

**2005 STATEWIDE *SPARTINA*  
INTEGRATED WEED MANAGEMENT  
PLAN**



**Prepared by  
Washington State Department of Agriculture**

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# **INTRODUCTION**

## **Location of Management Areas**

Spartina management efforts have been divided into six areas to better facilitate coordination between state, federal, tribal and local agencies with differing areas of responsibility.

### **North Puget Sound**

The waterbody covered in this management area includes Puget Sound in Snohomish, Skagit, Island, Whatcom and San Juan Counties. This includes Possession Sound, Port Susan, Saratoga Passage, Holmes Harbor, Penn Cove, Skagit Bay, Similk Bay, Padilla Bay, Fidalgo Bay, Burrows Bay, Guemes Channel, Bellingham Channel, Bellingham Bay, Samish Bay, Hale Passage, Lummi Bay, Birch Bay, Drayton Harbor, Semiahmoo Bay, the Strait of Georgia, President Channel, and Rosario Strait.

### **Willapa Bay**

Willapa Bay, located in southwest Washington, includes the mouth of Willapa Bay; the bay itself; and all the rivers, streams, and creeks that feed into the bay.

### **Grays Harbor**

The water body covered in this management area includes the mouth of Grays Harbor, Grays Harbor, all the rivers, creeks and streams that empty into Grays Harbor and Copalis River and Connor creek.

### **Straits/Coast**

The waterbody in this management area includes the west side of the Olympic Peninsula, running from the Copalis river to Cape Flattery; the north side of the Olympic Peninsula, running from Cape Flattery to Port Townsend (including Sequim Bay, Discovery Bay, Kilisut Harbor, Oak Bay, and Admiralty Inlet down to the head of Hood Canal at Bywater Bay State Park.

### **Hood Canal/Central Puget Sound**

The waterbody covered in this management plan includes Hood Canal from Bywater Bay South and all of Kitsap and King Counties.

### **South Puget Sound**

The water body in this management area includes Puget Sound from the King County line in Dalco Passage south. This includes the Narrows, Hale Passage, Case Inlet, Carr Inlet, the Nisqually Reach, Henderson Inlet, Budd Inlet, Eld Inlet, Totten Inlet, Hammersley Inlet, and Oakland Bay.

## **Characteristics of Washington State Intertidal Regions**

The intertidal region of Washington State is characterized by a twice-daily tide change that exposes large sand or mud flats, adjacent to emergent salt marshes. The mud flats are typically devoid of emergent vegetation, but support eelgrass and benthic invertebrates, which are essential food for higher order organisms. The emergent

saltmarsh is comprised of plants such as *Carex*, *Scirpus*, *Salicornia*, *Triglochin*, and *Distichlis*, among others. This distinct and highly productive Pacific Northwest intertidal zone provides critical habitat for many animal and fish species, including: Feeding grounds for multitudes of migratory waterfowl and shorebirds; breeding and rearing habitat for several marine fish species; important feeding grounds and transitional area for juvenile salmonids, crabs and marine mammals; and irreplaceable shellfish habitat. Historically, local Native Americans' diets appeared to depend in large part upon clams, salmon, and other fish species native to the estuaries and mudflats of Willapa Bay. Today, much of the intertidal mudflats has been invaded and drastically altered by the introduced *Spartina* species.

### **The Invasive Species of *Spartina***

*Spartina alterniflora* (Smooth cordgrass) is a species native to the East Coast of North America. It was introduced to the West Coast during the 1890s when used as packing material for oyster shipments from the East Coast.

*Spartina anglica* (Common cordgrass) is a very aggressive invader of Pacific Northwest tideland ecosystems. This species originated in England from a cross of the American *Spartina alterniflora* and the European *Spartina maritima*. The result of this cross was a sterile hybrid named *Spartina X townsendii*.

This sterile hybrid then underwent a genetic process termed "allopolyploidy" resulting in a fertile new species, *Spartina anglica*. The hybrid vigor of *Spartina anglica* is amazing. In a little over 100 years, it has taken over approximately 25,000 acres of intertidal salt marsh on the British Coast.

*Spartina densiflora* (Dense-flowered cordgrass) is a newly discovered invasive cordgrass in Washington State. *Spartina densiflora* is native to South America. It is speculated that the first introduction to North America occurred in Humboldt Bay, California, in the mid-1850's. The seeds introduced to Humboldt Bay most likely were transported in the ballast of timber ships returning from Chile.

The limited extent of *S. densiflora* in Washington State leads to the speculation of a recent introduction of the species. The vector of introduction has not been determined at this time.

Unlike the other *Spartina* species in Washington, the rate of seed viability of *S. densiflora* tends to be high and the plant continues to grow throughout the year. This gives the species the ability to spread over an extremely wide area very quickly.

*Spartina patens* (Saltmarsh cordgrass) is present at only one known location in Washington State, Dosewallips State Park in Jefferson County. *S. patens* is native to the Atlantic and Gulf coasts and is found from Newfoundland to Texas. Its niche is brackish

salt marshes at higher tidal elevations than the other *Spartina* species in Washington State.

### **Ecological Threat**

*Spartina patens* and *Spartina densiflora* listed as a Class-A noxious weeds, and *Spartina alterniflora* and *Spartina anglica*, listed as Class-B noxious weeds on Washington State's Noxious Weed List, are perennials that can spread through seeds or through rhizomal spread. In Washington State, *Spartina* species grow in the intertidal region from the high intertidal marsh to within 1 meter of mean lower low water. *S. patens* and *S. densiflora* are adapted to grow in the upper marsh where they mix with natives. *S. alterniflora* and *S. anglica* tend to invade bare mud in the lower tidal area.

*Spartina* shoots sprout from below ground rhizomes in the spring, reaching heights of three to six feet by mid-summer. *Spartina* flowers from late June to October, and seeds are typically produced in early September. Seed viability tends to be low, approximately 4 percent, and seeds require soaking in saltwater for about six weeks to germinate the following year. Seeds remain viable for about eight months, from September to May, so there is no accumulation of a seed bank from year to year. The plants are deciduous, and individual shoots typically live less than one year. *S. densiflora* is the exception with both highly viable seeds and continuous vegetative growth.

*Spartina* colonization begins when seeds germinate in the intertidal zone. Once established, the seedlings begin to grow vegetatively, forming small circular tussocks called clones. These clones then coalesce into contiguous meadows, usually fringing, but sometimes displacing, the native saltmarsh. The resulting meadow traps sediment that would normally be exported from the bay. The annual accretion of this sediment raises the intertidal height of the meadows and changes the hydrology of the associated habitat. These meadows not only trap sediments but also nutrients that are vitally important to the ecosystem. *Spartina*'s ability to fill an ecological niche in intertidal regions, devoid of predators or higher plant competition, makes it capable of growing unchecked.

*Spartina* species are aggressive colonizers that displace plants and animals historically associated with Washington State intertidal and estuarine environment. Tidal plant species supplanted include two eelgrass species (*Zostera marina* and *Z. japonica*) and microalgae. Loss of mudflat, eelgrass, and macroalgae negatively impacts those native fish and bird species that depend on these areas for feeding, spawning, or rearing habitats.

*Spartina* colonization results in significant landscape alteration with widespread ecological disruption. Stout stems and root masses up to five times greater than aboveground biomass promote accumulations of tidal sediments around *Spartina* stands. Sediment accretion takes place three times more rapidly than under native conditions, resulting in enhanced nutrient levels for the grass clone. Altered nutrient cycles become self-perpetuating, with *Spartina* clones themselves as the chief beneficiaries.

Decreased biodiversity and disrupted food chains are not the only negative repercussions of *Spartina* invasion. Property values diminish as flooding potentials increase and beach access for recreation is limited. Maintenance costs to landowners also increase, and opportunities for hunting, fishing, crabbing, and boating decline. Both subsistence harvesting and commercial production of shellfish have the potential to be adversely impacted following widespread cordgrass establishment.

### **Threatened and Endangered Species**

There are no federally listed endangered or threatened plant species in the area. *Puccinellia nutkaensis* is on the state list as a sensitive species (*Puccinellia nutkaensis* is not listed as occurring in the area). It is known to occur in the upper salt marshes of the area, but not within the targeted tideflats. *Howellia aquatilis* (T) may occur in freshwater wetlands, ponds, or lakes in the vicinity. It is not known to occur within the targeted tideflats.

The following federally listed Threatened (T) or Endangered (E) species may occur in the Bay or adjacent uplands: bald eagle (T), western snowy plover (T), spotted owl (T), marbled murrelet (T), Aleutian Canada geese (T), peregrine falcon (E), brown pelican (E), Oregon silverspot butterfly (T), Gray whale (E) is now on the state list as a sensitive species, Stellar sea-lion (T), Loggerhead sea turtle (T), leatherback sea turtle (E), and green sea turtle (T), Bull trout (T), Chinook Salmon (Puget Sound) (T), Chum Salmon (summer-run, Hood Canal) (T).

## **CURRENT EXTENT OF SPARTINA INFESTATION IN WASHINGTON STATE**

In understanding the extent of the *Spartina* infestation, it is important to know that there are different ways to measure and quantify acreage. Likewise, there are different uses for each type of acreage measurement. WSDA uses two terms: solid acres and affected acres. For instance, when reporting the amount of *Spartina* treated with herbicide it is best to think in terms of solid acres of plant material. WSDA defines solid acres as the actual amount of *Spartina*, as if the separate infestations were consolidated into one large area.

In management terms and in looking at the “big picture” it makes more sense to think of infested acres or “affected acres”. Affected acres are the overall number of acres affected by *Spartina* including the space between infestations. For example, we could look at ten acres of mudflat with many *Spartina* clones spread across it; this would be ten infested acres, but the solid acreage would perhaps be only one or two acres. It is important to note the affected acreage has the potential and is at risk of becoming solid acres if no treatment is implemented.

## **Puget Sound**

At the end of the 2003 field season, the North Puget Sound *Spartina* Task Force re-evaluated the total solid acreage in Puget Sound at 760 solid acres prior to the 2003 treatment season. After the completion of the 2004 season, treatment data, coupled with site surveys and monitoring data from sites where reductions were gained, has led managers to estimate the solid acreage remaining in Puget Sound at 645 acres. This is a 125-acre reduction from the 2003 figure and an overall acreage reduction of 35% from 1997

## **Willapa Bay**

In September 2003, DNR conducted an aerial infrared photography survey of the entire Willapa Bay. This survey allows DNR to identify the *Spartina* separate from all other vegetation and calculate a fairly accurate infested acreage figure. The infrared photography is able to identify the unique color signature of *Spartina* among the various other plants that occur in the area. For this to work, however, the *Spartina* has to be actively growing.

Because the survey was conducted at the end of the treatment season, photos of many of the treated areas did not yield accurate acreage numbers because the plants were no longer actively growing.

We do know, however, the approximate amount of acreage that was treated during the 2003 season. By using the 2003 treated acreage data together with the infrared photography data and then comparing it with information on solid acres treated in 2004, the agencies estimate there was approximately 7,020 solid acres of *Spartina* at the beginning of the 2004 treatment season.

This is a reduction of approximately 1,000 solid acres, or 12%, based on the estimated acreage at the beginning of the 2003 treatment season. This is the first time we have seen an actual decline in the solid acreage in Willapa Bay. With the use of a new, potentially more effective herbicide, and continued funding, we should start to see an even greater decline next year

## **Grays Harbor**

WSDA and WDFW continue to find small, scattered infestations in the Grays Harbor area. It is estimated that the infestation covers no more than 5 solid acres. This infestation will continue to prove problematic to eradicate until the infestation in Willapa Bay, the most likely seed source, is reduced to minimal acres.

**Figure 1. Estimated *Spartina* infestations in Willapa Bay, 2004**

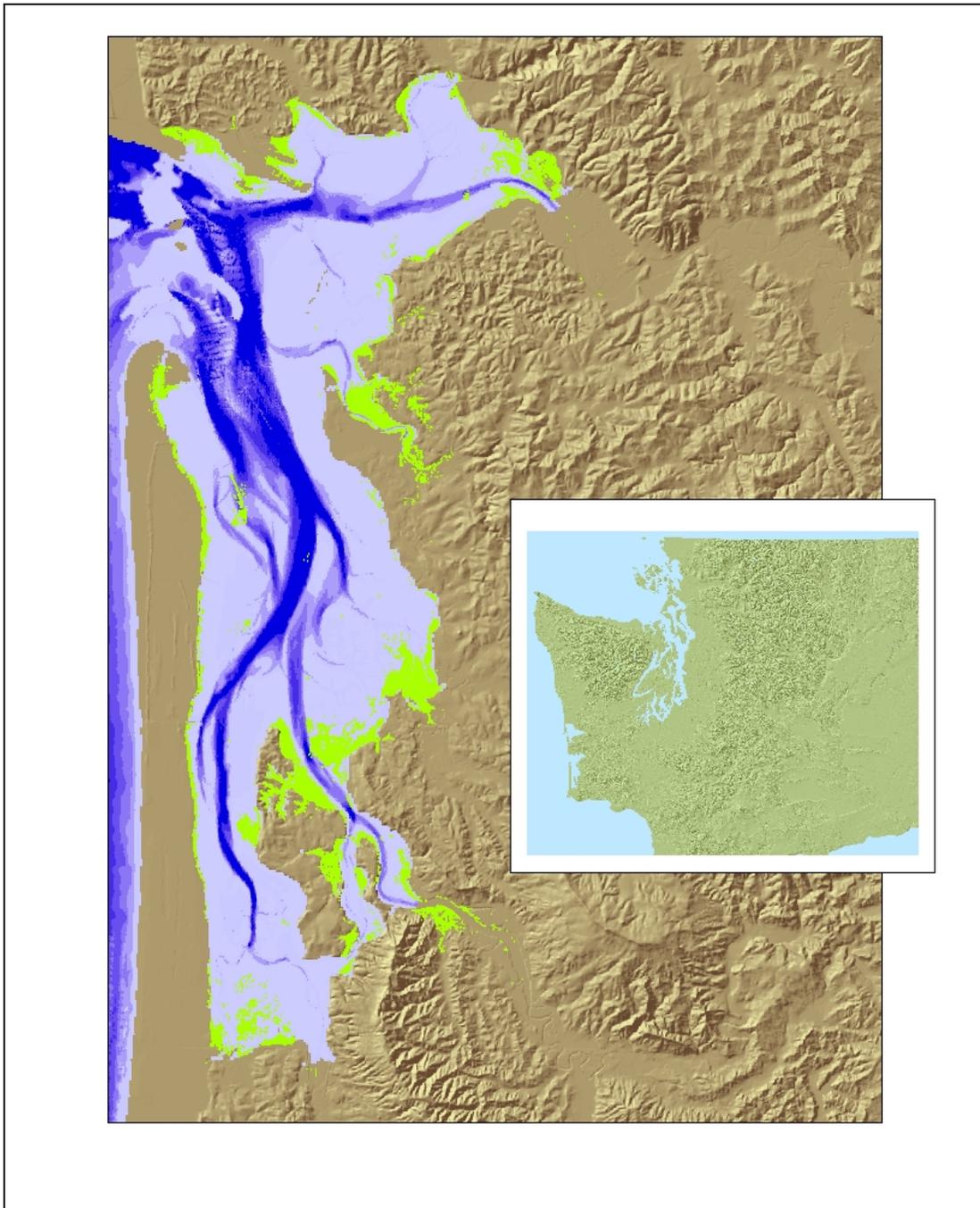


Figure 2. All known *Spartina* infestations and relative sizes in Grays Harbor, 2004

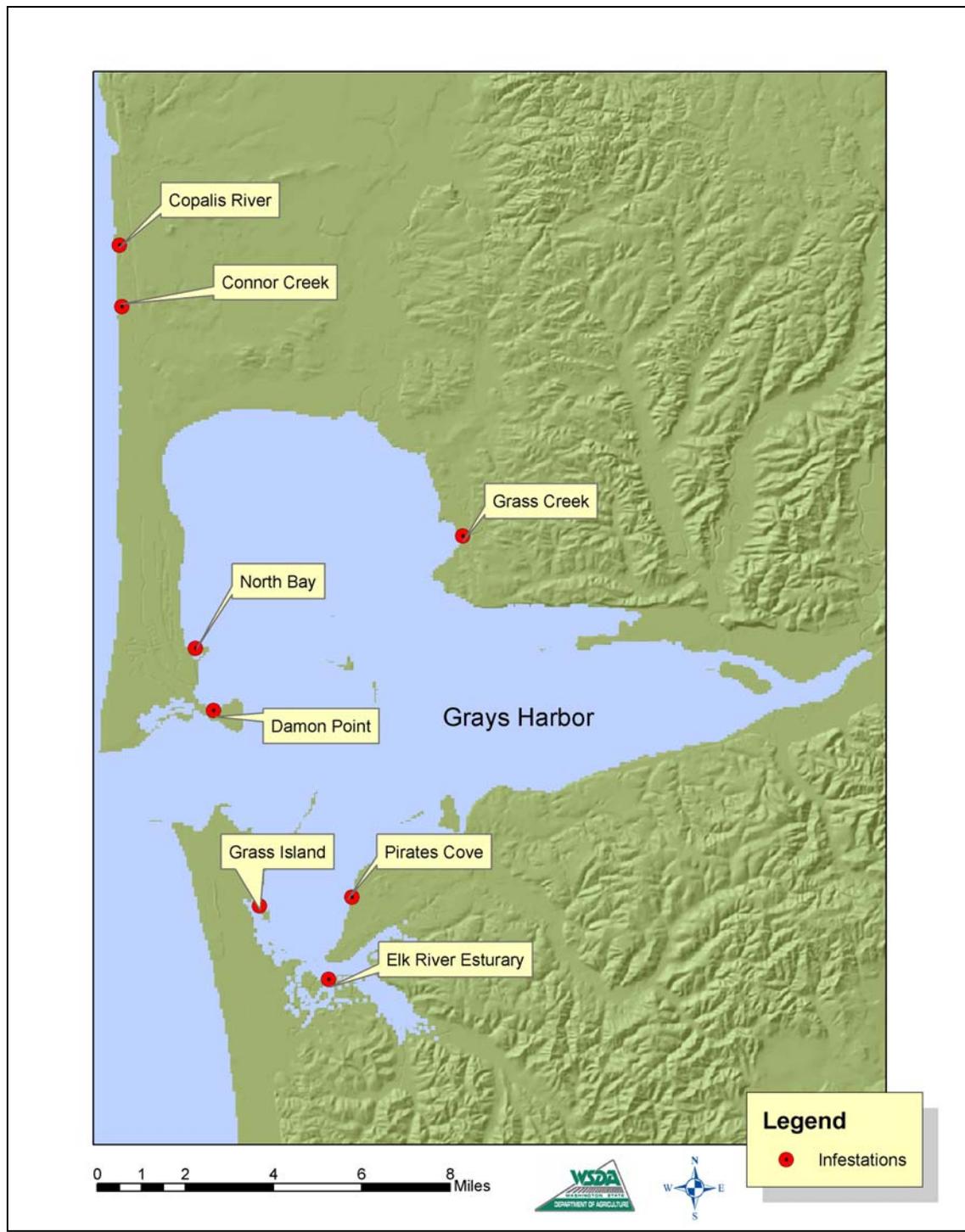
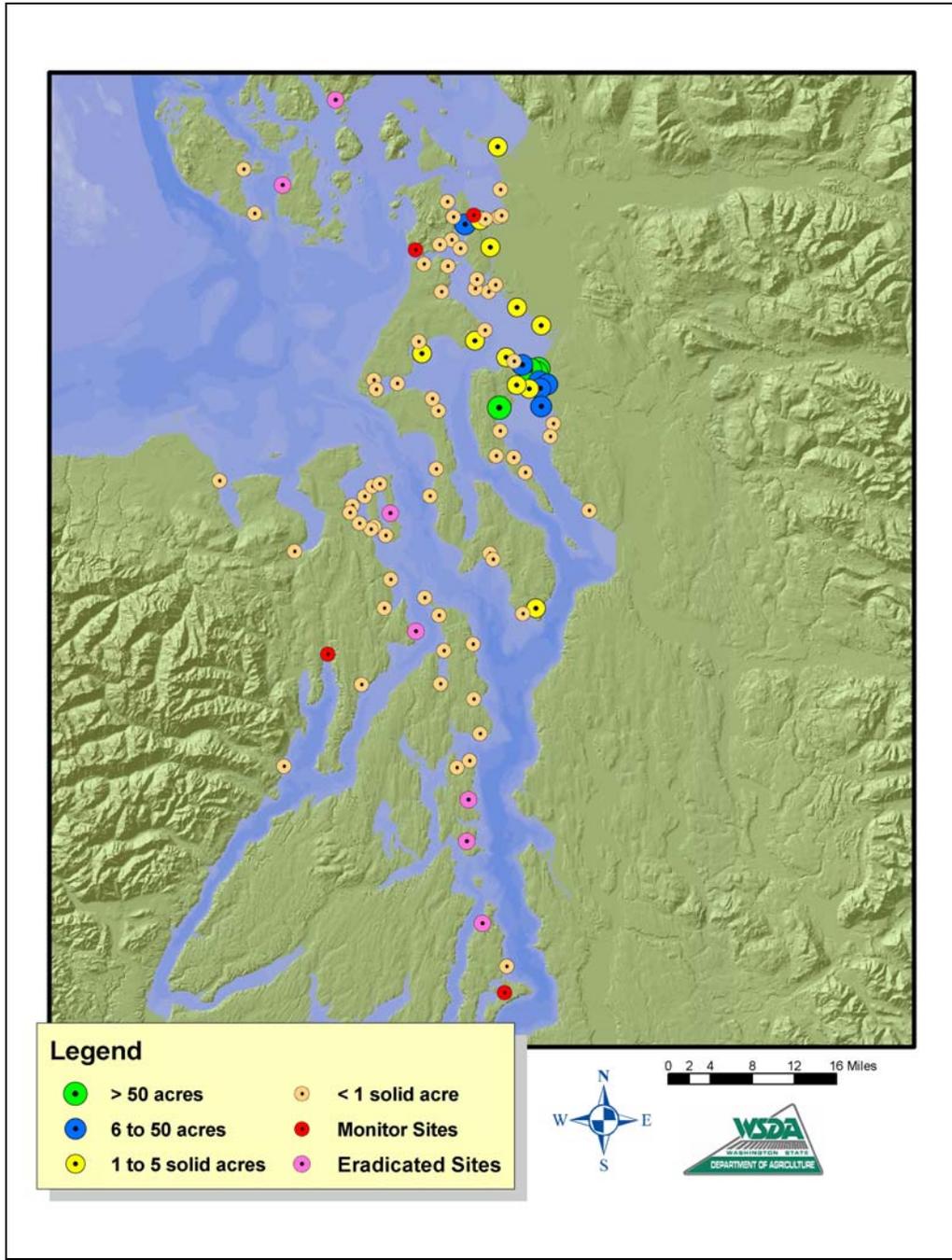


Figure 3. All Known *Spartina* Infestations and sizes in Puget Sound and Hood Canal, 2004



# WASHINGTON STATE SPARTINA MANAGEMENT STRATEGY

## **Goal and Objectives of *Spartina* Eradication Program**

The goal of *Spartina* management in Washington State is to preserve and protect the integrity of the mud flat and native saltmarsh ecosystem from the encroachment of *Spartina* through eradication of existing infestations and prevention of new infestations. An effective weed management program will restore native tidal areas and ensure that quality intertidal estuarine habitat is available for migrating waterfowl, anadromous and marine fish, and shellfish. It will also preserve natural resources for commercial and recreational fisheries, and cultural resources of significance to Native Americans.

The objectives for *Spartina* control in Washington State include:

- Estuarine restoration through the removal of *Spartina* grass from tidelands, enhancing public access and salmon and wildlife habitat.
- Monitor results of all previously controlled sites for efficacy and re-growth, seasonally. Modify and improve future control methods based on this information.
- Retreat sites if necessary.
- Prevent seed production each season at the largest infestations.
- Survey of nearby shorelines to identify and prevent establishment of new infestations.

## **Using Integrated Weed Management**

Use of Integrated Weed Management (IWM), as defined in Section 3.6.1 of the *Final Noxious Emergent Plant Management Environmental Impact Statement of 1993*, allows selection from treatment methods listed below to match the management requirements of each specific site. Treatment methods are chosen to maximize efficacy and to minimize negative environmental, economic and social impacts. At individual sites, they can also be used in combinations, permitting variation in environmental sensitivity within the sites to be appropriately addressed.

- **No treatment** - This is the least preferred option. No treatment will result in vegetative growth of the plant, in addition to seed production. Infestations will spread to uninfested bodies of water. This may lead to millions of dollars in lost production in industries dependant on intertidal areas and many lost acres of lost wildlife habitat.

- **Mowing** - Repeated mowing to/below the mud line can prevent seed production and reduce re-growth. In addition to killing some *Spartina* outright, mowing reduces the amount of herbicide needed to control *Spartina*. The optimal time to mow is in spring when the plant is expending energy stores on shoot production. Early mowing also allows enough time for herbicide treatments of regrowth by July. If mowing is the main management tool the plants should be mowed before they reach 12” in height. Mowing with a large machine costs approximately \$167/ acre not including the capital cost of the machine. Mowing with hand held brushcutters costs \$706/acre and a walk behind mower costs \$128/acre. Associated human health costs are from machine exhaust and siltation of waters after tidal inundation of treated area.
- **Herbicide (ground application)** – In 2004 the herbicide, imazapyr was registered with the EPA and approved for use in Washington State by the Department of Ecology. Researchers, studying the efficacy of imazapyr on *Spartina* have found it to be both effective and consistent. Early results from 2004 treatments with imazapyr are encouraging. Ground application using imazapyr is effective for treating clones and meadows. The timing of treatments is dependent on tide cycles. Imazapyr needs at least 4 hours dry time and at least 6 hours is optimal. Imazapyr is no more than slightly toxic to humans, fish, birds and aquatic invertebrates and binds tightly with soil; thus, it does not enter water table to any large degree. Additional environmental risks are associated with non-target species fatality when treating infestations mixed with native species. The cost for backpack, low pressure, and high-pressure applications are approximately \$1,300/acre, \$600/acre and \$450/acre respectively.
- **Herbicide (aerial application)** - Aerial application should be timed to coincide with the maximum susceptibility of the plant to increase efficacy. Aerial herbicide is only applied to very large clones or meadows to prevent seed production. The cost for aerial applications is approximately \$250/acre.
- **Herbicide (broadcast application)** – Broadcast application consists of a ground application of herbicide from a boom apparatus. This treatment should only be conducted when there are extended dry times at the treatment area. The cost of ground broadcast applications is approximately \$250 - \$300/acre.
- **Manual removal** – Includes hand pulling, seedling pushing, and digging. Manual removal can be extremely effective for removing seedlings and very small infestations though may lead to sedimentation. Volunteer organizations and tribal agencies have conducted small-scale removal projects successfully. This work is time consuming and labor intensive. Digging costs approximately \$50,000/acre. Associated human health and environmental concerns consist of siltation of waters after tidal inundation of treated area.
- **Covering** – Covering has been shown to eradicate small clones. The cost is prohibitive for use on a large scale. The treatment is highly labor intensive and

coverings must be regularly monitored to detect and repair torn fabric. No human health concerns are associated with this treatment. Environmental risks consist of release of fabric if washed away by tidal movement and non-target species fatality when treating infestations mixed with native species

- **Seed head clipping** - Clipping will reduce spread by seeds, but is highly labor intensive. Mowing plants while flowering can attain the same effect but before they have gone to seed. No human health or environmental concerns are associated with this treatment.
- **Flaming** – The high water content of *Spartina* prohibits large scale flaming of meadows. Flaming has been conducted for small-scale treatments, but has not been shown as effective as the flame must be held to the plant for an extended period of time to damage the underground biomass.
- **Dredging** – Some experimentation has been conducted with dredging systems. All of which were prohibitively slow and produced large amounts of root material mixed with mud. In addition, disposal of dredge materials to an upland site is problematic.
- **Rototilling** – Rototilling is an effective technique for restoring mudflats to pre-infestation elevations. Large amounts of sediment may be released into the waterbody during a short period. Associated human health and environmental risks are from machine exhaust and siltation of waters after tidal inundation of treated area.
- **Crushing/Disking** – These manual methods are conducted by driving large tracked vehicles over infestations while pulling implements. The implements consist of large rollers with angle iron attached or a diskier similar to those used in upland agriculture. The objective is to either kill the *Spartina* outright or knock the plants down so that the regrowth is more susceptible to chemical applications. The cost is approximately \$89.00/acre. Associated human health and environmental risks are from machine exhaust and siltation of waters after tidal inundation of treated area.
- **Biological control** - The planthopper *Prokelisia marginata* was released in Willapa Bay during the summer of 2000. Several populations of this insect are now well established and expanding. In 2004 researchers released about 275,000 insects in Willapa Bay and about 57,000 insects in Puget Sound. Researchers continue to investigate other potential bio control agents as well as ways to improve the success of the current agent. No cost for biological control is available at this time.

Unlike other alternatives, IWM includes a systematic process for establishing management goals and prioritizing activities on the basis of infestation type; prevention of introduction or infestation enlargement; determination of abundance thresholds used to dictate when management activities are required; infestation monitoring; and public

involvement. The preferred alternative, IWM, has and will continue to be the guiding principle for *Spartina* control, containment, reduction, and eradication efforts.

Various terms used in IWM have definitions that relate to specific objectives of the management approach. An assessment of *Spartina* population distribution and/or density determines the specific type of management response to be undertaken at each site. The following action levels are used by the agencies responsible for *Spartina* control in Washington State to prioritize *Spartina* management activities.

- **Eradicated** – These are sites where no regrowth has been found for at least the past three years. These sites are the highest level of importance with the focus being prevention of reinfestation.
- **Monitor** – These are sites of previous infestation where no regrowth or infestation has been found during the past season. This is the second highest level of importance. The focus of these sites is to continue to survey and remove any regrowth that may occur.
- **Eradication** – The site will be controlled with the focus being eradication. This is the third highest level of importance. The focus of these sites is to continue successful control work and progress toward monitor status.
- **Seed Suppression** – These are sites, which for a number of reasons, eradication at this time may not be feasible. This could be due to the size, location, or lack of available control tools. Best efforts are taken to suppress seeds at these sites as time and resources allow.

Cooperation and coordination between agencies continues to be an essential element of effective *Spartina* control and eradication efforts. Coordinating *Spartina* management efforts, on a regional basis, results in more effective control of *Spartina* than individual entities could accomplish working alone. In addition, regional coordination of *Spartina* eradication activities increases harmony amongst partners and promotes a positive perception by the public with regard to how public agencies address environmental issues. Volunteers and volunteer monitoring programs continue to play a critical support role in the overall IWM program.

### **Permitting**

The NPDES permit for aquatic noxious weed control is currently under litigation. At this time, WSDA plans to continue extending coverage for *Spartina* control to its partners. If this changes due to the current lawsuit, this management plan will be modified to reflect any changes made.

## Public Notification

WSDA will conduct a thorough public notification campaign beginning in the spring of 2005 and continuing throughout the treatment season. The campaign will consist of several components. First, during the spring, WSDA will send a mass mailing, consisting of informational letters and fact sheets, to all shoreline residents in areas where herbicide treatments will be conducted. Second, WSDA will publish legal notices in the Washington State Register. Third, a participating agency will post public notices. The notices will be posted at any public access point one half mile from any treatment site. Public access points are listed in the Washington Public Shore Guide, published by the Washington State Department of Ecology.

## Funding

**Table 1. State Budget Activity by Area – FY04 and FY05**

Activity	Puget Sound/Oly. Peninsula		Willapa Bay		Total	
	FY04	FY05	FY04	FY05	FY04	FY05
<sup>1</sup> WSDA Coordination and control activities	\$181,517	\$181,518	\$181,518	\$181,518	\$363,035	\$363,036
<sup>2</sup> Large-scale cost share and IPM	0	\$33,000	\$180,774	\$468,386	\$180,774	\$501,386
<sup>3</sup> 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			\$60,000	\$60,000		
- Other	\$5,000	\$5,000	\$5,000	\$5,000		
<b>Total WSDA Budget</b>	<b>\$336,517</b>	<b>\$369,518</b>	<b>\$427,292</b>	<b>\$714,904</b>	<b>\$763,809</b>	<b>\$1,084,422</b>
<sup>4</sup> Other Operational WDFW WDNR	\$113,284	\$84,915	\$172,755	\$141,425	\$286,039	\$226,340
			\$291,000	\$291,000	\$291,000	\$291,000
<b>TOTAL</b>	<b>\$449,801</b>	<b>\$454,443</b>	<b>\$891,047</b>	<b>\$ 1,147,329</b>	<b>\$ 1,340,848</b>	<b>\$ 1,601,762</b>

**Notes for Table 1:**

1. WSDA Coordination and Control Activities: These expenses include program coordination and control cost including salaries and benefits, travel, attorney fees, public notification expenses and other goods and services.
2. Large-scale cost share and IPM: These are the costs of aerial applications to approximately 2,300 acres (three sites) in Willapa Bay and cost-share to oyster growers for ground application. Includes additional one-time funding of \$85,00 for 2004 control season.
3. Purchased Services: WSDA has written two-year Interagency Agreements with Skagit, Island and Snohomish counties, an Interagency Agreement with WDFW to conduct work in Pacific County, and an Intergovernmental Agreement with the Swinomish Tribal Community to conduct work on its property in Skagit County.
4. These figures represent the *Spartina* eradication operational funds available to the Washington Department of Fish & Wildlife and the Washington Department of Natural Resources. This funding is separate from WSDA's *Spartina* funding.

The budget table does not include the amount of funding provided by the USFWS for eradication activities. USFWS reports it received \$956,713 for the 2004 control season.

## Summary of Statewide *Spartina* Eradication Activities

There are ten counties in western Washington with one or more infestation of *Spartina alterniflora*, *Spartina anglica*, *Spartina densiflora*, or *Spartina patens*. This includes Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Pacific, San Juan, Skagit and Snohomish counties. These infestations are equivalent to approximately 7,500 to 7,800 solid acres of *Spartina* (if all populations were one contiguous meadow) and are spread over more than 25,000 acres of intertidal mudflats. All but approximately four solid acres are located in Pacific, Snohomish, Island and Skagit counties. Table 2 summarizes the statewide control effort by county and year for the past eight years.

**Table 2. Acres of *Spartina* Treated in Washington State – 1997 through 2004**

County	<i>Spartina</i> Present at Start of 2004	<i>Spartina</i> Treated, 1997 - 2004		2004 Treatment Methods
Pacific (Willapa Bay)	~ 7,000 solid acres spread over > 18,000 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. 1,804 solid acres '03 – approx. 6,000 solid acres <b>'04 – approx. 5,700 solid acres</b>	Mow/herbicide, herbicide, seedling removal, various mechanical controls
Snohomish	Approx. 370 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 '03 – approx. 343 solid acres <b>'04 – approx. 350 solid acres</b>	Mow/herbicide, herbicide, seedling removal, dig, mechanically crush, mow
Island	Approx. 250 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. 300 solid acres '03 – approx. 325 solid acres <b>'04 – approx. 164 solid acres</b>	Mow/herbicide, herbicide, seedling removal, mechanically crush, mow
Skagit	Approx. 24 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 '03 – approx. 26 solid acres <b>'04 – approx. 13.5 solid acres</b>	Mow/herbicide, herbicide, seedling removal, dig, mow
Grays Harbor	Scattered clones and seedlings 2.8 acres in size	'97 - all treated '98 - all treated '99 - all treated	'00 – all treated '01 – all treated '02 – all treated '03 – all treated <b>'04 – all treated</b>	Herbicide, seedling removal, mow
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 '03 – all treated twice <b>'04 – all treated twice</b>	Mow, mow/herbicide, dig, seedling removal

Jefferson	14 infestations – approx. 0.01 solid acres total	'97 - all treated '98 - all treated twice '99 - all treated twice	'00 – all treated three times '01 – all treated three times '02 – all treated three times '03 – all treated twice	Mow, mow/herbicide, dig, seedling removal
		<b>'04 – all treated twice</b>		
Clallam	1 infestation < 0.001 acres in size	'97 - treated twice '98 - treated three times '99 - treated twice	'00 – treated four times '01 – treated four times '02 – treated four times '03 – treated three times	Dig
		<b>'04 – all treated twice</b>		
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 '03 – all treated twice	Dig
		<b>'04 – all treated twice</b>		
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 '03 – all treated	Survey, dig
		<b>'04 – all treated twice</b>		

### **Willapa Bay Status**

The Willapa Bay *Spartina* control effort has seen continued success in 2003 and 2004. In 2003 over 6,000 solid acres were treated and over 5,500 in 2004. The 2003 treatments resulted in over 1,500 acres of overall reduction. The results for the 2004 treatment season have not yet been evaluated. Monitoring data will be collected during the spring of 2005 to determine the level of reduction gained from the 2004 season. WSDA estimates the amount of *Spartina* remaining at the beginning of the 2004 season at 7,020 solid acres.

### **Grays Harbor Status**

Grays Harbor landowners and managers continue to be concerned about potential large-scale invasion of *Spartina* due to the magnitude of the problem in Willapa Bay. Surveys of Grays Harbor in 2004 continued to find small *Spartina* infestations, with the largest being approximately 50 square feet. WDFW treated all known *Spartina* infestations in Grays Harbor in 2004.

### **Puget Sound and Hood Canal Status**

The estimated area of *Spartina* within Puget Sound and Hood Canal in 1997 was approximately 1,000 solid acres spread over more than 8,000 acres. Estimates compiled during the 2004 control season by WSDA and partners indicated the solid acres of *Spartina* had been reduced to approximately 645 or by 35% since 1997. WSDA and partners continued to reduce small outlier infestations with chemical controls and utilized mechanical controls for reducing solid meadows. Specific accomplishments by county are summarized below.

### Snohomish County

In total, 350 solid acres of *Spartina* were treated in Snohomish County in 2004. For the second consecutive season, all meadows in Southeast Skagit Bay, Leque Island and Mystery Island were treated in their entirety. These sites are home to three of the largest infestations in Puget Sound and account for about 65% of the total infestation. The treatments were made possible through the successful cooperative efforts of WSDA, WDFW and Snohomish County. The combined size of these three infestations is approximately 280 solid acres. This constitutes about 80% of the overall infestation in Snohomish County.

### Island County

In total, 164 solid acres of *Spartina* were treated in Island County in 2004. In one of the great success stories in Puget Sound, Livingston Bay, estimated at 100 solid acres in 1999, has been reduced to 4.5 solid acres. This reduction of 95% was the result of six successful years of treatment, including 2001 when herbicide use was not allowed. WDFW and WSDA continue to focus on the infestations in Triangle Cove (65 solid acres) and Emerick/Price meadow (60 solid acres) using mechanical control tools.

### Skagit County

All known *Spartina* infestations in Skagit County, excluding a sizeable infestation on Swinomish tribal land, were treated in entirety. Many sites are now being maintained free of *Spartina* through surveys and seedling digs.

### Clallam, Jefferson, Kitsap, King and San Juan counties

With the exception of tribal lands, all known *Spartina* infestations within Clallam, Jefferson, Kitsap, King and San Juan counties were treated in 2004. With the exception of tribal lands, all sites are nearing eradication and can be maintained that way with yearly surveys and control. Two out of four sites in San Juan County previously infested with *Spartina* are now considered eradicated (five consecutive years without *Spartina*).

## **Planned 2005 *Spartina* Control Efforts**

### **Willapa Bay**

WSDA, WDFW, DNR and USFWS will continue to conduct a large-scale IPM program, utilizing a combination of mechanical, herbicide, physical and biological control tools. The majority of the mechanical control work will focus on reducing seed set and preparing the infestations for chemical control. Mechanical control techniques are also being tested for potential use in restoration activities to large meadows that have been successfully reduced. The herbicide applications will take place in two basic forms, broadcast application, both ground based and aurally based, and hand held applications.

The broadcast applications will focus on large meadows and solid infestations, while the hand held applications will focus on scattered regrowth and clone fields.

The overall effort will attempt to treat approximately 95% of the infestation in Willapa Bay during the 2005 season. The overall goal is to ensure follow up treatments on all infestations treated during the 2003 and 2004 season and conduct initial treatments on all remaining infestations in the bay.

### **Grays Harbor**

WDFW and WSDA staff will survey the entire bay and work to eradicate any infestations found. WDFW will monitor all previously treated infestations and work to eradicate any regrowth. Eradication work will include chemical and mechanical treatments depending on the size of infestations.

### **Snohomish, Island and Skagit counties**

Control efforts in these counties will consist of both mechanical and chemical treatments. In 2005, agencies will chemically treat as much of the mechanically treated infestations as time and money allow. The effort will again mount a two-pronged approach, focusing both on eradicating the small outlier infestations and continuing to reduce the large meadows in South Skagit Bay and Triangle Cove. The agencies will continue to mechanically control infestations to prepare for additional chemical treatments in 2006. In addition, biological control agents will likely be released at several sites.

### **San Juan County**

The San Juan County Noxious Weed Coordinator will conduct surveys of all previous known infestations and will manually remove all regrowth, if possible. WSDA and San Juan County will conduct a countywide survey as time and money permit.

### **Clallam, Jefferson, Kitsap and King counties**

WSDA staff will monitor all known infestations in these counties a minimum of once a month. All regrowth will be manually removed or treated mechanically. WSDA staff will also survey as many possible infestation sites in these counties as time allows. Surveys will also take place in Mason, Thurston, and Pierce counties.

## **Monitoring**

### **Willapa Bay**

The Willapa Bay *Spartina* monitoring program will continue, building on the 2003 and 2004 efforts. The monitoring program allows managers to understand the effectiveness of treatment methods at different sites and then use that information, along with acres treated, to determine how much *Spartina* was killed each year. It also provides information about how effective the overall control approach is, as well as effectiveness

of individual treatments. Data generated from the program are also used for adaptive management purposes-to improve and make future adjustments to the control strategy.

Monitoring sites are 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. The sampling sites are chosen each year to reflect the overall eradication program in Willapa Bay. To date, the sampled sites include the following:

<u>Site</u>	<u>Treatments</u>
Stanley Point	Crushed winter 2002/spring 2003, sprayed 2003, 2004
Willapa River	Crushed summer 2001, 2002, 2003, sprayed 2004
Chetlo Harbor (Naselle River)	Crushed winter 2001 and fall 2002, sprayed 2003, 2004
Stoney Point	Crushed fall 2002, sprayed summer 2003, 2004
Disney Property	Crushed fall 2002 and 2003, sprayed 2004
Rose Ranch	Crushed winter 2002 and spring/summer 2003, 2004, sprayed 2004
Nahcotta	Crushed summer 2002 and summer 2003, no control 2004
Oysterville	Hand-held spray, summer 2002, 2003, 2004
Porters Point	Ground broadcast spray, summer of 2002, 2003, 2004
Tarlatt Slough	Ground broadcast spray, summer 2003, 2004, crushed winter 2005

For specific collection methods and sampling procedures please contact WSDA for the Willapa Bay monitoring protocols.

### **Puget Sound**

The Puget Sound monitoring plan utilizes the same monitoring protocol as is used in Willapa Bay. Monitoring is also conducted through fixed photo points, as well as color infrared photography taken every three years. The sites were the most consistent monitoring as occurred in Puget Sound includes the following;

<u>Site</u>	<u>Treatments</u>
Triangle Cove	Crushed 2002, 2003 and 2004
South Skagit Bay	Various applications 2002 – 2004
Price/Emericks	Ground broadcast spray 2002, crushed 2003, 2004

## Conclusion

Cooperation and coordination between agencies continues to be the essential element for effective *Spartina* control and eradication efforts. Coordinating *Spartina* management efforts on a regional basis will achieve more effective control of *Spartina* than individual entities can accomplish. The past strategy was intended to produce results that would allow for realistic cost figures and a better understanding of efficacy of individual treatments. These data and information were then used to hone and develop the 2003 Statewide *Spartina* Integrated Weed Management Plan. The lessons learned in each subsequent season have allowed for the development of this plan to its current form. The current control strategies rely more heavily on mechanical control to serve as both a primary treatment tool as well as a preparatory tool used to increase efficacy of herbicide applications. In addition, the agencies' cooperative work across ownership boundaries will continue to serve as a model to address *Spartina* management on a landscape level, one that transcends traditional weed and resource management boundaries.

Through continued cooperation, coordination and local involvement, *Spartina* management will continue to be successful in Puget Sound, and in Willapa Bay this approach will result in the continued reduction in the bay wide infestation during the 2005 treatment season.

## **Signatory Page**

I certify under penalty of law, that this document and all attachments were prepared under my direction, or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiries of the person or persons who manage the system, or those persons directly responsible for gathering information, in information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

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**Brad White**  
**Pest Program Manager**