit Bay. This site contained about 26 of the 60 solid acres of *Spartina* in the county. WDFW conducted a substantial amount of work on WDFW-owned and -managed lands in Snohomish County. Much of this work focused on Leque Island and Mystery Island, with WDFW treating 27 solid acres of *Spartina* on these two sites during 2007. WDFW also aided other cooperators within Snohomish County with logistical support. Through a National Fish and Wildlife Foundation Grant, WDFW also collected invertebrate and sediment data to assess the restoration efforts in Skagit Bay.

In 2007, TNC increased *Spartina* control effort on its 4,000-acre Port Susan Preserve. Through outside funding and the Landowner Incentive Program, TNC hired a full-time crew dedicated to *Spartina* eradication and survey. This crew treated a total of 1.89 solid acres of *Spartina* in Port Susan during 2007, a tenfold increase from 2006. This represents an increase in effort rather than a spreading infestation in Port Susan. Additional outside funding allowed TNC to conduct vegetation surveys in Port Susan to monitor the effectiveness of *Spartina* eradication and estuary restoration.

The Snohomish County Noxious Weed Control Board continued treating *Spartina* in southeast Skagit Bay and the Stillaguamish channel system in 2007 and was able to treat *Spartina* in previously untreated areas in Skagit Bay. The Weed Board also conducted vegetation monitoring in areas of active *Spartina* management to assess vegetative impacts of removing *Spartina*.

**Table 9: Summary of 2007 *Spartina* Eradication Effort in Snohomish County.**

Site	Estimated Solid Acreage treated	Entity Conducting Treatment	Treatment Method used
Port Susan	1.89	TNC	Herbicide, Dig
Southeast Skagit Bay	25.77	SC, WDFW, WSDA	Herbicide
Davis Slough	1.28	WDFW, SC	Herbicide
Mystery Island	1.25	WDFW	Herbicide
Leque Island	25.68	WDFW	Herbicide
South Leque	0.17	WDFW, WM	Herbicide
South Pass, West Pass, Stillaguamish River Channels	4.14	SC, WDFW	Herbicide
Big Flats	0.25	WDFW, WSDA, SC, TT	Herbicide
<b>Total Solid Acres Treated</b>	<b>60.43</b>		
WSDA = Department of Agriculture, SC = Snohomish County, TNC = The Nature Conservancy, TT = Tulalip Tribe, WDFW = Washington Department of Fish & Wildlife			

This year marked the first year of active involvement by People for Puget Sound (PPS) in the *Spartina* eradication effort in Snohomish County. PPS trained citizens in survey and inventory protocols for *Spartina*. PPS volunteers surveyed 11 miles of shoreline in the county and, with a \$500 contribution from WSDA, printed informational brochures to distribute to the public.

The Snohomish County control effort in 2007 was successful due to a high level of coordination between cooperators and increased effort. Table 9 is a summary of the 2007 control season with the areas treated, methods used, and which group conducted the control. Figure 18 shows the

approximate locations and sizes of *Spartina* infestations in Snohomish County. If overall effort levels are maintained in Snohomish County, the large populations will diminish, resulting in near eradication within three years.

## **Skagit County**

The Skagit County Noxious Weed Control Board (SCNWCB), the Department of Ecology, WDFW, and the Swinomish Tribal Community controlled approximately 6.2 solid acres of *Spartina* in Skagit County in 2007. WSDA provided \$30,000 for Skagit County's *Spartina* eradication effort and \$10,000 for the Swinomish Tribal Community's *Spartina* eradication projects.

SCNWCB was unable to staff its field positions until late July. Even though this late start and weather hampered control activities, SCNWCB treated 2.77 solid acres of *Spartina* during the season. The majority of SCNWCB's work focused on the Gallups and Rawlings Road sites in Skagit Bay. An estimated 2 solid acres of *Spartina*, however, did not receive treatment due to time and weather constraints. Skagit County expects to resolve staffing issues and will prioritize missed sites during the 2008 control season.

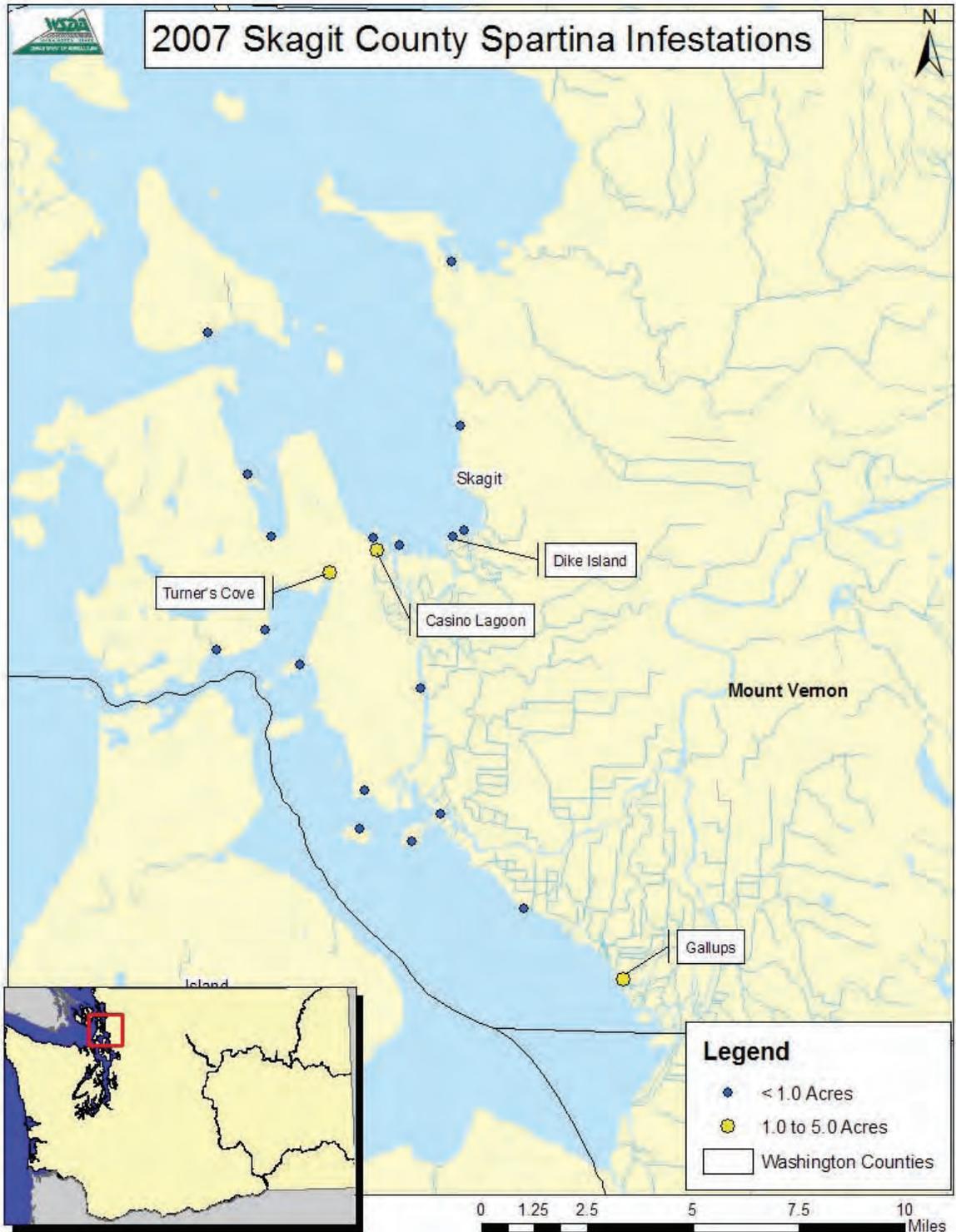
In 2007, Department of Ecology staff treated 0.015 acres of *Spartina* on the Padilla Bay Estuarine Research Reserve, which included all known infestations. Padilla Bay has two species of *Spartina* present: *S. anglica* and *S. alterniflora*. In 2007, Dike Island on the Reserve had the largest known population of *S. alterniflora* in Puget Sound with nearly 600 square feet. The Reserve has used IPM techniques to control *Spartina* since 1996. This year's treatment of 0.015 acres is a large reduction from the maximum of 17 solid acres reported in the Reserve during 1997. Department of Ecology staff expects to eradicate the *S. alterniflora* infestation in the next three years and will remain active in preventing new infestations of *S. anglica*.

In its sixth year of partnership with WSDA, the Swinomish Tribal Community actively engaged in *Spartina* control on its lands. The tribe adheres to non-chemical IPM techniques to eradicate *Spartina*. The work focuses primarily on Turner's Cove and other tribal shorelines. Turner's Cove is the largest single infestation in Skagit County and the focus of intense management activity. In 2007, tribal staff covered 2,500 square feet of *Spartina* with geotextile and mowed seed heads in Turner's Cove. The tribe partnered with People for Puget Sound and other groups to organize a community eradication event, which removed nearly 0.5 acres of *Spartina* from Turner's Cove.

WDFW participated in the *Spartina* eradication effort in Skagit County in 2007. In a partnership with the Swinomish Tribe, WDFW conducted mechanical treatments in Turner's Cove. WDFW also aided Skagit County crews with logistical support in Samish Bay.

Though this control season was hindered by a late start and poor weather, control of the major sites occurred. Table 10 summarizes this effort by site and Figure 19 shows the approximate size and extent of the *Spartina* infestations in Skagit County. Through planning and coordination, any sites missed in 2007 will receive treatment early in the 2008 control season. With ongoing

cooperation, WSDA expects significant reductions in the size of the Skagit County infestation in the next three years.



**Figure 19: Extent and Size of Known Infestations in Skagit County.**

**Table 10: Summary of the 2007 *Spartina* Eradication Effort in Skagit County.**

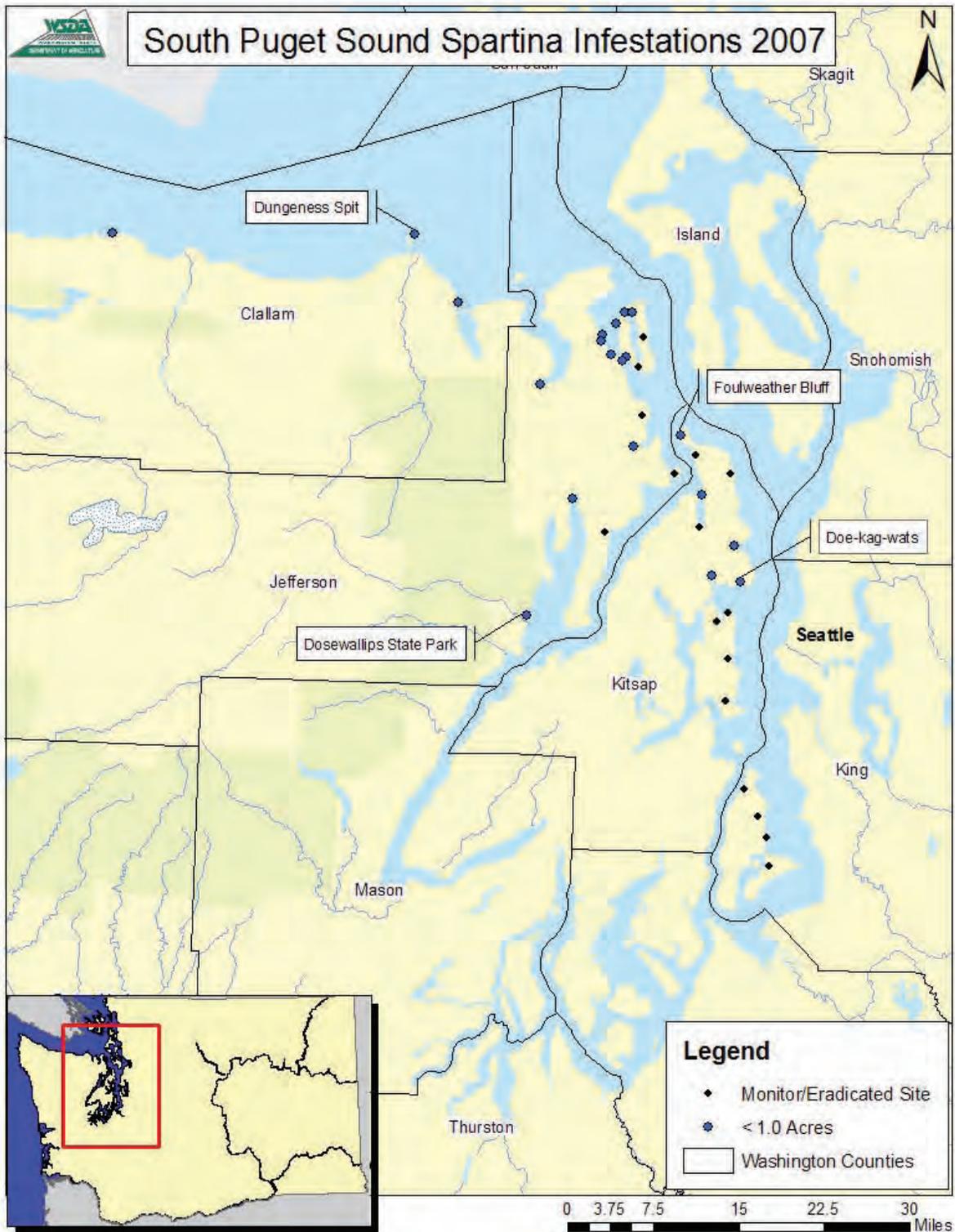
Site	Estimated Solid Acreage Treated	Entity Conducting Treatment	Treatment Method
Turner's Cove	3	WDFW, SW, PFPS	Crush, Dig, Cover, Mow
Rawlings Rd. South	0.81	SK	Mow, Herbicide
Casino Lagoon/ Casino Beach	0.75	WSDA, SK	Herbicide
Gallups South	0.63	SK	Mow, Herbicide
Padilla Bay/Alice Bay/Samish Bay	0.452	SK, DOE, WDFW	Dig, Herbicide
Eagle's Nest	0.27	SK	Mow, Herbicide
Swinomish Channel	0.17	SK, SW	Herbicide, Dig
Sands Island	0.05	SK	Herbicide
Dike Island	0.015	DOE	Herbicide
Kraft Island	0.01	SK	Herbicide
Kiket Island	0	SK	Monitor
Ika Island	0	SK	Monitor
Dewey Beach	0	SK	Monitor
March Point	0	SK	Monitor
Guemes Island	0	PFPS	Monitor
Whitmarsh	0	SK	Monitor
<b>Total Solid Acres Treated</b>	<b>6.16</b>		

WSDA = Department of Agriculture, DOE = Department of Ecology, PFPS = People for Puget Sound, SK = Skagit County, SW = Swinomish Tribal Community, WDFW = Washington Department of Fish & Wildlife

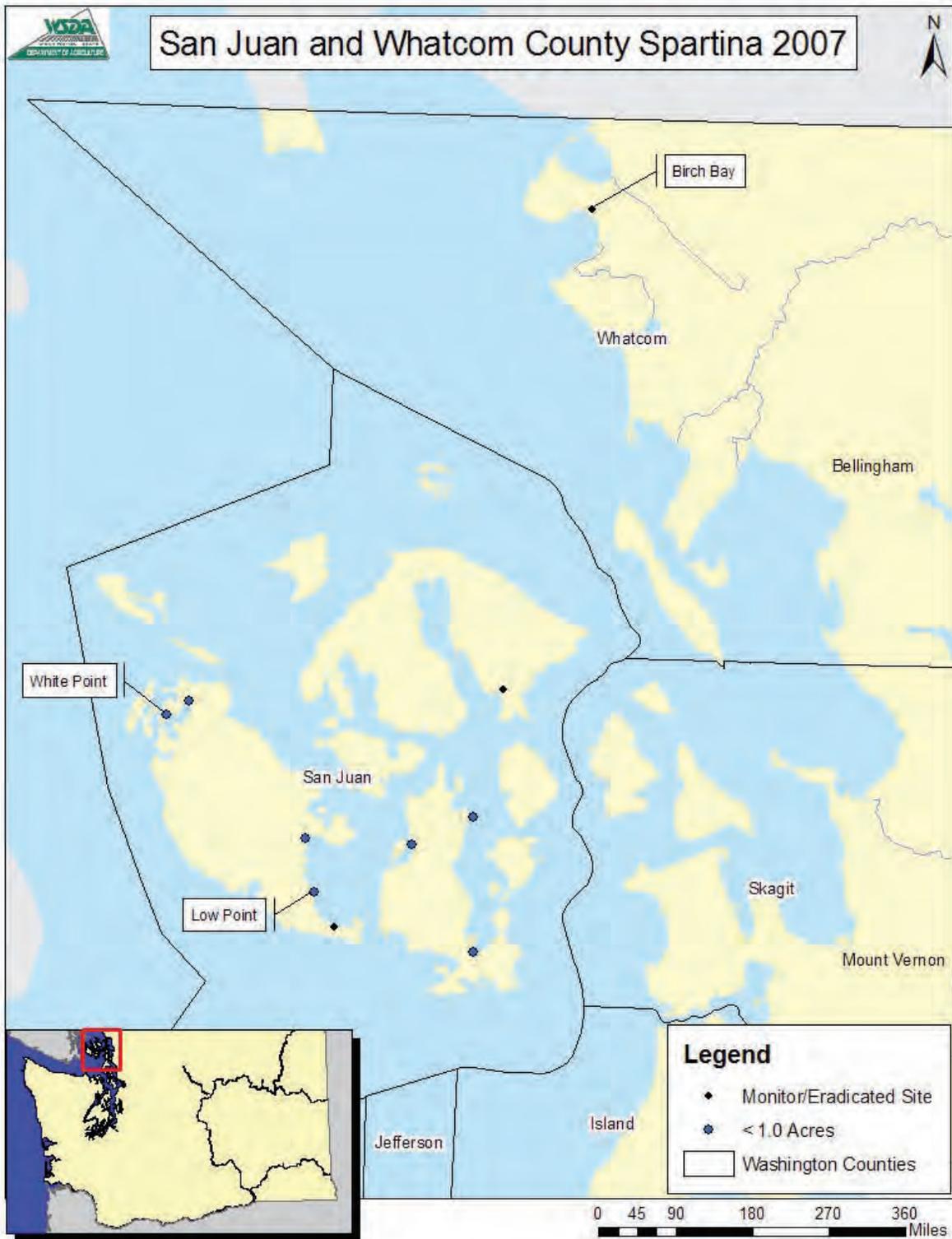
### **Clallam, Jefferson, Kitsap, King, San Juan and Whatcom Counties**

In 2007, WSDA continued to work with the noxious weed control boards of Clallam, Jefferson, King, San Juan, and Whatcom counties as well as the U.S. Navy, State Parks, Vashon-Maury Land Trust, Suquamish Tribe and U.S. Fish and Wildlife Service (USFWS) to conduct surveys and control *Spartina*. These cooperators provided logistical aid in surveying estuaries in these counties for outlying populations of *Spartina*. Table 11 summarizes the *Spartina* eradication effort in Clallam, Jefferson, Kitsap, King, San Juan, and Whatcom counties. Figures 20 and 21 show the approximate extent of the *Spartina* infestations in these counties.

In August 2007, USFWS staff detected a small infestation of *S. anglica* in the Dungeness Spit National Wildlife Refuge. In cooperation with USFWS personnel, WSDA controlled the infestation and designed a survey and management plan to eradicate *Spartina* in this sensitive location. After discovery of this new infestation, WSDA increased survey efforts along the Strait of Juan de Fuca and found two additional infestation sites in Clallam County. These infestations are located on the Makah Reservation near Neah Bay and at Salt Creek, ten miles west of Port Angeles. Figure 22 shows the approximate location of the Dungeness Spit and Salt Creek infestations. The Neah Bay infestations are discussed in the Grays Harbor section of this report.

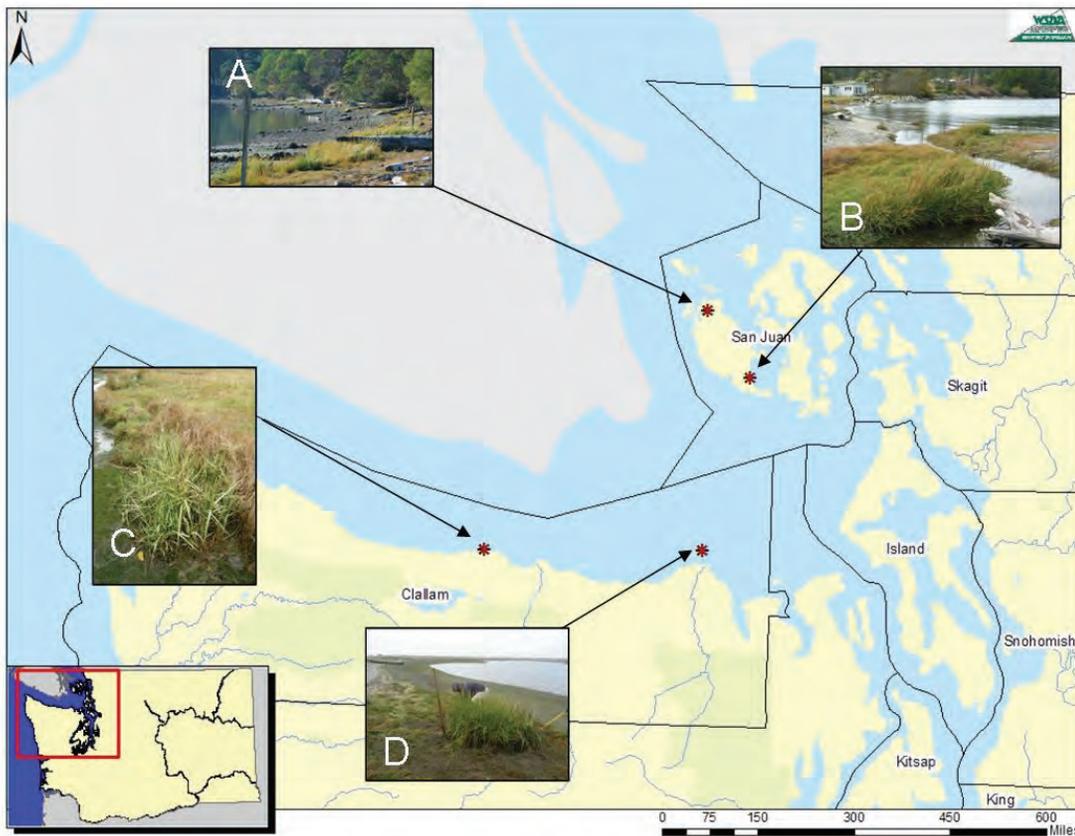


**Figure 20: Extent and Size of Known Puget Sound and Strait of Juan de Fuca Infestations.**



**Figure 21: Extent and Size of Known infestations in San Juan and Whatcom Counties.**

In Kitsap County, WSDA and the Suquamish Tribe worked together to tackle the largest known infestation in central Puget Sound at Doe-Kag-Wats. For the second year in a row, the herbicide imazapyr was applied at the site. In 2006, 0.50 acres were treated at the site. In 2007, the remaining 0.06 acres (2,600 square feet) of *Spartina* were treated. This is an 88% reduction in the infestation size. With repeated visits in the coming years, this last major seed-producing infestation in central Puget Sound will be eradicated.



**Figure 22: Newly discovered infestations in Clallam and San Juan counties. A) White Point, San Juan Island. B) Low Point, San Juan Island, C) Salt Creek, Clallam Co. and D) Dungeness Spit NWR.**

During 2007, WSDA and WDFW assisted the San Juan County Noxious Weed Control Board in a shoreline survey of the San Juan Islands. This survey was conducted by boat due to the extensive shoreline and limited access. The survey yielded two new infestation sites on San Juan Island. These infestations totaled approximately .075 acre and are now priority sites for control in the following years. Figure 22 shows the locations and sizes of these new infestations.

WSDA crews have substantially reduced all other known infestations in Clallam, Jefferson, Kitsap and King counties during the past seven years. All known sites were surveyed twice and all finds treated during the 2007 control season. Surveys in King and Whatcom counties did not find any *Spartina* in 2007. A complete list of historic *Spartina* sites surveyed this season is

listed in Table 12. Historic *Spartina* sites are locations where management activities have successfully controlled *Spartina* infestations. These historic sites may either be eradicated or still require monitoring prior to declaring eradication. This season more than 40 miles of shoreline were surveyed in areas adjacent to known infestation sites. As the amount of *Spartina* decreases, the area surveyed for *Spartina* has increased in Puget Sound. Surveys are important to detect any outlier infestations before they become well established.

**Table 11: Summary of *Spartina* Eradication Effort in Clallam, Jefferson, Kitsap, King, San Juan and Whatcom Counties.**

Site	Estimated Solid Area (square feet)	Entity Conducting Treatment	Treatment Method
<b>San Juan County</b>			
Argyle & Jackle's Lagoons	5	SJC/WSDA	Dig
Fisherman Bay & Mud Bay	50	SJC/WSDA	Dig
Spencer Spit	20	SJC/WSDA	Dig
Low Point	1,089	SJC	Seed Removed
White Point	2,178	SJC	Seed Removed
<b>Clallam County</b>			
Salt Creek	10	CC	Dig
Dungeness Spit NWR	500	USFWS/WSDA	Dig
<b>Jefferson County</b>			
Dosewallips State Park	805	WSDA	Herbicide
Tarboo Bay	5	WSDA	Dig
Scow Bay	10	WSDA	Dig
Chimicum Creek	6	WSDA	Dig
Discovery Bay	15	WSDA	Dig
South Indian Island	10	WSDA	Dig
North Indian Island	30	WSDA/Navy	Dig
Fort Flagler	5	WSDA	Dig
<b>Kitsap County</b>			
Foulweather Bluff	50	WSDA	Dig
Miller Bay	15	WSDA	Dig
Doe-Kag-Wats	2,374	WSDA/ST	Herbicide
Arness Park	10	WSDA	Dig
Port Gamble	2	WSDA	Dig
<b>Total Solid Area Treated</b>	<b>7,189 sq feet</b> (0.165 acre)		
WSDA = Department of Agriculture, CC = Clallam County, Navy = US Navy, SJC = San Juan County, USFWS = U.S. Fish & Wildlife Service, ST = Suquamish Tribe			

## Recommendations for the Future

Continuous control work, paired with the elimination of major seed-producing populations in Puget Sound, has resulted in significant decreases in the total amount of *Spartina* in Puget Sound. The *Spartina* management model in Puget Sound is moving away from aerial treatments, boom sprayers and large-scale mechanical control towards a more labor-intensive effort that uses fewer material resources. Treating these diffuse populations is a more labor-intensive process

that requires a different suite of tools for invasive plant managers. The geographic area covered by this effort will not decrease in size in the coming years.

To complement the great reductions in the size of the Puget Sound *Spartina* infestation that have occurred in the recent past, more effort will need to be placed on surveys. In the next several years, the amount of *Spartina* will decrease along the shores of Puget Sound but the amount of work to accomplish will not.

**Table 12: Historic *Spartina* sites in Puget Sound. These are sites with no *Spartina* recorded in 2007. Eradicated sites are locations with no *Spartina* recorded for two years.**

Site	Status
<b>San Juan County</b>	
Buck Bay	Monitor
<b>Clallam County</b>	
Gibson Spit	Monitor
<b>Jefferson County</b>	
Bywater Bay	Eradicated
Mats Mats Bay	Eradicated
Mystery Bay	Eradicated
Kala Point	Monitor
Oak Bay	Monitor
Port Hadlock	Monitor
Port Ludlow	Monitor
Thorndyke Bay	Monitor
Whalin Point	Monitor

Site	Status
<b>Kitsap County</b>	
Eglon	Eradicated
Murden Cove	Eradicated
Kingston	Monitor
Manzanita	Monitor
Point Julia	Monitor
Point Monroe	Monitor
<b>King County</b>	
Fern Cove	Eradicated
Gorsuch Road	Eradicated
Point Heyer	Monitor
Rabb's Lagoon	Monitor
Port Blakely	Eradicated
<b>Whatcom County</b>	
Birch Bay	Monitor