



**People For Puget Sound
Regional *Spartina* Survey and Inventory Program
Northwest Straits Commission Final Report: June 30, 2010
D.O. E. Contract # C1000086**

Prepared by:

**Rachel Benbrook, *Spartina* Survey Program Coordinator
Keeley O'Connell, Restoration Ecologist**

Introduction:

This final report describes the results of the July 2009-June 2010 season of People For Puget Sound's *Spartina* Survey Program, which was supported in part by a generous grant from the Northwest Straits Commission. People For Puget Sound has been working to support the Washington State Department of Agriculture and the diverse array of local controllers in efforts to eradicate invasive *Spartina* grasses from Puget Sound shorelines. Among this network, surveys have repeatedly been identified as the most important element that can be added by a citizen-based organization. People For Puget Sound's citizen-science led *Spartina* surveys are conducted by volunteer sea kayakers, as kayaks are especially suited to access the shallow, hard to access areas that are most difficult to survey by traditional means. Volunteer kayakers surveyed over 103 miles of shoreline in the 2009 survey season, locating 198 square meters of *Spartina* in four North Sound counties.

There are four species of invasive *Spartina* in Puget Sound, with *S. anglica* by far the most widespread; it has been found in all North Puget Sound counties as well as British Columbia. *Spartina anglica* is an invasive, salt-tolerant grass that was introduced to the Puget Sound in 1961 for erosion control and cattle forage. It spreads rapidly into a variety of shoreline habitats, including mud flats, marshes, and cobble and sand beaches. Once established, it rapidly displaces native vegetation and disrupts shellfish habitat and shorebird and salmon foraging areas. After over a decade of aggressive control, all major infestations have been identified and controlled. Surveys are increasingly important to locate scattered clones that represent seed-sources for potential re-infestation of the region.

This final report will describe the *Spartina* Survey Program work completed from July 2009-June 2010, and the progress made on two contractual tasks: 1) Recruit and train volunteers, and 2) Manage and disseminate survey data. We will also review the outreach efforts and program development that was accomplished over the past year. This program has been evolving and adapting to changing needs for almost a decade, and continues to change to fill new niches in the statewide *Spartina* eradication effort. The last year saw great new strides in developing partnerships in the NW Straits region and beyond. People For Puget Sound is working with partners in British Columbia, Canada to support burgeoning efforts to develop a citizen science kayak survey program on the shorelines of the Georgia Strait. The growing infestation in B.C. is one of the most insidious threats to Washington's successful eradication efforts, and People For Puget Sound is one of the few entities addressing it.

Review of Program Tasks and Results:

TASK 1) RECRUIT AND TRAIN VOLUNTEERS

This grant period of July 2009-June 2010 encompasses the entire recruitment and training process of summer 2009, as well as the off-season efforts and initial recruitment and early training sessions of winter, spring and early summer 2010. One of the first steps is to get in contact with the regional *Spartina* Controllers and determine where the priority shorelines for survey are located. This occurs in cooperation with the Washington State Department of Agriculture (WSDA) Puget Sound *Spartina* Coordinator, county Noxious Weed Control offices, tribal Natural Resource Departments, and any other local controllers. This information is used to inform targeted recruitment efforts. Once the known

priority areas are determined, volunteer recruitment in these areas can proceed. In 2009 and 2010, program staff recruited volunteers through presentations to WSU Beach Watchers and regional kayaking groups, by networking with local kayak clubs, and by posting program flyers and posters throughout the region. Program materials were also distributed to sea kayak outfitters, rental and guide companies, and outdoor-oriented retail businesses throughout the Puget Sound region. Additionally, the Program Coordinator attended the 2009 West Coast Sea Kayak Symposium in Port Townsend and conducted a slide presentation about the *Spartina* Survey Program to about 150 paddlers.

Training and program announcements were distributed through: Whatcom Association of Kayak Enthusiasts (WAKE), Hole In The Wall Kayak Club (HITW), Washington Kayak Club, Washington Water Trails Association, Olympic Peninsula Paddlers, and the WSU Beach Watchers in Skagit and San Juan Counties. Recruitment flyers were also posted throughout the county at locations frequented by paddlers. Additionally, program announcements were sent to the following publications: San Juan Islander, San Juan Journal, Island Weekly, Islands Sounder, Bellingham Herald, Cascadia Weekly, Ferndale Record Journal, Northern Light, Skagit Valley Herald, Anacortes American, Whidbey News Times, Whidbey Examiner, South Whidbey Record, and Western Front. Recruitment efforts in 2010 were stepped up a notch with the acceptance of a multi-page article with color photos that appears in the Summer issue of *WaveLength Magazine*, released in June 2010 (see Appendix 1). *WaveLength* is a quarterly publication that distributes 24,000 copies over 600 distribution points in two countries, mainly from California to British Columbia. This article will bring information about the survey program and the invasive *Spartina* to a broader audience than ever before.

Survey Training

Volunteer kayakers attended one of nine training sessions that were conducted around North Puget Sound in 2009. One training session and one outreach paddle have been conducted so far in the 2010 survey season. Volunteers received formal training from the project coordinator that included information about *Spartina*, proper survey and identification techniques, and kayak safety guidelines. Each volunteer was given a packet which included all the necessary forms and guidelines to conduct surveys, including the "Identifying *Spartina* in Puget Sound and Georgia Basin" laminated ID cards with detailed instructions on how to identify the plant. Surveyors were also provided with ziploc bags for



Photo 1: A volunteer records data on a clone during a *Spartina* Survey Training at Coronet Bay, Island County.

storing leaf and stem samples of any potential *Spartina* specimens that needed to be verified by the project manager. For a detailed look at the training agenda, see Appendix 2.

Surveys were conducted during a daylight tidal window of a +3 to a +7 tide to maximize *Spartina* exposure. Surveyors recorded the latitude and longitude of any *Spartina* infestations using a Garmin 60csx GPS unit (standard unit used in field surveys of this type) and entered this data onto the

inventory forms. They also recorded additional relevant information that could aid in location and removal- including estimated patch size, dominate substrate, presence of other vegetation, and other descriptive information. Water-based surveyors were encouraged to beach their craft and proceed on foot whenever possible, however, the project manager has determined with field trials that surveys can be completed successfully from the watercraft when carried out at the appropriate tidal height.

Priority shorelines in each county were identified with input from each of the County Noxious Weed coordinators, WSDA *Spartina* program coordinator and other *Spartina* controllers, and are listed in Figure 1. This figure also identifies the program partners that assisted with prioritizing shorelines, recruiting volunteers, and conducting trainings and surveys.

FIGURE 1: PRIORITY SHORELINES AND PROGRAM PARTNERS, 2009 SURVEY SEASON

Island County	<ul style="list-style-type: none"> •Priority Shorelines: W. shore Whidbey Island, Coronet Bay and Ben Ure Island •Partners: WSU Beach Watchers, Whidbey Island Sea Kayakers (WISK), Island Co. Noxious Weeds , Deception Pass State Park
San Juan County	<ul style="list-style-type: none"> •Priority Shorelines: Fisherman's Bay, Lopez Island •Partners: WSU Beach Watchers, San Juan Co. Noxious Weeds, Whale Museum K.E.L.P. Program
Skagit County	<ul style="list-style-type: none"> •Priority Shorelines: W. Fidalgo Island, N. Swinomish Channel Islands, Cypress and Guemes Island •Partners: WSU Beach Watchers, Skagit Co. Noxious Weeds, Skagit MRC, Hole In The Wall Kayak Club, Swinomish Tribe, Trust For Public Lands
Whatcom County	<ul style="list-style-type: none"> •Priority Shorelines: Chuckanut Bay, Red River Delta, Nooksack Delta •Partners: Whatcom Co. Noxious Weeds, Skagit MRC, Whatcom Area Kayak Enthusiasts, Lummi Nation, Swinomish Tribe
Statewide & International	<ul style="list-style-type: none"> •Partners: Washington State Department of Agriculture, Washington Invasive Species Council, Washington DNR, NOAA/Restore America's Estuaries, BC <i>Spartina</i> Working Group, Ducks Unlimited, B.C.

Table 1 on the following page describes the volunteer contribution and the results from the 2009 and early 2010 survey seasons. To date we have exceeded the contractual project goals, as this data illustrates. In 2009, program staff recruited 36 sea kayakers and an additional 6 non-paddling volunteers that assisted with *Spartina* removal events and other non-water based program needs. Program volunteers in 2009 contributed a total of 358 hours valued at \$5607. Preliminary results from 2010 add an additional 15 volunteers and 42.5 volunteer hours- bringing the value of volunteer contribution for the program up to \$6310. For a detailed look at survey routes, see Survey Coverage 2009 data in Appendix 3 .

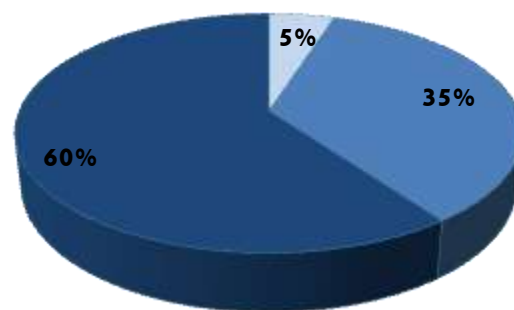
TABLE 1: VOLUNTEER CONTRIBUTION AND SURVEY RESULTS BY COUNTY

County	Volunteers (#)	Volunteer Hours	Miles Surveyed	<i>Spartina</i> Found (m ²)
Island	14	92.5	10.7	126.7
San Juan	4	54	15.5	3
Skagit	11	139	43.9	58.5
Whatcom	7	53.5	35	10.3
2010, Preliminary	15	42.5	10.4	5.6
Total:	51	381.5	115.5	204.1

In 2009, volunteers have surveyed over 105 miles of Puget Sound shoreline, which is nearly double the distance surveyed by program volunteers and staff in 2008. During these surveys, approximately 200 square meters of *Spartina* was identified. Many of these clones were previously unknown- including a large infestation on the Dredge Islands at the North entrance of the Swinomish Channel in Skagit County, and a cluster of clones in the Nooksack River Delta in Whatcom County. These areas are very shallow and challenging to access by traditional means. Discoveries such as these demonstrate the importance of having paddlers involved in survey efforts- we can easily access some of the most difficult areas to survey by motorboat or foot. It is also important to note that 60% of the survey miles logged in 2009 were conducted by trained volunteer citizen science efforts. The other 40% of the data was collected during staff-led Survey Trainings or *Spartina* Paddles.

FIGURE 2: 2009 SURVEY MILEAGE CONTRIBUTION

■ Survey Training ■ *Spartina* Paddle ■ Volunteer Effort



The 2010 survey season is already underway! To date, two *Spartina* Paddles and one Survey Training have taken place, resulting in an additional 10.4 miles of shoreline surveyed and 5.6 square meters of *Spartina* located. Already 15 new volunteers have been recruited, and 2011 is shaping up to be another productive survey year.

Outreach Activities

Outreach activities in 2009 included presentations at WSU Beach Watchers and regional kayaking groups. Additionally, program flyers and posters were posted throughout the region at launch sites, marinas and other locations frequented by paddlers. Program materials were distributed to sea kayak outfitters, rental and guide companies, and outdoor-oriented retail businesses throughout the Puget Sound region, including the "Identifying *Spartina* in Puget Sound and Georgia Basin" laminated ID cards. These cards were also circulated around the region to controllers, stakeholders, user groups, and the general public.

A new partnership developed in 2009 with the Whale Museum on San Juan Island's Kayak Education and Leadership Program (KELP). KELP's mission is to outreach to kayakers launching at San Juan County Park and other regional sites about how to respect the habitat and space of the regions resident Orcas. During Summer 2009, *Spartina* Survey Program information was distributed to paddlers along with Whale Museum outreach materials.

Targeted outreach to the paddling community occurred at the West Coast Sea Kayak Symposium in Port Townsend. Similarly, the restoration and scientific community was targeted when People For Puget Sound presented a poster demonstrating the results of the last three years of kayak surveys in the North Sound at the 2009 Northwest Straits Commission Annual Conference in Bellingham in November. Looking forward, 2010 is looking to present some exciting new developments in program outreach. With the release of the Summer 2010 *Wavelength Magazine*, this program has greater publicity than ever before. Also, both a poster and an oral presentation about the program have been accepted at the 2010 Restore America's Estuaries International Conference in November in Galveston, TX.

On August 16, People For Puget Sound conducted a small Dig Day at Kiket Island in Skagit County and removed about 15 square meters of *Spartina* from the Kiket Lagoon and the beach nearby. This island and tidal lagoon is set to become a part of Deception Pass State Park soon, and was a known site of *Spartina* infestation. Program staff worked in partnership with The Trust For Public Lands in order to get access to the site, which was still in private ownership at the time. Six volunteers participated in the Dig Day, including the Skagit County Noxious Weeds Aquatic Invasives Specialist- who donated the use of a county van for the day. A few short hours of work and all the *Spartina* clones were removed from the lagoon and nearby beach.



Photo 2: Volunteers and Skagit County Noxious Weeds staff at the Kiket Island Dig Day in August 2009.

TASK 2) DATA MANAGEMENT

The Program Coordinator entered all data into a *Spartina* Inventory Form and used GPS coordinates of survey coverage and *Spartina* locations to create GIS survey maps (see Appendix 4). Ultimately, maps were produced for all counties surveyed and additionally for heavily infested areas. Survey results from each county were provided to the local Noxious Weed Control Board staff, WSDA Puget Sound *Spartina* Program Coordinator, and any other stakeholders. The project manager is a member of the Puget Sound *Spartina* Task Force, and the surveying effort has been coordinated with WSDA throughout the planning and implementation of the program. County Noxious Weed Board staff received details of the infestations and survey results and coverage maps for their area. Control of any *Spartina* found during the surveys is the responsibility of the local Noxious Weed Control entity or other agency or organization determined to be the lead entity. People For Puget Sound is in some cases able to play a watchdog role within the controller network, helping be sure that scattered infestations are controlled and monitored effectively.

This year, program staff also continued to collaborate with Canadian partners to establish a similar survey program along British Columbia's shorelines. Cross-border cooperation is essential for Washington's eradication effort to be successful. *Spartina* seeds drift readily throughout the Salish Sea on our active currents, and British Columbia's growing *Spartina* problem presents a real risk of re-infestation to the Puget Sound. Newly discovered clones in the Nooksack and Red River Deltas, surveyed by kayakers in 2008 and 2009, are likely the first examples of *Spartina* re-infestation caused by cross border drift. Whatcom County was previously considered *Spartina*-free. Funding for *Spartina* monitoring and control is extremely limited in B.C., and volunteer-driven programs have the potential to be especially effective. At a meeting in Surrey, B.C. in February 2010, People For Puget Sound staff met with representatives from the B.C. *Spartina* Working Group, a consortium of conservation groups that is spearheading volunteer efforts in the province. We were able to provide insight and advice from three years of successful kayak surveys, and made plans for further collaboration to help get citizen science survey efforts off the ground in B.C. A recent communication with these partners confirms that these plans will come to fruition and paddlers will be on the water this summer conducting *Spartina* surveys along the lower B.C. mainland coast.



Photo 3: Volunteers record GPS coordinates for *Spartina* clone in the Nooksack Delta, Whatcom County.

Also attending at this meeting was the Director of the Community Mapping Network in British Columbia, an online Canada-wide resource for habitat and inventory mapping and data entry. As part of our collaboration with these partners, the Community Mapping Network will create a custom interface for use by People For Puget Sound surveyors. Volunteers will be able to view interactive maps of priority shorelines for survey, determine which in their area need to be covered, and then enter in their data once the survey is complete. This is an exciting opportunity to gain access to innovative online tools that People For Puget Sound has lacked the funding and capacity to build in-house.

People For Puget Sound *Spartina* Survey Program staff also participated in some noteworthy regional gatherings. We have shared several years worth of survey and removal data with the Washington Invasive Species Council (WISC), who are conducting a baseline assessment and management framework for 15 priority invasive species in Washington State, including *Spartina*. The *Spartina* Survey Program Coordinator has been invited to participate in a series of Expert Work Sessions on Marine Invasives, to provide feedback to WISC as this process develops. People For Puget Sound's data and expertise continues to be recognized among the myriad institutions involved in the fight against *Spartina* and other marine invasives. Program staff also attended the 2010 meeting of the Puget Sound *Spartina* Task Force, the only comprehensive gathering of sound-wide controllers. This meeting provided lots of useful information to inform priority shorelines for 2010 and beyond.

Conclusion:

Thanks in part to the generous support of the Northwest Straits Commission, People For Puget Sound's *Spartina* Survey Program has been able to continue to successfully supported the WSDA's eradication efforts by spearheading citizen science involvement in shoreline surveys. In 2009 and early 2010, Volunteer kayakers surveyed over 115 miles of shoreline and identified 204 square meters of invasive *Spartina*. Paddlers provided valuable data on previously unknown infestations in Island, Skagit, and Whatcom Counties.

People For Puget Sound has consistently adapted this program to fit the needs of the eradication effort. In 2009 and 2010, we have continued to do so by working towards building new partnerships in British Columbia to support fledgling efforts to use citizen scientist-trained kayakers to gather data on the growing *Spartina* infestation across the border- a significant threat to Washington State's nearly successful eradication effort. *Spartina* Survey Program staff have conducted outreach presentations to hundreds of paddlers and other citizens, and new publicity in 2010 means that program information is getting out to a much larger audience than ever before. We could not have provided this support to the Washington State Department of Agriculture and other Puget Sound *Spartina* Task Force members without this funding from the Northwest Straits Commission- thank you for this support!

APPENDIX 1: WAVELENGTH MAGAZINE ARTICLE

Conservation/Ecology

By Rachel Benbrook

Volunteer kayakers survey Puget Sound and British Columbia for invasive grasses

ALONG THE BEACHES and bays of North Puget Sound a special group of sea kayakers is navigating local waters to gather valuable data in a program helping to build connections between scientists and citizens.

The end result is helping researchers tap into a vast and knowledgeable volunteer base. Consider it citizen science for kayakers: the Seattle-based non-profit environmental organization People For Puget Sound has been working with volunteer sea kayakers since 2007 by training paddlers to conduct shoreline surveys for non-native *Spartina* grasses. These invasive grasses have spread steadily all over the Pacific Northwest over the last half a century and have been found locally throughout Puget Sound and into British Columbia.

Paddling with a

There are four species of invasive *Spartina* found in Washington State. *Spartina anglica*, English cord-grass, is by far the most prevalent in Puget Sound, where it was introduced in the 1960s for dike stabilization. It aggressively displaces native vegetation, disrupts shorebird and foraging areas for juvenile salmon, and impacts shellfish habitat. *Spartina* grows in a variety of tide-influenced locations, such as mudflats, salt marshes and sand or cobble beaches. The seeds are known to be dispersed widely by the active currents of Puget Sound. Washington state has spent millions in the quest of eradication, and after over a decade of aggressive treatment all major *Spartina* infestations have been controlled. At this point, surveys are of critical importance to ensure that all potential seed sources for re-infestation are located and eliminated.

This is where People For Puget Sound's network of volunteer sea kayakers are helping. Volunteer kayakers have made a significant contribution to the statewide effort to eradicate this dangerous invasive weed from the beaches, bays and salt marshes of North Puget Sound. Trained citizen scientists participating in People For Puget Sound's *Spartina* Survey Program have surveyed 319 kilometres of shoreline across four counties, and have identified



A volunteer scans the Nooksack River Delta in Whatcom County, WA, for *Spartina*.

almost 450 square metres of *Spartina*, much of it previously unknown. Volunteers use GPS units to record where they surveyed and the location of any *Spartina* they find. Program staff then process and map the data and share it with state and local *Spartina* controllers. Approximately 95 percent of the *Spartina* located by volunteer kayakers has been successfully treated and is no longer a threat to the marine environment.

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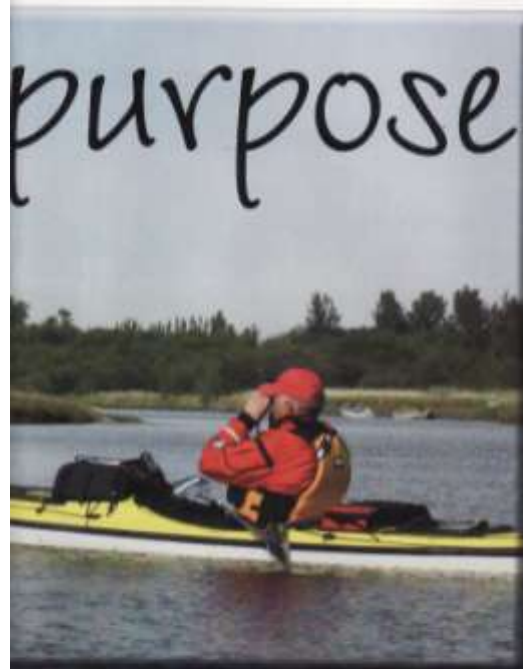
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Who to contact**Puget Sound Volunteers**

Contact: Rachel Benbrook, People For Puget Sound

Web: www.pugetsound.org/sound-spotlight/spartina-kayak

Email: Spartina@pugetsound.org

Phone: (206)882-7007

British Columbia Volunteers

Contact: Claire de la Salle, Ducks Unlimited Canada

Web: spartina.ca

Email: c_delasalle@ducks.ca

Phone: (604)315-7449

Since 2007, People For Puget Sound has trained over 75 volunteer kayakers who have contributed almost 800 hours of their time to attend trainings and get out on the water in search of *Spartina*.

"I love kayaking and I love doing good work in the world," says Mira Jean Sternbecher, a survey volunteer since 2008. "Hunting the dreaded *Spartina* grass gives me the opportunity to do both at the same time. It's also great to get out on the water with people I don't know well, to make new connections, [and] to find fellow paddlers. It's a kind of networking and fellowship that makes my world a bigger and a better place."

Spartina surveys also get paddlers out into waters they might not otherwise choose to explore. Shorelines are selected for survey at the beginning of the year based on input from state and local *Spartina* controllers, and volunteers are asked to paddle some of these priority shorelines in their area. Kathleen Murphy, a volunteer who has surveyed over 50 miles, appreciates how surveying gets you out on waters and along shores that are not your usual destination. "This kind of paddling, in marinas and along city shores, is unique and beautiful in its own way – an unexpected delight."

Others appreciate the pace and focus of surveying. "For those paddlers who like to savor the nooks and crannies of our waterways, this is a perfect activity," says volunteer Jeanine Pechar.

Volunteers are needed for 2010 to help with *Spartina* surveys in the Puget Sound



Surveying the winding channels of Skagit Bay near La Conner, WA, in search of *Spartina* (shown below).



region and even in British Columbia, where all four invasive *Spartina* species are known to occur. Unfortunately there is little government funding to deal with eradication, so the BC *Spartina* Working Group, a consortium of regional conservation groups, has stepped in to fill the void. Little is known about the extent of the infestation in BC, and more surveys are desperately needed.

Training sessions for interested sea kayakers will be scheduled by both the People For Puget Sound and the BC *Spartina* Working Group. It's a chance to use time on the water to paddle with a purpose: to protect and restore the beautiful shorelines of Puget Sound and the B.C. Coast.

Rachel Benbrook is the *Spartina* Survey Program Coordinator with People For Puget Sound. She has been recruiting and training volunteer kayakers to conduct surveys since 2008, and has personally paddled over 100 miles in search of *Spartina* grass. She lives on Guemes Island outside of Anacortes, WA.

APPENDIX 2: SURVEY TRAINING AGENDA

Training Schedule:

Allow 15-20 minutes of wiggle room for folks to arrive and, if necessary, get boats unloaded before beginning

- I. On-land training components (Approx. 45 minutes)
 - i.) Welcome and Thank Yous to volunteers, introduction to People For Puget Sound and supporters for the program (including NWSC)
 - ii.) What will this training cover?
 - what is *Spartina*, why are we doing surveys, why are we using kayaks, kayak safety, survey protocol and GPS use, survey trip planning, and pick your survey routes
 - iii.) What is *Spartina*-
 - Invasive salt dependant grass found on Puget Sound beaches
 - Imported from Europe in 1960's to be used for dike stabilization by farmers (before any regulations existed and knowledge of damage caused by introducing non-native species)
 - Originally planted in Snohomish County in Stanwood area- this is the area of largest infestation still today
 - It's been found in all N. Sound counties plus Kitsap, Clallam, Jefferson and King. Also found in BC in Boundary Bay, both sides of Pt Roberts and east side of Vancouver Is.)
 - It's highly adaptable to a variety of habitat types and conditions found in Puget Sound- found in mudflats, native marshes, sand, cobble, and silt beaches, found growing out of riprap. Not found on rocky headlands, but can be in small pocket beaches nestled between stretches of rocky shores
 - Grows via special roots (called rhizomes) and through seed production- these seeds can travel throughout Puget Sound on currents
 - Outcompetes native marsh vegetation (proper food and habitat resources for our native wildlife), displaces important economic shellfish like clams, mussels, and oysters, grows over and destroys important forage fish (surf smelt and sand lance) spawning habitat on fine sediments at upper portion of intertidal beaches
 - Class B designated on the State noxious weed list- requires control by law. This applies to homeowners and can potentially lower property values if not controlled.
 - One of only four noxious weeds in the state that receives federal funding for control and eradication (out of over 300 noxious weeds statewide)
 - Generally found growing between the rockweed and the driftwood, i.e. on the beach itself.
 - Tips to ID: grass (not rush or sedge or broadleaf), grayish- yellow green, rough/scratchy relatively short leaves coming off stem at 45-90 degrees, doesn't blow in the wind much, hairy ligules (explain and demonstrate), circular clones or individual seedlings, Flowers July- September. Can be the only green in the marsh in winter!
 - iv.) Why are we doing surveys
 - Because of continuous state funding for several years, control agencies (state Dept of Ag, WDFW, and noxious weed boards) are making great headway in the control

effort- they are treating close to 100% of all known infestations in Puget Sound each year

- We now need to find all unknown infestations, including individual plants, if we are going to eradicate it. One plant could seed source to re-infestation of Puget Sound
- Dept of Ag has asked groups like People For Puget Sound to help in the survey effort by getting the public involved, which acts two fold to also educate more people about the problem and train them in identification

v.) Why are we using kayaks

- Kayaks allow us to cover more shoreline per year than walking surveys, gets us around the private property and trespass issues since we will be on the water, yet allows us to get close enough to the shoreline and beaches to do thorough surveys
- Reaches out to a user group that has a vested interest in improving the health of Puget Sound
- Works within established communities of kayakers which helps with recruitment, training, communication and relationship building

vi.) Kayak safety

- Always wear a Coast Guard approved PFD while on the water
- Other recommended safety gear: VHF Radio, paddle float, first aid kit, boat repair kit, tow belt, emergency clothes, extra paddle, pump, cell phone, etc.
- Paddle and survey with a partner! Not only is solo paddling more risky, but juggling GPS, data sheet, etc. and writing down data while rocking in shallow water is tricky. Surveying is much more fun with a friend!
- Use good judgment and your usual safe paddling techniques: be aware of tides, currents, and marine weather forecasts, stay close to your fellow paddlers, be aware of rocky headlands, high current zones, tide rips and other exposed and treacherous areas. Don't hesitate to end the survey and go home if conditions are getting dicey for any member of the group. Be aware of the protocols for VHF use and know how to call for help.
- Stay within easy voice contact of all paddlers in the group and don't forget to turn around and check on the folks behind you!

vii.) Survey protocol and GPS use

- Review through Kayak Survey Protocol document step by step
- Work with volunteers to get all GPS units set to decimal degrees and NAD83
- Go over using Washington State Department of Ecology's Coastal Atlas system to use shoreline aerials to record *Spartina* location for folks without access to GPS

viii.) Survey trip planning

- Generally, surveys should be done between +4 to +7 tide
- Other considerations:
 - Many areas like mudflats and deltas have large tidal fluctuations and shallow expanses of water. These areas also tend to have more native marsh vegetation that *Spartina* can hide in. Survey areas like this at higher tides, more like +8 to +9 so you can paddle at the vegetation line to find hidden *Spartina*.
 - Other shorelines like cobble and sandy beaches can be surveyed at the +4 to +6 range as these tend to be open expanses of beach where *Spartina* will stand out as some of the only vegetation.
 - Plan accordingly- i.e.: survey beaches on the rising tide on the way to the marsh.

- ix.) Pick your survey routes
 - o Discuss priority shorelines in their area with volunteers and how they can communicate to each other and to program staff via the spartinakayakers@pugetsound.org email list.

- II. On –Water Components: allow 2-4 hours for paddling, depending on survey route.
 - i.) Instruct volunteers in how to fill out survey location data, and be sure to record start time and coordinates on form.
 - ii.) If possible, point out *Spartina* plants in various types of habitat and explain tricks to ID in each (i.e., spiky and taller in pickleweed marsh, growing out in cobble where nothing else does, how to look for it when submerged, etc.)
 - iii.) Point out native plants that can be confused with *Spartina*.
 - iv.) Be sure each volunteer practices as both the data recording and GPS operator
 - v.) If training is first survey of a new infestation, be sure to keep track of which volunteer has the master data form so you can get a complete data set!
 - vi.) Point out other natural history and ecosystem function tidbits as necessary- teachable moments are everywhere 😊

APPENDIX 3: SURVEY DATA TABLE

People For Puget Sound 2009 North Sound *Spartina* Survey Coverage Information

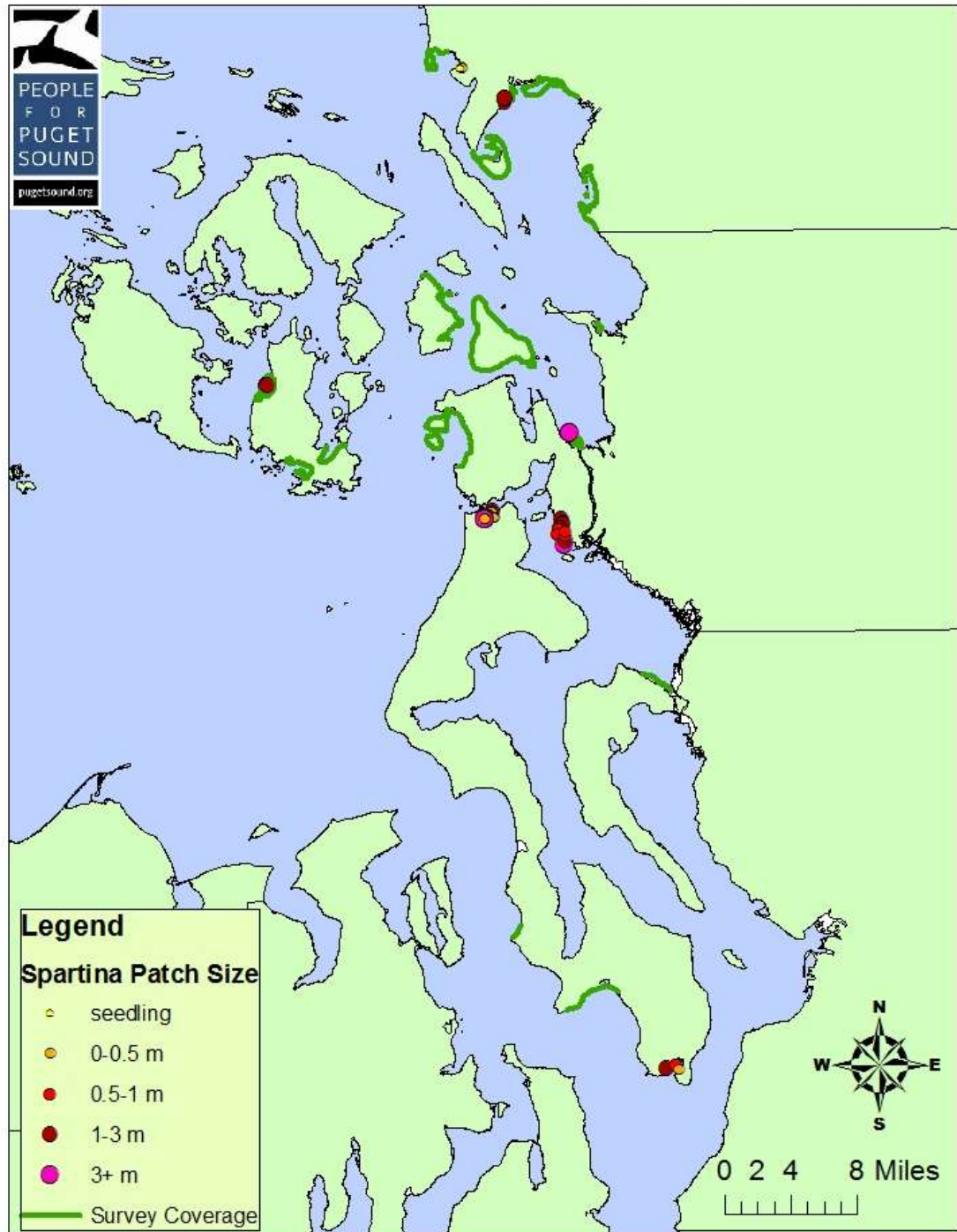
Survey Coverage Section	County	Section Length (miles)	Date	Survey Method	Start Coordinates (UTM Zone 10)		Stop Coordinates (UTM Zone 10)		Survey Type	Notes*:
					Northing	Easting	Northing	Easting		
Coronet Bay 1	Island	0.49	7/10/2009	Kayak	527188.5117	5361009.889	526799.5174	5360470.043	Training	
Ben Ure 1	Island	0.55	7/10/2009	Kayak	527524.5491	5361161.571	527524.5491	5361161.571	Training	Circumnavigation of Ben Ure Island
Coronet Bay 2	Island	1.3	7/17/2009	Kayak	527950.2957	5360978.023	526799.5174	5360470.043	Training	
Coronet Bay 3	Island	0.26	7/17/2009	Kayak	527188.5117	5361009.889	526995.448	5361363.378	Training	
Cultus Bay 1	Island	1.35	7/28/2009	Kayak	544268.604	5307245.146	545508.6921	5307277.027	Training	
Double Bluff 1	Island	3.74	8/2009	Kayak	536251.1952	5314391.63	538639.7507	5315418.368	Volunteer	
Bush Point 1	Island	0.94	8/10/2009	Walk	529575.2512	5320110.949	527950.2957	5360978.023	Volunteer	
Camano 1	Island	2.09	9/12/2009	Kayak	541741.0443	5345535.817	530029.7806	5320637.598	Volunteer	
Fishermans Bay 1 Section A and B	San Juan	A: 0.79	8/11/2009	Kayak	A: 506042.962	5373637.026	505163.939	5372906.866	Volunteer	
		B: 0.72			B: 505074.074	5372590.788	504603.056	5372014.411	Volunteer	
Fishermans Bay 2	San Juan	5.7	9/23/2009	Kayak	505773.0368	5373371.426	505773.0368	5373371.426	Volunteer	Survey of entire perimeter of Fisherman's Bay
Mud Bay 1	San Juan	3.56	9/21/2009	Kayak	552698.2252	5418130.581	513159.0637	5367644.827	Volunteer	
Mackaye Hbr 1	San Juan	4.7	9/22/2009	Kayak	506966.0339	5365944.262	510102.4795	5365393.215	Volunteer	
Dredge Islands 1	Skagit	2.83	7/20/2009	Kayak	535425.824	5367641.653	535736.753	5367453.212	Volunteer	Around isls. on W. of Swin. Chan.
Dredge Islands 2	Skagit	1.7	8/2/2009	Kayak	535736.753	5367453.212	536151.324	5367368.413	Volunteer	Islands E. of channel
Allan/Burrows 1 Section A and B	Skagit	A: 4.45	7/27/2009	Kayak	A: 523174.328	5370609.117	523174.328	5370609.117	Volunteer	Circumnav. of Burrows Island
		B: 2.98			B: 522266.084	5368525.989	522266.084		Volunteer	Circumnav. of Allan Is.
SneeOosh 1 Section A-E	Skagit	A: 1.86	8/22/2009	Kayak	A: 533953.907	5360681.632	534522.711	5358115.404	Paddle	
		B: 0.41			B: 534023.157	5359471.336	534023.157	5359471.336	Paddle	Circumnavigation of Big Deadman Island
		C: 0.18			C: 533861.397	5359064.557	533861.397	5359064.557	Paddle	Circumnavigation of Little Deadman Is.
		D: 0.15			D: 534422.8	5358022.63	534422.8	5358022.63	Paddle	Circumnav. of Dot Is
		E: 0.13			E: 534613.107	5357684.836	534613.107	5357684.836	Paddle	Circumnavigation of Sugarloaf Island

Survey Coverage Section	County	Section Length (miles)	Date	Survey Method	Start Coordinates (UTM Zone 10)		Stop Coordinates (UTM Zone 10)		Survey Type	Notes*:
					Northing	Easting	Northing	Easting		
Guemes 1	Skagit	6.77	9/2/2009	Kayak	525693.7465	5379792.957	530806.9791	5375572.288	Paddle	Paddled counter clockwise from start point to stop point
Fidalgo 1	Skagit	3.59	9/2/2009	Kayak	522968.793	5371058.885	525056.299	5366706.965	Volunteer	
Fidalgo 2	Skagit	1.01	9/9/2009	Kayak	525056.299	5366706.965	524154.072	5365521.686	Volunteer	
Samish Bay 1	Skagit	1.31	9/18/2009	Kayak	537972.849	5378756.762	537972.849	5378756.762	Volunteer	Cicumnav. group of small islands
Cypress 1 Section A and B	Skagit	A: 8.12	10/10 and 10/11/2009	Kayak	A: 523455.52	5377765.618	520687.337	5383871.513	Paddle	
		B: 0.43			B: 523203.867	5382229.147	523468.765	5382056.963	Paddle	Partial circum. Cone islands
Guemes 2	Skagit	7.95	10/11/2009	Kayak	525693.7465	5379792.957	530806.9791	5375572.288	Paddle	Paddled clockwise from start point to stop point
Red River 1 Section A, B, C	Whatcom	A: 0.79	7/18/2009	Kayak	A: 524776.954	5404113.098	524537.333	5404481.989	Training	
		B: 0.04			B: 524543.639	5404305.426	524572.015	5404349.567	Training	
		C: 0.21			C: 524704.437	5404015.358	524776.954	5404113.098	Training	
Chuckanut Bay Section A and B	Whatcom	A: 7.46	7/2009	Kayak	A: 536249.988	5393079.013	537543.527	5388409.121	Volunteer	
		B: 0.52			B: 536681.0105	5391814.794	536681.0106	5391814.794	Volunteer	Circumnavigation of Dot Island
Nooksack 1	Whatcom	A: 1.56	9/20/2009	Kayak	A: 529342.5986	5402174.254	528649.709	5400449.858	Paddle	
		B: 1.26			B: 528649.709	5400449.858	529342.5986	5402174.254	Paddle	
Portage 1	Whatcom	10.21	9/25/2009	Kayak	526307.7802	5395169.277	565279.9167	5393908.768	Volunteer	Circumnavigation of Portage Island
Nooksack 2 Section A and B	Whatcom	A: 6.51	10/4/2009	Kayak/Walk	A: 535746.249	5401209.217	532276.526	5402870.991	Paddle	loop around Nooksack delta
		B: 1.73			B: 532299.606	5402855.604	534607.626	5401816.995	Paddle	return at high tide along shore
Sandy Point 1 Section A, B, C	Whatcom	4.67	10/11/2009	Kayak	523175.65	5405551.084	521299.653	5405808.574	Volunteer	Into 1st lobe of marina only

* Survey tracts are complex and are not linear, coordinates represent start and stop points only. See maps for detail of survey paths between coordinates.

APPENDIX 4: GIS MAPS

2009 Spartina Surveys: North Puget Sound



2009 Spartina Survey: Island County



2009 Spartina Survey: Coronet Bay, Island County



2009 Spartina Survey: Lopez Island, San Juan County



2009 Spartina Survey: Skagit County



2009 Spartina Survey: Snee Oosh, Skagit County



2009 Spartina Survey: Swinomish Channel Dredge Islands, Skagit County



2009 Spartina Survey: Whatcom County



2009 Spartina Survey: Red River Delta, Whatcom County



2009 Spartina Survey: Nooksack Delta, Whatcom County

