REPORT TO THE LEGISLATURE

PROGRESS OF THE 2002 *SPARTINA* ERADICATION PROGRAM

December 15, 2002

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TABLE OF CONTENTS

EXECUTIVE SUMMARY **3**

INTRODUCTION **7**

WSDA *SPARTINA* PROGRAM **8**

2002 CHALLENGES AND NEW DEVELOPMENTS **11**

SPARTINA ERADICATION EFFORTS IN WILLAPA BAY **15**

***SPARTINA* ERADICATION EFFORT IN GRAYS HARBOR** **23**

SPARTINA ERADICATION EFFORT IN PUGET SOUND

AND HOOD CANAL **25**

2002 PROGRESS OF THE *SPARTINA* ERADICATION PROGRAM

EXECUTIVE SUMMARY

Introduction

Spartina, a plant species commonly known as cordgrass, is an aggressive noxious weed that severely disrupts the ecosystems of native saltwater estuaries in Washington state. Since the initial introduction into our state, *Spartina* has grown to infest an area covering over 7,500 acres, spread out across 20,000 acres in marine intertidal areas of ten counties in western Washington, especially Willapa Bay. *Spartina* is crowding out beneficial native vegetation, 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*. This report details the progress of the eradication program in 2002.

SUMMARY OF 2002 STATEWIDE *SPARTINA* ERADICATION ACTIVITIES

Challenges and New Developments

In 2002, WSDA, state and federal partner agencies, local governments, tribal entities, commercial landowners and private landowners treated approximately 2,260 solid acres of *Spartina* in all of Puget Sound, Grays Harbor and Willapa Bay. After regaining the use of a major control tool, WSDA and its partner agencies were able to embark on the aggressive eradication plan approved and funded by the 2001 legislature.

The stepped-up eradication effort funded in the 2001-03 biennial budget was dealt a major setback in 2001 when a U.S. Circuit Court decision resulted in the Department of Ecology (Ecology) revising its permit requirements for applications of pesticides to aquatic environments. Early in 2002, WSDA, WDFW, the Department of Natural Resources (DNR) and many county noxious weed control boards worked together with Ecology to develop an NPDES permit for Aquatic Noxious Weed Control. The permit was issued to WSDA and, in turn, WSDA issued coverage to many interested agencies, entities and individuals that conducted *Spartina* control in 2002.

In reviewing *Headwaters, Inc., et al. v Talent Irrigation District*, Ecology determined that all pesticide applications to aquatic environments would require a National Pollutant Discharge Elimination System (NPDES) permit. Ecology had not previously required NPDES permits for these applications and needed time to develop the process to make such permits available. As a result, no pesticides were used in the 2001 control season. This resulted in a setback at many sites that had previously been treated with herbicides and allowed the expansion of the *Spartina* infestation in Willapa Bay by another 500 to 1,000 acres rather than a reduction of several hundred acres and slowed the eradication progress in Puget Sound.

The *Spartina* eradication program resumed the use of the herbicide Rodeo in 2002 after a one-year hiatus. As a result, WSDA, state and federal partner agencies, local governments, tribal entities, commercial landowners and private landowners treated approximately 2,260 solid acres of *Spartina* in all of Puget Sound, Grays Harbor and Willapa Bay compared to 1,150 acres in 2001.

Arsenal® Research and Registration Process Makes Progress

WSDA staff began work in 2002 to conduct the environmental review necessary to allow the use of the herbicide Arsenal® for *Spartina* control. The herbicide has undergone several years of testing on small plots of *Spartina alterniflora* in Willapa Bay. The tests suggest that Arsenal® will improve the ability to treat large areas of infestation with similar efficacy to Rodeo®, while affording a similar safety margin for non-target organisms in the Bay. While WSDA and an environmental consultant work on the environmental review, the U.S. Environmental Protection Agency (EPA) is concurrently in the process of reviewing the product for a federal registration that may result in a federal aquatic use label for Arsenal®.

WSDA plans to have the environmental review of the herbicide completed by the end of June 2003 in preparation for the federal registration. EPA recently indicated that it expects to complete the registration process by the end of 2003. If the registration process results in a federal aquatic use label for Arsenal®, Washington will have yet another tool to use to eradicate *Spartina* in both Puget Sound and Willapa Bay.

Large-Scale Integrated Pest Management of *Spartina*

After investigating the possibility of large-scale mechanical eradication of *Spartina*, WSDA concluded that, at this time, large-scale mechanical eradication is not feasible. WSDA worked with an aquatic weed control company specializing in mechanical control to test this approach. After several months, the company decided to withdraw their proposal.

After the funding that had been set aside for a potential contract was freed up, WSDA called together representatives from WDFW, DNR and USFWS to formulate a collaborative plan for utilizing the funding. The group will work together to develop a work plan that will utilize an integrated pest management approach and result in a significant portion of the overall infestation being treated. This effort will likely result in substantial acreage reductions over the next year and begin the first significant reductions to the overall infestation in Willapa Bay.

New Spartina Species Discovered

In the fall of 2001, a South American *Spartina* species, *Spartina densiflora,* was discovered by WDFW *Spartina* control crews conducting routine surveys in the northwest portion of Grays Harbor and at Race Lagoon in Island County. Plant samples were sent to the University of California at Davis for confirmation through DNA identification and positive identification of the species was made in January of 2002.

Upon positive identification of the samples, WSDA, WDFW and DNR proceeded immediately to conduct mechanical and physical control of the Grays Harbor infestation throughout the winter and spring. WDFW also applied herbicide to both sites in the summer of 2002 to ensure

successful control of the infestation and prevent further spread. Surveys will be conducted this winter to evaluate the success of treatments at both sites.

Department of Fish and Wildlife Cuts Spartina Budget

Following the 2002 legislative session, WDFW was confronted with a substantial reduction in its agency budget. One of the steps WDFW took to deal with the reduction was to reduce funding for *Spartina* control in Willapa Bay. This reduction resulted in substantially less acreage being treated both chemically and mechanically than planned in 2002 and eliminated any agency work on eradicating Willapa Bay *Spartina* after December 31, 2002. WDFW has been an integral part of the Spartina program since its inception. They also have the equipment and trained staff that have been invaluable to the programs success.

WDFW generally starts preparing for the control season in April and begins mechanical treatments by May of each year. The Governor's 2003 supplemental operating budget request provides $233,000 of Aquatic Lands Enhancement Account (ALEA) funding to continue WDFW's *Spartina* control efforts during the remainder of FY 2003. Additionally, the Governor's 2003-05 operating budget request also provides an additional $466,000 of ALEA funding to WDFW for *Spartina* control. If no supplemental funding is provided, WDFW will be unable to prepare for the control season until July 1, 2003, and then only if funding for the 2003-05 Biennium is provided.

2002 WSDA *Spartina* Eradication Program Activities

As part of or in addition to the efforts noted above, WSDA

- Worked collaboratively with partner agencies to continue *Spartina* control as outlined in five regional integrated pest management plans;
- Hired, equipped and coordinated a crew to treat all infestations in Clallam, Jefferson, Kitsap and King counties; assist the Swinomish and Suquamish tribal communities with control work on their property; and work cooperatively with the WDFW and DNR on infestations in Willapa Bay;
- Provided NPDES coverage to numerous federal, state and local governmental agencies, and private entities for herbicide applications to both marine and freshwater environments;
- Provided funding through interagency agreements, personal services contracts and direct cost-share to state and local government agencies and private landowners;
- Organized and facilitated the exchange of *Spartina* eradication information through regional planning and informational meetings; and
- Continued to explore with partner agencies more efficient and cost-effective ways to eradicate *Spartina*.

Table 1. Acres of *Spartina* Treated in Washington State – 1997 through 2002

County	*Spartina* Present in 2002	*Spartina* Treated, 1997 - 2002	2002 Treatment Methods
Pacific (Willapa Bay)	Over 6,800 solid acres spread over > 15,000 acres	'97 - approx. 742 solid acres '98 - approx. 450 solid acres '99 – approx. 600 solid acres '00 – approx. 800 solid acres '01 – approx. 900 solid acres '02 – approx. 1804 solid acres	Mow/herbicide, herbicide, seedling removal, various mechanical control.
Grays Harbor	Scattered clones and seedlings 0.25 acres in size	'97 – all treated '98 - all treated '99 – all treated '00 – all treated '01 – all treated '02 – all treated	Herbicide, seedling removal, mow
Snohomish	Approx. 350 solid acres spread over > 4,500 acres	'97 - approx. 89 solid acres '98 - approx. 126 solid acres '99 – approx. 90 solid acres '00 – approx. 158 solid acres '01 – approx. 75 solid acres '02 – approx. 238 solid acres	Mow/herbicide, herbicide, seedling removal, dig, mechanically crush, mow
Island	Approx. 350 solid acres spread over >1,000 acres	'97 - approx. 250 solid acres '98 - approx. 160 solid acres '99 - approx. 155 solid acres '00 – approx. 130 solid acres '01 – approx. 72 solid acres '02 – approx. 180 solid acres	Mow/herbicide, herbicide, seedling removal, mechanically crush, mow
Skagit	Approx. 40 solid acres spread over > 2,000 acres	'97 - approx. 91 solid acres '98 - approx. 57 solid acres '99 – all treated '00 – approx. 60 solid acres '01 – approx. 33 solid acres '02 – approx. 37 solid acres	Mow/herbicide, herbicide, seedling removal, dig, mow
Clallam	1 infestation < 0.001 acres in size	'97 - treated twice '98 - treated three times '99 – treated twice '00 – treated three times '01 – treated four times '02 – treated four times	Dig
Jefferson	14 infestations – approx. 0.01 solid acres total	'97 - all treated '98 - all treated twice '99 – all treated twice '00 – all treated twice '01 – all treated three times '02 – all treated three times	Mow, mow/herbicide, dig, seedling removal
Kitsap	8 infestations - approx. 1 solid acre total	'97 - all but 2 tribal sites '98 - all treated '99 – all treated twice '00 – all treated '01 – all treated '02 – all treated twice	Mow mow/herbicide, dig, seedling removal
King	2 infestations – single clones and a few seedlings	'97 - monitored '98 – all treated '99 – all treated '00 – all treated twice '01 – all treated twice '02 – all treated twice	Dig
San Juan	Re-growth found at one site. 2 other sites clean for four consecutive years	'97 - all treated '98 - all treated '99 - monitored '00 – all treated '01 – all treated '02 – all treated	Survey, dig

SPARTINA ERADICATION PROGRAM

INTRODUCTION

Why is *Spartina* a problem?

Four different species of invasive *Spartina* are now found in the marine intertidal areas of Washington state. These species out compete and displace beneficial native vegetation. They destroy extremely important migratory shorebird and waterfowl habitat in Willapa Bay, one of the most important estuaries on the West Coast migratory route. They also threaten to severely impact a huge shellfish industry that is extremely important to the economy of Washington state.

What species of *Spartina* occur in Washington State?

There are currently four species of *Spartina* known to occur in Washington state. *Spartina alterniflora* is most widely found in Willapa Bay with over 6,800 solid acres currently infesting the Bay. *Spartina alterniflora* is also known to occur in Skagit County within Padilla Bay, Clallam County within Sequim Bay, Jefferson County within Thorndyke Bay, and at several sites within Grays Harbor. Figure 12 *(see p. 38)* shows *Spartina alterniflora* invading a mudflat in Willapa Bay.

Spartina patens is known to occur at only one location in Washington state, Dosewallips State Park in Jefferson County. This infestation is controlled with yearly surveys and herbicide applications. Figure 13 *(see p. 38)* shows the largest of the *Spartina patens* clumps found in 2001.

Spartina anglica is present in Skagit, Snohomish and Island counties. It has also been found in San Juan, King, Kitsap and Jefferson counties. Figure 14 (*see p. 39*) shows a *Spartina anglica* seedlings invading mudflats in Livingston Bay, Puget Sound. It currently infests approximately 730 – 750 acres in Puget Sound and Hood Canal.

Spartina densiflora is a species that was recently discovered in the northwest portion of Grays Harbor and within Race Lagoon in Island County. Figure 15 (*see p. 39*) shows *Spartina densiflora* as it was discovered in northwest Grays Harbor.

How was *Spartina* introduced into Washington State?

Spartina alterniflora was introduced to Willapa Bay unintentionally as packing material for east coast oysters that was dumped into the bay during the late 1800's. *Spartina anglica* was also intentionally introduced into Puget Sound. It was planted at a farm located in Port Susan in the early 1960's. The purpose for the introduction was to serve as bank stabilization and potential feed for cattle. The modes of introduction for both *Spartina patens* and *Spartina densiflora* are unknown at this time.

In all, there are ten counties in western Washington with one or more infestations of *Spartina alterniflora, Spartina anglica, Spartina patens* or *Spartina densiflora*. These include Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Pacific, San Juan, Skagit and Snohomish counties.

Spartina infestations range from one infestation in Clallam County measuring only a few square feet to more than 6,800 solid acres (if contiguous) spread throughout Willapa Bay in Pacific County. All totaled, *Spartina* infests over 7,500 solid acres spread over more than 20,000 total acres.

How do we eradicate *Spartina?*

Spartina spreads quickly and is extremely 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 (methods include mechanical, chemical, manual or a combination of these methods);

3) After successful eradication is achieved, monitoring the area and removing new seedlings to ensure no re-establishment occurs;

4) Continuing to survey shorelines, educate the public and follow-up on possible sightings of new infestations.

WSDA *SPARTINA* PROGRAM

In 2002, the WSDA *Spartina* Eradication Program worked collaboratively with partner agencies to continue *Spartina* control, as outlined in five regional integrated pest management plans; hired, equipped and coordinated a crew to treat all infestations in Clallam, Jefferson, Kitsap and King counties, assisted the Swinomish and Suquamish tribal communities with control work on their property and worked cooperatively with the WDFW and DNR on infestations in Willapa Bay.

WSDA worked cooperatively with Ecology to develop an NPDES permit for aquatic noxious weed control, providing NPDES coverage to numerous federal, state and local governmental agencies, and private entities for herbicide applications to both marine and freshwater environments.

WSDA provided funding through interagency agreements, personal services contracts and direct 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 with partner agencies more efficient and cost-effective ways to eradicate *Spartina.*

2002 *Spartina* Budget

WSDA allocated $2,166,260 of its appropriation from the Aquatic Lands Enhancement Account (ALEA) for *Spartina* activities this biennium. Table 2 illustrates how WSDA is using these funds. The table shows projected expenditures for FY02 and FY03.

Table 2. Budget Activity by Area – FY02 and FY03

Activity	Puget Sound/Oly. Peninsula		Willapa Bay		Total	
	FY02	*FY03*	*FY02*	*FY03*	*FY02*	*FY03*
[1]**WSDA Coordination and control activities**	$201,565	$201,565	$206,565	$206,565	$408,130	$408,130
[2]**Arsenal Evaluation**	0	$50,000	0	$50,000	0	$100,000
[3]**Large-scale Mechanical Control**	0	0	$190,000	$600,000	$190,000	$600,000
[4]**Purchased Services**					$220,000	$220,000
- Skagit	$40,000	$40,000				
- Island	$50,000	$50,000				
- Snohomish	$50,000	$50,000				
- Swinomish Tribe	$10,000	$10,000				
-WDFW (Pacific Co.)			$60,000	$60,000		
- Other	$5,000	$5,000	$5,000	$5,000		
[5]**Direct Cost Share**	$5,000	$5,000	$5,000	$5,000	$10,000	$10,000
[6]**Other Operational**						
WDFW		$145,000		$145,000		$290,000[a]
WDNR			$300,000	$300,000	$300,000	$300,000
TOTAL	**$361,565**	**$556,565**	**$766,565**	**$ 1,371,565**	**$ 1,128,130**	**$ 1,928,130**

Notes for Table 2:

1. WSDA Coordination and Control Activities: These expenses include agency administrative expenses, salaries.
2. A second herbicide option is important to achieving Spartina control. Because the herbicide imazapyr is not addressed in the current Environmental Impact Statement, funding is dedicated toward developing the necessary environmental review.
3. The only company that submitted a proposal for large-scale mechanical control withdrew their proposal in early December 2002. WSDA is currently working with other State and Federal agencies to evaluate possible approaches to consider. Note: Figures for this line item have been reworked since the 2001 Report to reflect a correction and separation of the Arsenal Evaluation line item from this one. Both line items are actually budgeted under the same Contract category. The Arsenal Evaluation line item had not previously been subtracted from the Large-scale Mechanical Control line item total. Furthermore, the $600,000 figure which was originally intended to cover the first fiscal year was traded with the $190,000 figure - orginally for the second fiscal year - to reflect actual timing.
4. Purchased Services: WSDA wrote two-year Interagency Agreements this biennium for county work crews in Skagit, Island and Snohomish counties. WSDA also wrote an Interagency Agreement for the WDFW to conduct work in Pacific County and an Intergovernmental Agreement for the Swinomish Tribal Community to conduct work on their property in Skagit County.
5. Direct Cost Share: These amounts include only payments to landowners as reimbursement for equipment/supplies.
6. These figures represent the *Spartina*-eradication operational funds normally available to the Washington Department of Fish & Wildlife and the Washington Department of Natural Resources respectively. This is funding which is separate from WSDA's regular and enhanced Spartina-eradication funding.

a. WDFW funding reported for FY 2003 control season; FY 2002 figure not obtained

County Activities

In 2002, WSDA continued to allocate funding for labor and equipment for *Spartina* work crews in those counties with the majority of the infestations. WSDA allocated these resources by way of interagency agreements with the Skagit, Island and Snohomish County Noxious Weed Control Boards and WDFW in Pacific County. WSDA staff conducted field audits throughout the

control season and facilitated coordination meetings to ensure contract priorities were adequately addressed.

Cost Share Program

As directed by RCW 17.26.007, WSDA offered limited financial assistance to private landowners for *Spartina* control and eradication in 2002. With the issuance of NPDES permits for herbicide applications, WSDA was able to provide cost share assistance in the form of purchasing herbicide for licensed private applicators as well as providing control for private landowners through county and state crews.

Table 3. WSDA Cost Share Options

Eradication/Control Method	WSDA Contribution	Landowner Contribution
County work crews mow and/or apply herbicide	WSDA grants county funds to treat priority areas in '02 control season	Must treat once in '02 season or agree to pay herbicide expenses
Direct cost share - Landowner applies herbicide	100% of herbicide costs	100% labor & equipment
Direct cost share - Landowner covers or digs up infestation	100% of pre-approved materials	100% labor
Direct cost share - Landowner uses WSDA pre-approved contractor	50% of contractor cost	50% of contractor cost

Because private landowners most often request the services of the state or county work crews, WSDA allocates the majority of cost share funding for this option (through interagency agreements). However, during the 2002 season, WSDA provided over $10,000 in direct cost share to landowners in Willapa Bay. No assistance was requested during the 2001 season because herbicide use was not an option.

Management Plans

In the winter and spring of 2002, WSDA staff worked with the county noxious weed control board coordinators, staff from the WDFW, DNR, USFWS, tribal communities, and private landowners, to update five regional *Spartina* management plans. These management plans are developed for North Puget Sound, South Puget Sound, Hood Canal/Central Puget Sound, Grays Harbor and Willapa Bay. The management plans provide information on the effects of *Spartina* on the intertidal ecology of these areas, describe previous control efforts/results, and outline the control strategy for the coming years.

WSDA has been developing regional management plans since 1998. The current strategies for control in each region are all founded upon the 1998 plans, and many are proving successful, especially in North Puget Sound where the strategy has resulted in a 27% decline in the overall size of the infestation. Copies of 2002 plans are available by contacting the WSDA Statewide *Spartina* Eradication Program Coordinator. WSDA will update all management plans prior to the 2003 control season.

2002 CHALLENGES AND NEW DEVELOPMENTS

In 2002, WSDA, state and federal partner agencies, local governments, tribal entities, commercial landowners and private landowners treated approximately 2,260 solid acres of *Spartina* throughout Puget Sound, Grays Harbor and Willapa Bay. Although there are some positive highlights in 2002, such as the development of a new permitting system for National Pollutant Discharge Elimination System Permits (NPDES) and the possibility of a new herbicide control tool, WSDA and other state and federal agencies involved in the *Spartina* control effort faced a major setback during the 2001 control season which impacted the progress during the 2002 control season.

National Pollutant Discharge Elimination System Permits

On March 12, 2001, the Ninth Circuit Court of Appeals filed its decision in *Headwaters, Inc., et al. v Talent Irrigation District*, No. 99-35373. The plaintiffs, two environmental advocacy groups, filed suit against the Talent Irrigation District, located in Oregon, to stop the district's use of an herbicide in irrigation canals for weed and algae control. The plaintiffs claimed that these treatments could not occur without the defendant first obtaining a permit under the National Pollutant Discharge Elimination System. The plaintiffs claimed that failure to have an NPDES permit violated the federal Clean Water Act, which prohibits the discharge of pollutants from a point source into navigable waters of the U.S. unless authorized by an NPDES permit.

The Ninth Circuit found in favor of the plaintiffs and ruled that an NPDES permit was required for the treatment to continue. This decision by the Ninth Circuit Court of Appeals in *Headwaters, Inc. v. Talent Irrigation District* can be interpreted to require an NPDES permit prior to application of any aquatic pesticide into all navigable waters of the state. Ecology had not previously issued NPDES permits for aquatic applications of pesticides and therefore did not have such permits available. Given the time it takes to develop the permitting process, this decision by the Ninth Circuit Court resulted in the absence of aquatic herbicide use during the 2001 control season. The removal of this highly important control tool resulted in a setback at many sites that had been treated with herbicide for the past several years.

The result of not being able to use herbicide during the 2001 season was the continued expansion of the infestation in Willapa Bay, and a slowing of the reduction in Puget Sound. If herbicide use had been an option in 2001, the effort would likely have treated approximately 1,700 solid acres in Willapa Bay, potentially resulting in a reduction of several hundred acres. In Puget Sound the use of herbicide would have likely resulted in a 10% reduction in the overall infestation, rather than an estimated 2% – 5% reduction.

WSDA, WDFW and DNR began to work with Ecology during the winter of 2002 to develop an NPDES permit for aquatic noxious weed control. The goal for WSDA was to assist Ecology in developing a general permit that would facilitate the operational needs of Ecology and comply with the federal Clean Water Act, while not unduly discouraging noxious weed control. WSDA focused on carrying out the intent of RCW 17.26.010 which states "state agencies and local governments may not use any other local, state, or federal permitting requirement, regulatory authority, or legal mechanism to override the legislative intent and statutory mandates." This encouraged WSDA to take on much of the burden of the NPDES permit.

Ecology issued a statewide NPDES permit to WSDA on June 15, 2002. WSDA administered coverage to 92 public, private and commercial applicators for use on a wide variety of aquatic noxious weeds. WSDA continues to work closely with Ecology to ensure that proper reporting of applications takes place.

With the development of the NPDES permit, WSDA is required to generate both Integrated Pest Management plans and herbicide monitoring plans for both *Spartina* and Purple Loosestrife programs. These documents will be completed and submitted to Ecology in early spring of 2003.

Registration Process Initiated for a New Herbicide-Arsenal®

Research on potential new herbicides for use in *Spartina* control has been ongoing for the past several years. This research has indicated that one herbicide, imazapyr, trade name Arsenal®, has the potential to produce similar effectiveness as the current herbicide being used as well as allowing the effort to treat much more acreage. This may be possible because Arsenal® appears to work well while requiring far less water in the tank mix than the currently available herbicide. This makes individual applications more cost effective.

WSDA staff began work to conduct the environmental review necessary to evaluate the use of the herbicide for *Spartina* control. The U.S. Environmental Protection Agency (EPA) is also in the process of reviewing the product for a federal registration, possibly resulting in a federal aquatic use label for the herbicide.

WSDA plans on having the environmental review of the herbicide completed by the end of June 2003 in preparation for the potential federal registration. EPA has recently indicated that they expect to have the registration complete by the end of 2003.

With the successful registration and complete environmental review, the cooperative control effort would add another tool to the *Spartina* control toolbox. This tool, used in conjunction with the existing herbicide, mechanical and biological control tools, will allow the cooperating entities to more successfully control invasive *Spartina* in both Puget Sound and Willapa Bay.

Large-Scale Integrated Pest Management of *Spartina*

WSDA approached the legislature during the 2001 legislative session with a budget enhancement that contained additional funding to pursue a contract for large-scale mechanical eradication of *Spartina* in Willapa Bay.

WSDA received the budget enhancement for the 2001-03 biennium and began to pursue a contract for large-scale mechanical eradication of 1,000 solid acres of *Spartina.* With the assistance of the Department of General Administration, WSDA developed a Request for Proposal that was released to the public during the spring of 2002. One company responded to the request for proposal and further agreed to conduct an on site demonstration in Willapa Bay.

After an initial demonstration the company re-evaluated their approach and requested a change to the initial proposal specifications. WSDA was not in the position to change any specifications, and in December 2002 the company declined to pursue a contract.

After the funding that had been set aside for the potential contract was freed up, WSDA called together representatives from WDFW, DNR and USFWS to formulate a collaborative plan for utilizing the funding. The group will work together to develop a work plan that will utilize an integrated pest management approach and result in a significant portion of the overall infestation being treated. This effort will likely result in substantial acreage reductions over the next year and begin the first significant reductions to the overall infestation in Willapa Bay.

Washington State Department of Fish and Wildlife Budget Cuts

Following the 2002 legislative session the Washington state Department of Fish and Wildlife was faced with a substantial reduction in the overall agency budget. One of the steps the WDFW took to deal with the reduction was to reduce the funding for *Spartina* control in Willapa Bay. Although the legislature did not specifically target the *Spartina* program for a reduction, the severity of the overall budget reduction to WDFW forced the agency to reevaluate all its programs. Funding for the WDFW Willapa Bay *Spartina* control program was reduced by approximately $168,000. This reduction resulted in WDFW hiring fewer crewmembers, which in turn only allowed the use of one airboat for herbicide applications. Overall, it appears this budget reduction resulted in treatment of half as much acreage as WDFW had anticipated.

The Governor's 2003 supplemental operating budget request provides $233,000 of Aquatic Lands Enhancement Account (ALEA) funding to continue WDFW's *Spartina* control efforts during the remainder of FY 2003. Additionally, the Governor's 2003-05 operating budget request also provides an additional $466,000 of ALEA funding to WDFW for *Spartina* control. If no supplemental funding is provided, WDFW will be unable to prepare for the control season until July 1, 2003, and then only if funding for the 2003-05 Biennium is provided.

New *Spartina* Species Discovered

While conducting routine surveys for *Spartina alterniflora* in Grays Harbor and *Spartina anglica* in Island County, WDFW crews found unidentified plants exhibiting some characteristics similar to *Spartina*. The plant material was collected and sent to the University of California at Davis for identification through DNA testing. Upon completion of the DNA test, UC Davis reported to WDFW that the samples were *Spartina densiflora*. Two locations were discovered, one in Island County was made in Race Lagoon on Whidbey Island and in Grays Harbor near Damon Point on the Northwest side of the harbor.

Spartina densiflora is native to South America and is also known to occur in Humboldt Bay and Corte Madera Creek in Marin County and several locations in San Francisco Bay, California. This species exhibits different growth characteristics than the other three species of *Spartina* already known to occur in Washington state. For example, unlike the other three species, *Spartina densiflora* does not become dormant during the winter, but continues to grow and produce new plant material throughout the entire year. It also occurs higher in the intertidal than both *Spartina alterniflora* and *Spartina anglica.* These characteristics would allow *Spartina densiflora* to displace greater numbers of native plants than either *S. anglica* or *S. alterniflora*.

Also, researchers in California have indicated that the seed viability of this species appears to be extremely high, potentially allowing it to become widespread even more rapidly than the other species already in Washington.

Upon positive identification of the samples, WSDA, WDFW and DNR proceeded immediately to conduct mechanical and physical control of the Grays Harbor infestation during the winter of 2002. Furthermore, WDFW applied herbicide to the infestation in both Grays Harbor and Race Lagoon to ensure successful control of the infestations and prevent further spread.

WSDA, WDFW and DNR will continue to survey other areas of the state for *Spartina densiflora*. It is still unknown how this species was introduced into state waters; therefore, the agencies will continue to investigate potential pathways of introduction. If the cause of the introduction is determined, managers will better be able to survey for and prevent future infestations.

Program Results by Geographic Area

SPARTINA ERADICATION EFFORTS IN WILLAPA BAY

This waterbody 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

During the 2002 control season a combined survey approach conducted by WSDA, WDFW, DNR, U. S. Fish and Wildlife Service (USFWS) and UW-Olympic Natural Resource Center (ONRC) was carried out. The survey was conducted by use of Global Positioning System (GPS) units from both ground based and air based platforms. These GPS based surveys were also compared to aerial infrared photos taken of the entire infestation during the 2000 season. These methods coupled with current season treatment figures have proven to be far more accurate at estimating the size of the infestation than past methods. Through this survey WSDA determined that there are more than 6,800 solid acres of *Spartina* spread throughout the bay. The large increase from last seasons' estimates represent the more accurate method for estimating infestation size.

Roles and Responsibilities of Participating State and Federal Agencies in 2002

In 2002, the participating agencies pursued the use of various medium and large scale mechanical control tools and several herbicide application systems to combat the spread of *Spartina*. The following list outlines the role each agency assumed in Willapa Bay during the 2002 control season.

- **WSDA** – Worked with Ecology to develop and receive an NPDES permit allowing for the use of herbicide applications for aquatic noxious weed control. WSDA provided funding to WDFW for eradication work, conducted cost share control activities with WDFW and DNR on private land on the Long Beach peninsula, continued to operate mechanical control tools on North Long Beach Peninsula and provide additional herbicide to WDFW and DNR.

- **DNR** – Continued to operate a Marsh Master I amphibious machine, conducted control work on Natural Area Preserves and maintenance sites, managed the infrared aerial photography and mapping program, developed and implemented a *Spartina* control monitoring program and supported scientific research on *Spartina* being carried out by the University of California at Davis. Conducted control activities within Willapa National Wildlife Refuge boundaries and in the Naselle River.

- **WDFW** – Continued to operate tracked utility vehicles for control purposes, conducted control operations in North Bay priority area, conducted control work with WSDA on private property on the Long Beach peninsula and assisted UC-Davis in collecting data for research that may help to improve *Spartina* control. Collected data for control monitoring program. Conducted aerial GPS survey.

- **USFWS** – Operated precision boom spraying equipment, provided operational support to DNR, conducted control work in South Bay area. Provided airboat support for *Spartina* researchers. Assisted in ground based GPS survey.

- **UW – ONRC –** Continued to manage the biological control release program and provided mapping and Geographic Information System (GIS) support.

2002 *Spartina* Control Monitoring Program, Willapa Bay

Spartina control monitoring protocol was refined and implemented again during the 2002 field season. The program was first implemented during the 2001 control season as a pilot study. The purpose of the monitoring program is to assess how well the management goals are being met, the effectiveness of current control methods, and the natural recovery of eelgrass and native salt marsh species. The collection of long-term monitoring data will contribute to control efforts by providing a quantitative evaluation of how effectively we are eradicating *Spartina* and restoring the native mudflat conditions in Willapa Bay.

The data will also be used to help managers better plan for future control work and to assist in the updating of the management plan before each control season. Monitoring sites were selected in areas where chemical and mechanical control have been previously conducted and at untreated sites. Untreated sites will serve as a reference for comparison to the sites where control has taken place. To date, the sampled sites include the following:

- Willapa River meadow treated by the WDFW Bombardier in 2001.
- Willapa River meadow untreated section.
- Smith Creek clone field, treated with herbicide by WDFW in 1999 and 2000.
- Oysterville mowed by WSDA in 2001. Crushed and tilled by WSDA in 2002.
- Oysterville treated by the WDFW Bombardier in 2001.
- O'Meara Cove and Stanley Point treated by DNR Marsh Master 1 in 2001. Treated with herbicide by DNR in 2002.
- South Bay mowed and tilled by USFWS in 2001. Ground broadcast herbicide applications by USFWS in 2002.
- East Long Island untreated.
- Palix River meadow untreated.
- North Oysterville, treated by DNR Marsh Master in 2001-2002 and WDFW ASV and D3-LGP in 2001.
- Stony Point treated by Bombardier in 2001.
- Potshot, multiple year multiple treatment.
- North Potshot treated with Marsh Master 2001.

Sampling at each site consisted of no less than three randomly located transects. Each transect consisted of thirty, 0.25 square meter quadrats. *Spartina* stem counts and the estimated percent native vegetative cover were recorded in each quadrat. Additional data collected varied by site, but included such things as percent flowering and personal observations. Figure 16 (*see p. 40*) shows WDFW staff conducting sample collection in south Willapa Bay.

Highlights of the 2002 Season in Willapa Bay

In 2002, the cooperative *Spartina* eradication effort resulted in treatment of approximately 1,804 solid acres, or about 27% of the overall solid infestation. Figure 2 shows the approximate location of all treatment sites. Table 4 identifies the areas of the bay treated, who conducted treatment and what kind of treatment was done. Figures 3 and 4 are maps of each priority area with treatment sites corresponding to table 4.

WSDA estimates that the 1,804 solid acres treated during the 2002 season will result in at least a 55% efficacy rate. Based on the 17% infestation growth rate projections calculated by DNR, the 55% efficacy would result in essentially no expansion of the overall infestation. Furthermore WSDA is currently working with partner state and federal agencies to evaluate possible control strategies employing $600,000 that was previously budgeted for large-scale mechanical control, but was made available when a potential contractor withdrew their proposal. The approach that will be taken is intended to result in significant acreage treated and a substantial reduction in the overall infestation.

Progress was made in several areas of the bay during the 2002 season by the agencies involved. WDFW continued to reduce the overall size and spread of the infestation in North Willapa Bay by treating more than 280 solid acres of clones, seedlings and solid meadow. North Willapa Bay is an area of extreme importance to shorebirds and waterfowl. Aerial surveys conducted by USFWS and WDFW staff in May 2000, November 2000, May 2001 and October 2001 identified over 100,000 shorebirds utilizing North Willapa Bay, as compared to approximately 80,000 shorebirds surveyed in the rest of the bay.

DNR focused the majority of their control work in the Long Island Slough and Naselle River areas, treating more than 350 solid acres with a combination of herbicide applications and mechanical control tools. The majority of this work was done on publicly owned tidelands within the Willapa National Wildlife Refuge boundary.

WSDA has continued to focus its efforts on the Long Beach Peninsula, specifically providing cost share assistance to shoreline residents in both the Oysterville – Nahcotta area as well as the South Long Beach Peninsula area. Through cost share assistance during the 2002 season, over 200 solid acres of *Spartina* were treated on private tidelands on the Long Beach Peninsula.

The USFWS focused almost their entire efforts on the Porters Point/South Bay area and treated more than 700 solid acres of both meadow and clone fields. During the winter of 2002 USFWS staff continued to pursue effective mechanical control with the use of a newly acquired Wilco tracked amphibious vehicle. The USFWS was able to treat over 50 solid acres resulting in near 100% efficacy. Figure 17 (*see p. 40*) shows the Wilco machine in the process of rototilling during the winter of 2002. Figure 18 (*see p. 41*) is an aerial view of the rototill area almost one year after tilling. The photo was taken after all regrowth had been treated with herbicide.

The USFWS was able to treat over 550 acres of solid meadow with the use of an advanced ground broadcast herbicide application system mounted to a tracked amphibious vehicle. The system uses infrared eyes mounted to a boom sprayer coupled to a GPS unit to track the location of applications. The infrared eyes are able to distinguish *Spartina* plants from non-vegetated

mudflats. Figure 19 (*see p. 41*) shows the tracked amphibious vehicle with the ground broadcast application system. USFWS staff worked closely with researchers from Washington State University to investigate and calibrate this system.

Biological Control

Scientists with the University of Washington have continued to monitor and expand the biological control program. The biological control agent, a planthopper called *Prokelisia marginata* (*Fig. 20, page 43*), was originally released in 2000 and 2001 at three sites (a total of more than 200,000 insects at Smith Creek, Tarlatt Slough, and Lewis Slough). In 2002, an additional 159,000 planthoppers were released at 16 new sites throughout the bay. These new sites were selected based on quality of overwintering habitat for the insects, after the original released populations had very low survival over the winter of 2001-2002. Planthopper densities at these new sites increased an average of 3.74 times during the summer of 2002. The greatest population growth was at a site on South Long Island, where planthopper densities reached 61,000 per m^2 and feeding damage turned Spartina plants brown in the vicinity of the release point. Figure 1 identifies locations of 2000, 2001 and 2002 release sites and monitoring sites as well as experimental sites. In field cages, *Pokelisia marginata* reduced the above ground biomass of *Spartina alterniflora* by 50%. The planthoppers are therefore expected to be effective control agents provided they are able to build and maintain high population densities over large areas. As with any biological control project, it may take several years before the full impact of the biocontrol agent is known.

Several research projects are underway to enhance the biocontrol project. Researchers are looking at habitat characteristics in relation to insect performance. This information will be used in future years to release insects in sites where they will have the greatest population growth and impact. One clear pattern discovered this summer is that planthopper population growth is greatest in sites where leaf nitrogen is high. Another research project underway is examining the effect of clone size and tidal elevation on the performance of planthoppers. A third research project conducted by scientists from University of California at Davis is examining the potential for *Spartina* to become resistant to the damaging effects of the current biological control agent in Willapa Bay.

Recommendations for the Future

If funding continues at sufficient levels, it is projected that eradication will occur in approximately 6 to 8 years. Graph 1 illustrates the projected overall decrease in total solid acres over 6 years. This graph assumes that:

- WDFW and DNR will continue to be awarded funding for future biennia at the same levels as the 2001-2003 biennium.
- USFWS continues to fully fund federal *Spartina* control efforts at current or enhanced levels.
- WSDA receives the carry-forward funding requested in the 2003 agency-funding request.
- Through large-scale IPM, WSDA will successfully eradicate at least 2000 solid acres per year.

Graph 1. Projected solid acres of *Spartina* with continued same level funding

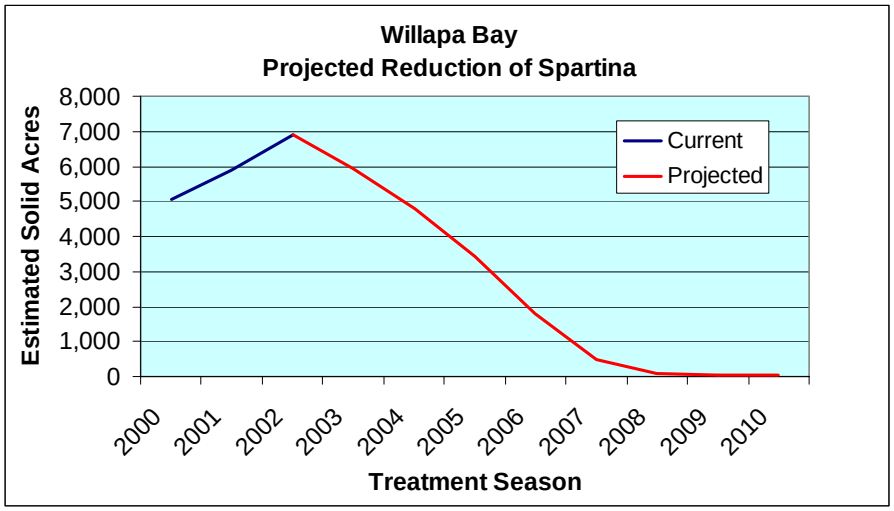


Figure 1. Map of biological control sites, including release sites, monitoring sites, and experiment sites.

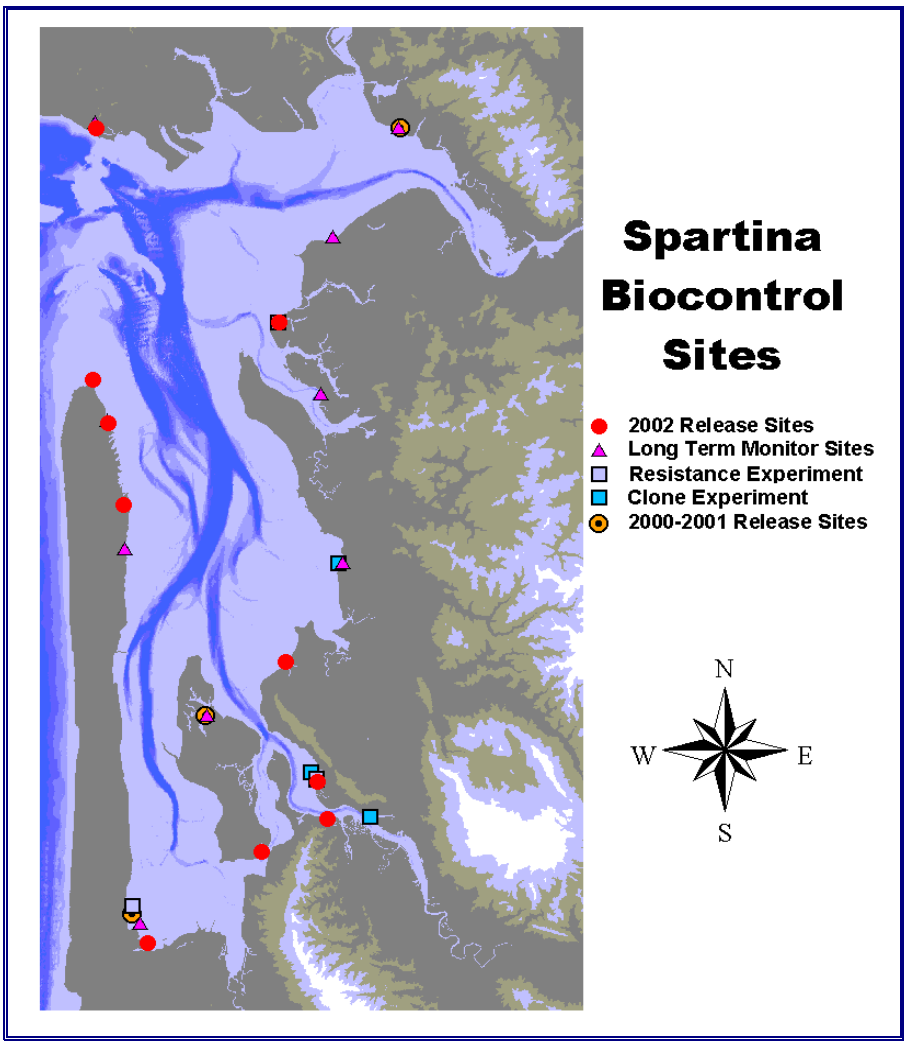


Figure 2. Approximate Location of 2002 Interagency Willapa Bay Treatment Sites

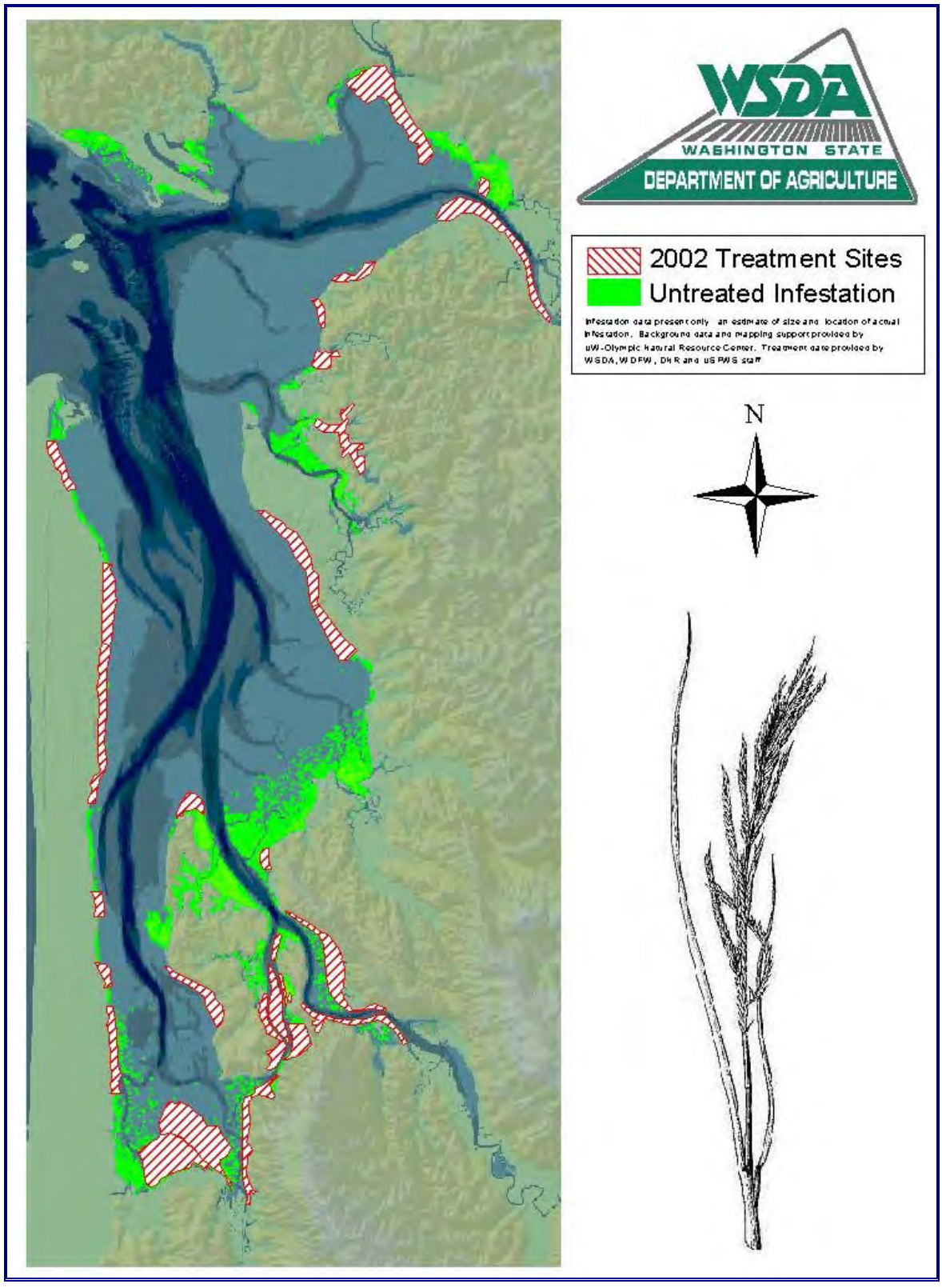


Table 4. Summary of 2002 Willapa Bay *Spartina* Eradication Effort

Site	Solid Acreage Treated	Approximate Affected Acres Protected	Entity Conducting Treatment	Treatment Method Used
North Willapa Priority Area				
North River/Smith Creek/Willapa River Meadow	91.58	450	WDFW	Herbicide
Nemah Public Beach	1.5	100	WDFW	Herbicide
Rhodesia Beach	1.5	100	DNR	Seedling Dig
North Stoney Point	40	40	WDFW	Crush
Oysterville - Nahcotta	247	250	WSDA, DNR	Crush, Disk, Dig, Herbicide
South Willapa River	121.07	200	WDFW, WSDA	Herbicide, Crush
Niawiakum NAP	23.5	300	DNR	Herbicide
Bone River NAP	9.5	50	DNR	Herbicide
Leadbetter Point	30.25	50	DNR	Herbicide
South Stoney Point	40	40	DNR, WSDA	Crush
South Willapa Priority Area				
North Pot Shot	18.4	20	DNR	Herbicide
O'Meara Pt. – Bear R.	3	250		
O'Meara	48.5	50	DNR	Herbicide
Pot Shot	110	160	DNR	Herbicide
Smokey Hollow	1	20	WSDA	Seedling Dig
East Long Island	6.66	60	USFWS	Herbicide
Ellsworth/Naselle	62.74	120	DNR	Herbicide
Chetlo Harbor	80	250	DNR	Crush, Herbicide
South Bay Meadow	600	600	USFWS	Rototill, Herbicide
Stanley Point	4.8	10	DNR	Herbicide
Middle Island	3.33	150	WDFW	Herbicide
South Bay Clones	209.17	900	USFWS	Herbicide
Cost Share	50.05	100	WSDA, DNR, WDFW	Herbicide
Total	**1,803.55**	**4,270**		

Figure 3. 2002 North Willapa Bay Priority Area Interagency Treatment Sites.

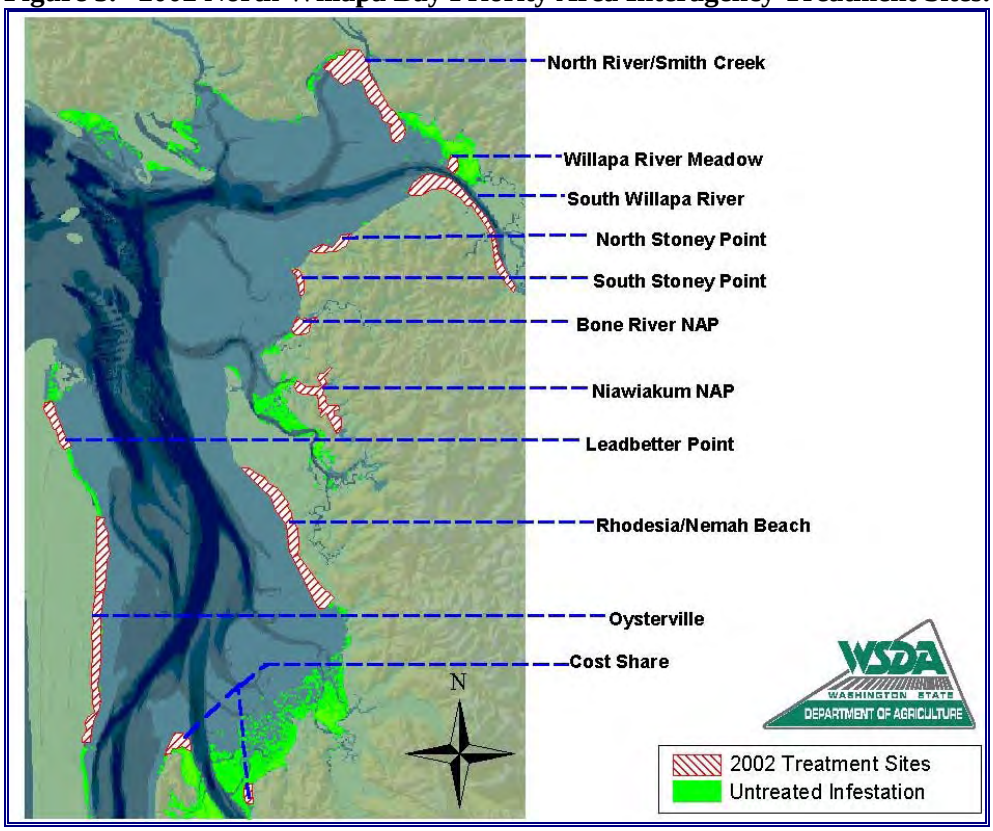
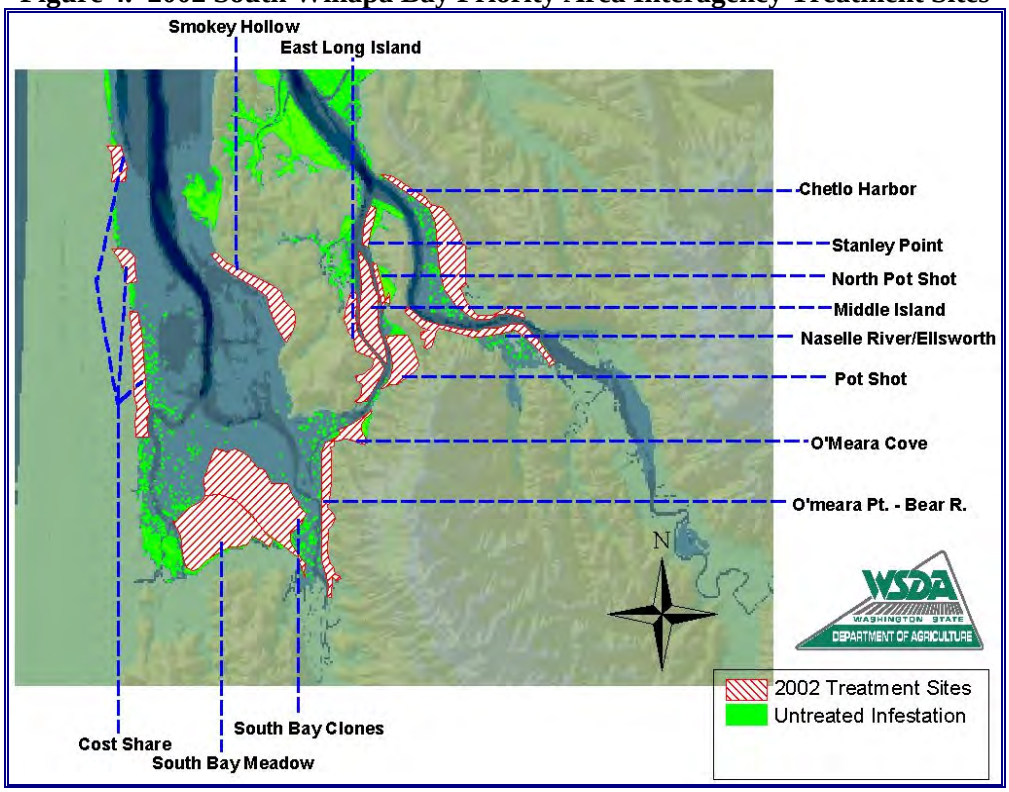


Figure 4. 2002 South Willapa Bay Priority Area Interagency Treatment Sites



SPARTINA ERADICATION EFFORT IN GRAYS HARBOR

This waterbody includes the mouth of Grays Harbor, Grays Harbor, and all the rivers, creeks and streams that run into Grays Harbor and the Copalis River drainage. Figure 5 shows the approximate locations of the 2002 treatment sites in Grays Harbor.

Extent of the Infestation in Grays Harbor

Due to the magnitude of the problem in neighboring Willapa Bay, property managers and landowners in Grays Harbor have long been concerned about the potential for invasion of *Spartina*. This threat was validated in 1992 with the discovery of one large *Spartina* clone in Grays Harbor by DNR staff. This was the only known infestation in Grays Harbor at the time, and the DNR crew mowed it repeatedly throughout the growing season.

In 1995, WDFW began conducting yearly surveys and control work in Grays Harbor. At the beginning of the 1995 season there were approximately 2 solid acres of known *Spartina* within the Grays Harbor management area.

In 2002, WDFW, WSDA and DNR continued to put strong emphasis on preventing *Spartina* establishment in Grays Harbor. Specifically, all known infestations were treated by the end of the 2002 season, including the newly discovered *Spartina densiflora*. Depending on continued funding, WDFW will continue to conduct yearly surveys and control work to ensure that Grays Harbor does not become further infested.

Recommendations for the Future

The size of the Grays Harbor treatments has fluctuated since 1992 from as much as the 2.86 solid acres controlled this season, to as little as 0.25 acres controlled during the 2001 season. Every year new infestations are found throughout the bay, suggesting that seed is being transported from Willapa Bay and deposited in various areas of Grays Harbor. This demonstrates the importance of continued funding not only to conduct surveys and control work in Grays Harbor, but also to allow for future reductions in the Willapa Bay infestation.

With continued funding and support for surveys, control work, and monitoring of the infestation in Grays Harbor, and continued funding and support for *Spartina* control activities in Willapa Bay, Grays Harbor can continue to be protected from a major infestation. At this time, funding needs for control activities in Grays Harbor are minimal due to the small scale of the infestation. However, extensive surveys are required to ensure all infestations are identified and treated.

Figure 5. Approximate Locations of WDFW Grays Harbor Treatment Sites in 2001

SPARTINA ERADICATION EFFORT IN PUGET SOUND AND HOOD CANAL

For purposes of the WSDA *Spartina* Program, Puget Sound and Hood Canal refers to San Juan, Skagit, Island, Snohomish, Clallam, Jefferson, Kitsap and King counties. Figure 6 identifies approximate locations and sizes of all known *Spartina* infestations in Puget Sound and Hood Canal. Figure 6 also shows locations of monitor sites, which are defined as sites of previous infestation with at least two consecutive years of no regrowth.

Extent of the Infestation in Puget Sound and Hood Canal

In 1997 and 1999, WSDA and its partners completed two surveys to quantify the extent of *Spartina* colonization within Puget Sound. Two measurements were made to characterize the infestation. The first measurement estimated the total affected area or the area in which *Spartina* had invaded but not yet become one contiguous meadow. The second measurement was the solid area or actual abundance of *Spartina* if it was combined into a meadow.

WDFW took infrared aerial photographs of known Puget Sound *Spartina* infestations at a 1:6,000 scale in August 1997. From these color photos, WDFW measured the *Spartina* infestation in acres. Patches smaller than three feet in diameter were not discernible in the photographs. WDFW calculated both the affected and solid area of *Spartina* at each site, and then conducted field reconnaissance to ground verify the data. WSDA, WDFW, and Snohomish, Island, and Skagit County Noxious Weed Board crews manually measured infestations not photographed.

In the summer of 1999, WSDA, WDFW and the Snohomish, Island and Skagit County Noxious Weed Board crews conducted field audits of all sites including some new sites discovered since 1997. Solid *Spartina* acres were estimated by comparing the infrared photos taken in 1997 with the amount of *Spartina* present at the site in 1999 and by measuring new infestations.

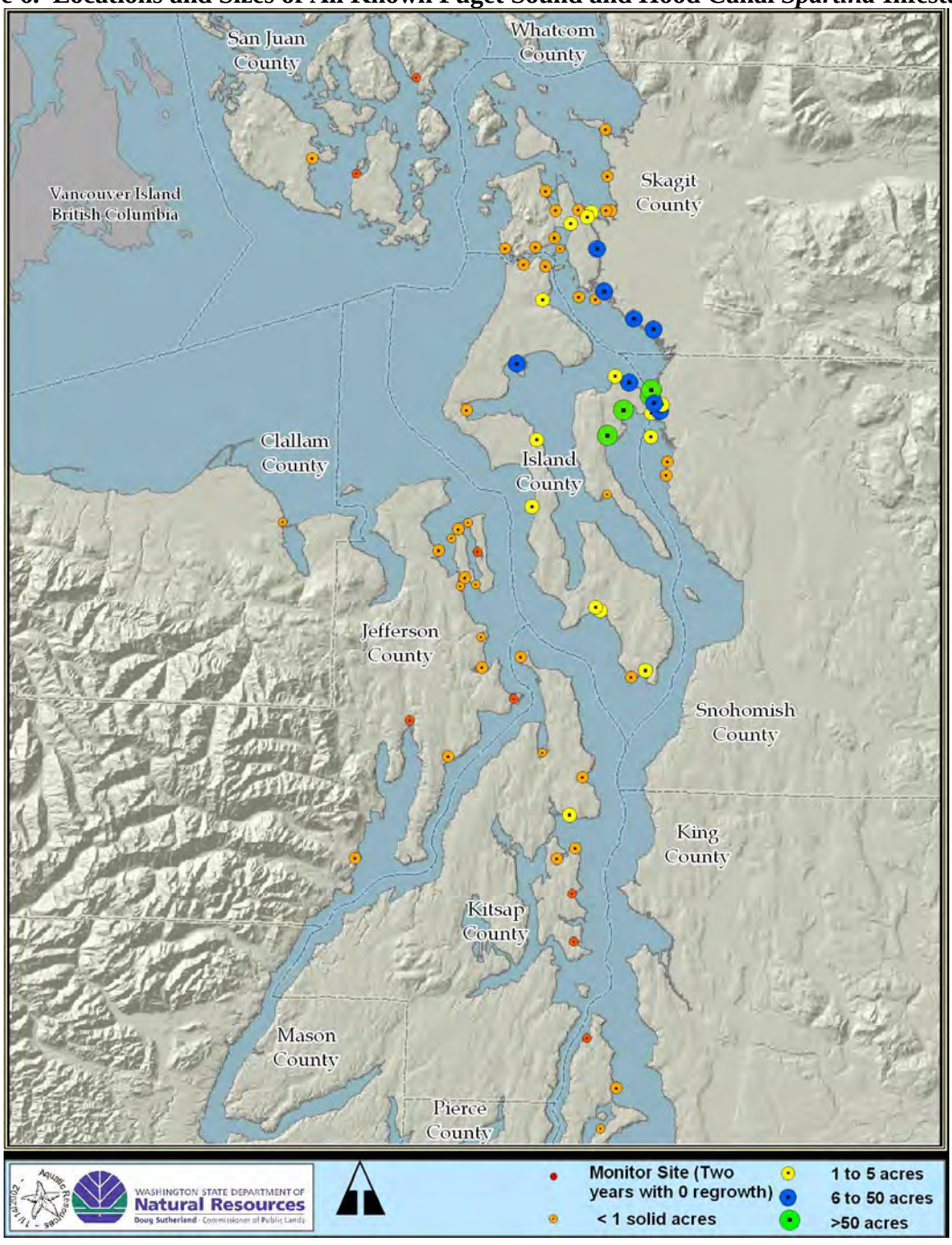
The estimated area of *Spartina* within Puget Sound and Hood Canal in 1997 was approximately 1,000 solid acres, spread over approximately 8,000 acres. At the beginning of the 1999 control season, there were an estimated 900 solid acres within Puget Sound and Hood Canal. This amounts to a 10% decrease in the overall *Spartina* population in Puget Sound and Hood Canal from 1997 to 1999.

During the 2001 treatment season, WSDA, WDFW, and Skagit, Island and Snohomish County Noxious Weed Board crews conducted a field audit again to determine the extent of the infestation. Audit results indicate the size of the Puget Sound and Hood Canal infestation at approximately 800 solid acres, an 11% decrease from 1999.

Further field audits and control work conducted during the 2002 control season indicate that there were approximately 730 solid acres remaining in Puget Sound and Hood Canal at the beginning of the season. This represents an overall decrease of 27% from 1997 when control work began. During the 2002 season approximately 455 solid acres were controlled in Puget Sound and Hood Canal. Based on treatment and efficacy data compiled over more than 5 years,

an efficacy of at least 55% will result likely from the 2002 treatments. This efficacy would result in an estimated 20% reduction in the overall size of the infestation from 2001.

Figure 6. Locations and Sizes of All Known Puget Sound and Hood Canal *Spartina* Infestations



Snohomish County

WSDA provided $50,000 to the Snohomish County Noxious Weed Control Board for *Spartina* eradication activities in 2002. In addition, Snohomish County carried forward the entire $50,000

provided by WSDA for 2001. Within a biennial budget period, counties may arrange to carry forward *Spartina* funds under some circumstances. Because of the absence of herbicide use during the 2001 season, Snohomish County chose to retain funding until 2002. Work conducted by Snohomish County in 2001 was done with county funds only. WDFW also conducted a substantial amount of control work in Snohomish County during the 2002 season. This work was focused mainly on WDFW-managed lands on Leque Island.

In total, 238 solid acres of *Spartina* were treated in Snohomish County in 2002. Table 5 shows the solid acres treated, who did the treatment, and the treatment methods used on every site in Snohomish County. Figure 7 identifies the approximate location of the infestations.

Table 5. Summary of 2002 *Spartina* Eradication Effort in Snohomish County (SC)

Site	Solid Acreage treated	Entity Conducting Treatment	Treatment Method used
Port Susan	2*	SC	Herbicide
South East Skagit Bay	62	SC	Herbicide, Crush
Davis Slough	2.5	WDFW	Herbicide
Leque Island	165.3	WDFW	Herbicide, Crush
Warm Beach	0.02*	SC	Herbicide
Stilliguamish Channel	1*	SC	Herbicide
Kayak Point to Warm Beach	0.0001*	SC	Mow,Dig
South Pass	5.64*	SC	Herbicide
Total Solid Acres Treated	**238.46**		

***Denotes entire site treated**
SC = Snohomish County, WDFW = Department of Fish and Wildlife.

All known *Spartina* infestations within Port Susan were treated, which totaled about 2 solid acres. However, these 2 acres were scattered throughout 1,600 acres of the bay, thus protecting the entire 1,600 acres from infestation. Also, approximately 50 acres of the largest infestation in Puget Sound located in South Skagit Bay, were mechanically crushed in preparation for herbicide applications in 2003. Several acres in south Skagit Bay not suitable to mechanical control were controlled with herbicide. Large *Spartina* infestations on Leque Island and along the Stillaguamish River were also mechanically and chemically controlled by WDFW, and the Warm Beach region was maintained *Spartina*-free by Snohomish County. Figure 23 (*see p. 44*) shows WDFW staff mechanically crushing *Spartina anglica* infestations on Leque Island.

Snohomish County conducted both herbicide applications and mechanical control with a small tracked amphibious vehicle purchased with funds carried forward from their 2001 funding provided by WSDA. The use of this vehicle allowed the county to treat more acreage this season in South Skagit Bay than in any previous season and will greatly benefit in future control work conducted by Snohomish County.

Figure 7. Approximate Locations of all 2002 Snohomish County *Spartina* Treatment Sites

Island County

WSDA provided $50,000 to the Island County Noxious Weed Control Board for *Spartina* eradication activities in 2002. As with Snohomish County, Island County also carried funds forward (approximately $9,000) from the 2001 control season. Island County sub-contracted the majority of *Spartina* eradication work to a private contractor, Wildlands Management (WM). In addition, WDFW conducted a large amount of control work in Island County during the 2002 season. Residents of the Skatchet Head community, located on southern Whidbey Island, also contributed labor during community-organized cooperative *Spartina* digs within Cultus Bay.

In total, 180 solid acres of *Spartina* were treated in Island County in 2002. Table 6 shows the solid acres treated, who did the treatment and the treatment methods used. Figure 8 shows the approximate locations of the treatment sites.

Table 6. Summary of 2002 *Spartina* Eradication Effort in Island County (IC)

Site	Solid Acreage Treated	Entity Conducting Treatment	Treatment Method
Ala Spit	<0.25*	WDFW	Dig
Cornet Bay	0.25*	WDFW	Herbicide
Dugwalla Bay	2*	WM, WDFW	Herbicide
Race Lagoon	1*	WDFW	Herbicide
Arrowhead Beach	5*	WM	Herbicide
Livingston Bay	67*	WDFW, WM	Herbicide
Deer Lagoon	2.75*	WM	Herbicide
Cultus Bay	3.5*	WM, WDFW, WSDA	Herbicide
English Boom	19.5*	WM, WDFW	Herbicide
Maylor Marsh	13.5*	WM, WDFW	Herbicide
Hancock Lake	1.25*	WSDA, WDFW	Herbicide
Scatchet Head	<0.25*	DNR/Private Landowners	Survey, Dig
Elger Bay	0	WDFW	Monitor
Sunlight Beach	1.75*	WM	Herbicide
Juniper Beach	1	WM/WDFW	Mow
Triangle Cove	61	WDFW	Crush
Penn Cove	0.01	WSDA	Dig
Total Solid Acres Treated	**180.5**		

***Denotes entire site treated**
WM = Wildlands Management, WDFW = Department of Fish and Wildlife,
WSDA = Department of Agriculture, DNR = Department of Natural Resources.

The effort continues to focus on reducing and eradicating the small outlier infestations, as has been the focus in the past. Also, during the 2002 season, WDFW and Wildlands Management made huge progress on several of the largest infestations in Island County.

Triangle Cove on Camano Island, the largest infestation left in Island County, received extensive control work for the first time. WDFW mechanically crushed approximately 61 solid acres of the 170-plus acre infestation. This effort will be built upon during the 2003 control season with the goal of mechanically crushing the entire infestation. This continued mechanical control work is intended to reduce seed production and dispersal of the meadow, and it will prepare the infestation for future herbicide applications.

Figure 8. Approximate Locations of all 2002 Island County *Spartina* Treatment Sites

Livingston Bay, located on eastern Camano Island, has been a significant source of seed in past years. During the 2000 treatment season, Wildlands Management and WDFW treated the entire infestation in Livingston Bay. This treatment resulted in approximately 50% reduction in

acreage. Although herbicide was not in use during the 2001 season, Wildlands Management and WDFW continued to make progress in Livingston Bay. The entire infestation was mechanically controlled by using a small amphibious vehicle and by mowing, resulting in extremely little seed set. During the 2002 season WDFW and Wildlands Management combined efforts to treat the entire infestation with herbicide. Applications were made to the infestation during neap tides that would allow for over 6 hours of dry time, resulting in improved efficacy over earlier treatments.

Skagit County

WSDA provided $40,000 to the Skagit County Noxious Weed Control Board, and $10,000 to the Swinomish Tribal Community during the 2002 control season. Skagit County also received a $13,000 grant from a Skagit Fisheries Enhancement Group and the Swinomish Tribe, WDFW, Washington Department of Ecology and Wildlands Management allocated resources towards *Spartina* eradication activities. In addition, Skagit County carried over $33,000 that remained from the 2001 funding provided by WSDA.

In total, 36 solid acres of *Spartina* were treated in Skagit County in 2002. All known *Spartina* infestations were treated with exception of a few infestations on Swinomish tribal land. Table 7 shows the solid acres treated, who did the treatment, and the treatment methods used on every site in Skagit County. Figure 9 shows the approximate locations of all Skagit County 2002 treatment sites.

The Swinomish Indian Tribal Community has been working with WSDA to develop an integrated approach towards controlling *Spartina* infestations on reservation land. Past control work has allowed for the use of all control options excluding herbicide. The Tribal Community, along with assistance from WSDA, WDFW and Skagit County, developed and implemented a control approach during the 2002 season that allowed for herbicide applications at two sites.

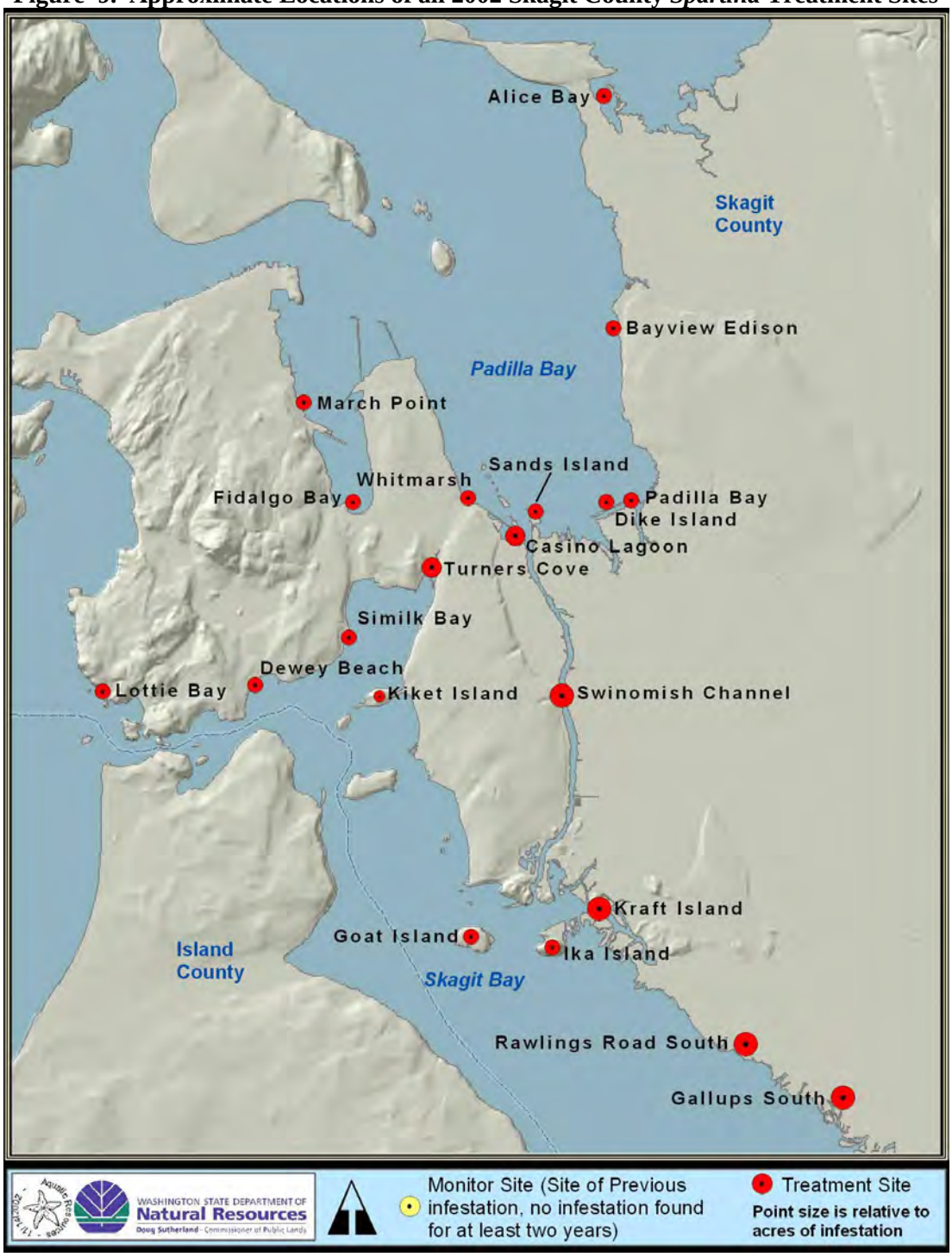
WSDA and WDFW treated 8 acres on Swinomish tribal property. As mentioned above, the control work was conducted at 2 sites, the Swinomish Channel, which consisted of 5.5 acres of treatment, and a lagoon adjacent to the Swinomish Casino, which consisted of 2.5 acres. The tribal community also conducted physical removal at the casino lagoon site of approximately 1 solid acre.

Table 7. Summary of 2002 *Spartina* Eradication Effort in Skagit County

Site	Solid Acreage Treated	Entity Conducting Treatment	Treatment Method
Gallups South	10.44*	SK	Dig, Herbicide
Rawlings Rd. South	8.22*	SK	Mow, Herbicide
Kiket Island	0	SK	Monitor
Sands Island	1*	SK	Herbicide
Kraft Island	5.2*	SK	Herbicide
Ika Island	0.01*	SK	Dig
Dike Island	0.75*	WM, WDFW	Herbicide
Padilla Bay	0.003*	DOE	Dig
Similk Bay	0.002*	SK	Dig
Bayview Edison	0.0005*	DOE	Dig
Alice Bay (Samish Island)	0.07*	WDFW, DOE	Herbicide
Turners Cove	1	SW	Mow
Lottie Bay	0.0001*	SK	Monitor, Dig
Goat Island	0.8*	SK	Herbicide
Dewey Beach	0.01*	SK	Monitor, Dig
Fidalgo Bay	0.03*	SK	Dig
March Point	0.025*	SK	Dig, Herbicide
Whitmarsh	0.025*	SK	Dig, Herbicide
Casino Lagoon	3.5*	WDFW, WSDA, SW	Mow, Dig, Herbicide
Swinomish Channel	5.5*	SK, SW, WSDA,WDFW	Dig, Herbicide
Total Solid Acres Treated	**36.39**		

***Denotes entire site treated**
SK = Skagit Count, WM = Wildlands Management, DOE = Department of Ecology, WSDA = Department of Agriculture, WDFW = Department of Fish and Wildlife, SW = Swinomish Tribal Community.

Figure 9. Approximate Locations of all 2002 Skagit County *Spartina* Treatment Sites



San Juan, Clallam, Jefferson, Kitsap, King Counties

In 2002, WSDA continued to work with the San Juan County Noxious Weed Control Board Coordinator, as well as the U.S. Navy and State Parks, to conduct control work in San Juan, Clallam, Jefferson, Kitsap and King counties. San Juan County conducted surveys and dug *Spartina* at one site, Argyle Lagoon. Figure 10 shows where the surveys and control work took place. The U.S. Navy assisted the WSDA crew with control and surveys on Indian Island by providing both labor and access to sites on Naval property. WSDA also worked with State Parks to conduct control work at Dosewallips State Park in Jefferson County. Figure 11 shows the locations of all 2002 WSDA treatment sites. Table 8 shows the solid acres treated, who did the treatment and the treatment methods used on every site in San Juan, Clallam, Jefferson, Kitsap and King counties.

WSDA crews have substantially reduced all known infestations in Clallam, Jefferson, Kitsap and King counties during the past four years. It is important to note that with the exception of the Doe-Kag-Wats site in Kitsap County, all other sites were treated entirely at least twice. With the exception of the Doe-Kag-Wats infestation located on the Suquamish Reservation in Kitsap County, all sites are nearing eradication and will continue to progress towards that end with yearly surveying and physical control.

The Suquamish Tribe and the owners of the property adjacent to the Doe-Kag-Wats site agreed to an experimental use of herbicide this season. The experiment compared the efficacy of physical, mechanical and chemical controls.

Recommendations for the Future for Puget Sound

It is reasonable to assume that continuous control and monitoring of these sites, coupled with the elimination of major nearby seed producing meadows, is reflected in the small infestation size and the low re-infestation rate of central and southern Puget Sound infestations. With continued funding for all agencies involved, this same success will be achieved in the rest of Puget Sound. Substantial control took place for the first time ever at three of the largest infestations in Island and Snohomish counties, the first step necessary to eradicating these infestations. Continued funding and support is needed to keep up this successful effort in Puget Sound.

Figure 10. Approximate Locations of 2001 San Juan County *Spartina* Treatment/Survey Sites

Figure 11. Approximate Locations of all 2002 Clallam, Jefferson, Kitsap and King county *Spartina* infestations

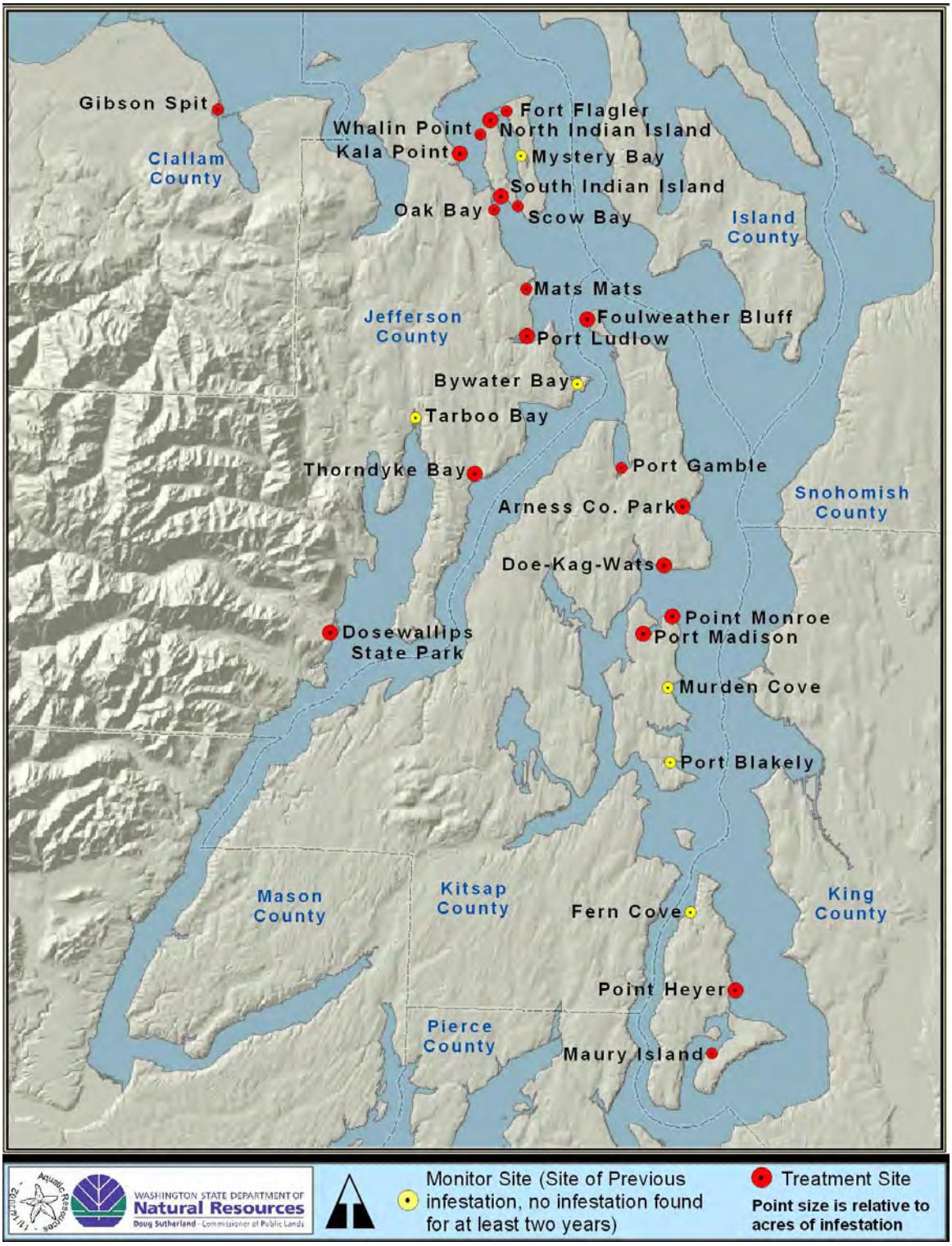


Table 8. Summary of 2002 *Spartina* Eradication Effort in San Juan, Clallam, Jefferson, Kitsap and King Counties

Site	Solid Acreage Treated	Entity Conducting Treatment	Treatment Method
San Juan County			
Argyle Lagoon	0.0001*	SJC	Dig
Fisherman Bay	0	SJC	Monitor
Buck Bay	0	SJC	Monitor
Clallam County			
Gibson Spit	0.0001*	WSDA	Dig
Jefferson County			
Dosewallips State Park	0.01*	WSDA	Herbicide
Thorndyke Bay	0.0001*	WSDA	Dig
Tarboo Bay	0	WSDA	Monitor
Oak Bay	0	WSDA	Monitor
Mats Mats	0	WSDA	Monitor
Scow Bay	0	WSDA	Monitor
Whalin Point	0	WSDA/Navy	Monitor
Kala Point	0.001*	WSDA	Dig
Bywater Bay	0	WSDA	Monitor
South Indian Island	0.0001*	WSDA	Dig
North Indian Island	0.01*	WSDA/Navy	Dig
Fort Flagler	0	WSDA	Monitor
Port Ludlow	0.001*	WSDA	Dig
Mystery Bay	0	WSDA	Monitor
Kitsap County			
Murden Cove	0	WSDA	Monitor
Port Blakely	0	WSDA	Monitor
Point Monroe	0.0001*	WSDA	Dig
Foulweather Bluff	0.01*	WSDA	Dig
Port Gamble	0	WSDA	Dig
Doe-Kag-Wats	1*	WSDA	Mow, dig, herbicide
Arness Park	0.001*	WSDA	Dig
Port Madison	0.01*	WSDA	Dig
King County			
Fern Cove	0	WSDA	Monitor
Maury Island	0	WSDA	Monitor
Point Heyer	0.0001*	WSDA	Dig
Total Solid Acres Treated	**1.0364**		

***Denotes entire site treated**

SJC = San Juan County, WSDA = Department of Agriculture, Navy = U.S. Navy

Figure 12. *Spartina alterniflora* in Willapa Bay, Pacific County, Washington (2000)

Figure 13. *Spartina patens* at Dosewalips State Park, Jefferson County, Washington (2000)

Figure 14. *Spartina anglica* invading mudflat in Livingston Bay, Island County (1999)

Figure 15. *Spartina densiflora* located in Grays Harbor near Damon Point (2002)

Fig. 16. WDFW staff conducting Willapa Bay Efficacy Monitoring Program. (2002)

Figure 17. USFWS Wilco tracked amphibious machine rototilling *Spartina alterniflora* (2002)

Figure 18. USFWS rototill area after being treated with herbicide (2002)

Figure 19. USFWS tracked amphibious vehicle equipped with precision boom sprayer (2002)

Figure 20. Biological control agent *Prokelisia marginata* nymphs and adults.

Figure 21. WDFW Trailmaster crushing infestation on Leque Island, Snohomish County (2002)