County: Skagit County
Grant No: **G1000022**

PROJECT TITLE: **Northwest Straits Project: Skagit County Marine Resources Committee Action and Administration**

DELIVERABLES FOR TASK NO: **TASK 10: *Spartina* Survey and Removal**

PROGRESS REPORT: [] FINAL REPORT [**X**]

PERIOD COVERED: **Jan 1, 2011– Dec 31, 2011**

DATE SUBMITTED: **December 30, 2011**

Project Summary: Skagit MRC contracted with People for Puget Sound (PPS) to support a regional effort to eradicate *Spartina*. Over 82 volunteers participated in 37 surveys across 7 counties, covering over 225 miles of shoreline. Almost 100 miles were surveyed in Clallam and Jefferson Counties alone. Approximately 115.2 square meters of *Spartina* was found. The majority of the Spartina documented in 2011 was located in Skagit and Whatcom Counties.

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Salish Sea *Spartina* Survey Program

Northwest Straits Commission Final Report: November 20, 2011

DOE Grant #G1000022

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INTRODUCTION: On the shores and in the marshes of the Salish Sea a war is being waged against dangerous invaders. The enemy is a family of salt-tolerant plants known as cordgrasses- *Spartina*. These seemingly innocuous grasses are critical species in their native habitats, but once introduced to new areas they have the potential to displace native wildlife and vegetation communities, and drastically alter the ecosystems they infest. In the Puget Sound and Northwest Straits region, one species, *Spartina anglica*, is the main troublemaker. Also known as common cordgrass, it was deliberately planted in the Stanwood area in Snohomish County in 1962 to stabilize dikes and provide cattle forage. It began to spread rapidly; by the mid-1990s there was almost 1000 acres of Spartina across the region, and it was found from Birch Bay to Vashon Island. Recognizing the potential of *Spartina* to severely impact nearshore ecosystems, a statewide eradication effort was launched, which was led by the Washington State Department of Agriculture (WSDA).

This eradication effort involved a diverse array of local and regional controllers that includes statewide agencies, non-profits, tribes, and local government. Extensive control efforts have paid off, and only around 20 acres of *Spartina* remains in Puget Sound and the Northwest Straits. As the known infestations are treated and monitored, the need for more extensive surveys became apparent to identify unknown infestations. The Skagit Marine Resources Committee (MRC) has been supporting efforts by the state and non-profits such as People For Puget Sound to control *Spartina* in local waters. Since 2007, this effort has focused on recruiting and training volunteer sea kayakers to conduct boat-based shoreline surveys. This approach has been very successful in identifying isolated clones and unknown infestations in areas that are challenging to access by traditional means such as shallow mudflats and remote island beaches.

In 2010, the Skagit MRC partnered with People For Puget Sound to develop a proposal for funding through the Northwest Straits Conservation Initiative for a regional *Spartina* survey program that would expand the survey program to the Olympic Peninsula. The extensive beaches of Clallam and Jefferson counties had not yet been systematically surveyed, and this data gap represented one of the last unknowns in the statewide eradication effort. This additional funding would also be used to support surveys in Whatcom County, where the proximity to BC's expanding Spartina infestations in Boundary Bay raises concerns of re-infestation from the northern reaches of the Salish Sea. People For Puget Sound has included in this report comprehensive survey results that include work done outside of the Northwest Straits region that was supported by other funders. Outreach to the paddling community throughout Puget Sound is also relevant to the Northwest Straits region, as many kayakers from the urban waters travel north to paddle the shores of our rich deltas and emerald isles.

RECRUITMENT: In 2011 volunteer recruitment efforts spanned across 7 counties and reached out to sea kayakers in new regions of the Salish Sea. Volunteers were targeted through local kayak clubs, partner environmental and marine organizations, through print media, and posters and flyers. Email announcements were distributed by many of the program partners listed in Table 1.

Table 1: Priority areas for survey and program partners by region

Region	Priority Areas	Program Partners
Clallam	Pysht Delta Salt Creek Sequim Bay Port Angeles Bay	Olympic Peninsula Paddlers Clallam MRC Clallam County Beach Watchers Klahhane Hiking Club
Island	Coronet Bay	WISK Club Island County Noxious Weed Control Island County Beach Watchers
Jefferson	Discovery Bay Marrowstone/Indian Is. Port Townsend beaches Chimaucum Creek	Olympic Peninsula Paddlers Jefferson MRC Jefferson County Beach Watchers Jefferson Noxious Weed Control
Kitsap	Port Gamble Indianola	Olympic Kayak Club
Pierce	Hylebos waterway	Tacoma Mountaineers Matelot Kayak Club
Skagit	Dredge Islands Sinclair/Vendovi Islands Edison Slough Swinomish Channel Cypress Island	Skagit MRC Skagit County Beach Watchers Hole in the Wall Kayak Club Swinomish Tribe Skagit Noxious Weed Control
Whatcom	Drayton Harbor Red River Delta Sandy Point Community Bellingham Bay	Lummi Nation Whatcom Noxious Weed Control Whatcom MRC Whatcom Area Kayak Enthusiasts Bellingham REI Whatcom Community Foundation Community Food Co-op Bellingham Community Boating Center
Soundwide	Skagit, Whatcom, Clallam and Jefferson Counties	WSDA WDFW Northwest Straits Commission People For Puget Sound

Posters and flyers were displayed around the region in places frequented by paddlers such as kayak shops, outdoor gear retailers, and shoreline access points. In addition, print media coverage of this program in 2011 included an article in the June newsletter of the Community Food Co-op in Bellingham. Also, People For Puget Sound's Restoration Ecologist Rachel Benbrook wrote a feature article in one of the kayaking industries most popular publications, *Sea Kayaker Magazine*. This article: "*Spartina* Grass: Friend and Foe" discussed the cordgrasses as key natives in some habitats and dangerous invasives in others, and highlighted this work in Puget Sound as an example of how kayakers are engaged in citizen science to address this issue (see attached PDFs for media articles).

SURVEY METHODS: There are four main components to conducting *Spartina* surveys:

1. Prioritize shorelines for survey
2. Determine appropriate survey technique (kayak or foot)
3. Conduct survey trainings
4. Process survey data

1. Prioritize shorelines for survey

Greater Puget Sound, including the Northwest Straits region, encompasses more than 2,500 miles of shoreline. In order to prioritize these miles and miles of coastline for survey, collaboration with the diverse array of state, local and tribal agencies who are involved in *Spartina* control is vital. People For Puget Sound's North Sound Restoration Ecologist attended the 2011 Puget Sound *Spartina* Task Force on May 4 to do just that. In addition, we keep in touch with local and regional controllers throughout the season to respond to new reports and make sure we are getting our paddlers into areas where the need is greatest. Table 1 above describes priority areas in each county.

The primary focus of work in 2011 was to survey the shoreline of Clallam and Jefferson counties, and expand ongoing efforts in Whatcom and elsewhere in the Northwest Straits region. The Olympic Peninsula from Port Townsend west had only been systematically surveyed by air, which is known to not be very effective at locating isolated infestations. This entails over 100 miles of coast, much of which is rugged and exposed to wave action from the Strait of Juan de Fuca. In order to eliminate stretches with no habitat value for *Spartina*, online aerial photography resources such as Google maps and the Department of Ecology's Washington Coastal Atlas were used to identify rocky bluffs and other inhospitable shores that were lower priority for survey. This information was used in combination with the public beaches information available on the Coastal Atlas to located beaches with appropriate public access, and thus suitable for survey. This was a very fortuitous development as this public beaches data was just added earlier in 2011- just in time for it to be very helpful to our work (thanks DOE for this great resource!).

2. Determine appropriate survey technique (kayak or foot)

Since 2007, People For Sound's *Spartina* surveys have focused on working with volunteer kayakers. In north Puget Sound, the extensive private beaches and challenging, shallow bays and salt marshes makes kayaks the perfect vessel for this work. However, conditions on the Olympic Peninsula are quite different and a modified approach was required. Much of the coastline west of Port Townsend is characterized by bluff backed or otherwise rugged beaches exposed to extensive wave

Figure 1: People For Puget Sound staff surveying rugged beaches near Pillar Point Park, Clallam County. Photo: R. Benbrook

action. There are often rock gardens just off shore or other seaward hazards that make paddling close to shore challenging or dangerous. Because of these conditions, only the more protected shorelines (Discovery Bay, Sequim Bay, and Port Angeles Harbor) were surveyed by boat. For the more rugged coasts, foot surveys were determined to be the only safe and effective method. In addition, People For Puget Sound determined that many of these shorelines were too dangerous to survey with volunteers, so staff members conducted almost all foot surveys west of Port Townsend (Figure 1). See Figure 4 in the results section for a map of the survey method used for all shorelines in the region.

3. Conduct survey trainings

Volunteer kayakers attended one of seven training sessions that were conducted around the region in 2011. Volunteers received formal training 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 (updated in 2011) with detailed instructions on how to identify the plant. Surveyors were also provided with ziploc bags for 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 and survey materials, see Appendix 1.

Kayak and foot 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 GPS unit and entered this data onto the inventory forms. When no *Spartina* was found and data consisted solely of survey routes, an alternate method that was used was to record this information on Google maps and submit it in this format. This online resource is readily available to everyone, easy to use, and it's simple to pull latitude and longitude coordinates off to be entered into GIS for mapping purposes.

4. Process survey data

GPS data and lat/long coordinates from Google maps were processed and imported in ArcMap 9.3.1 to be formatted into maps that range in scale from the infestation level, to county, and finally region-wide. Area values for each clone are determined based on field observations. This year some data came in with an unknown area value, in cases where paddlers were unable to get close enough to determine an area (Swinomish Channel) or where there were so many plants that a decision was made in the field that gathering area information was not possible (Dredge Islands). Unknown clones were assigned an area value of 0.5 meters for area calculations.

One of the key responsibilities of this program is to disseminate data from the citizen scientists to the controllers who will use it, and People For Puget Sound's decade plus of experience working with the *Spartina* network in the region helps greatly in this effort. People For Puget Sound is also monitoring ongoing infestations in Skagit and Whatcom County to ensure that control work is being effective, see discussion section for more details on these efforts.

RESULTS: This was a big year for the Spartina program. Over 82 volunteers participated in 37 surveys across 7 counties, covering over 225 miles of shoreline and located 115.2 square meters of *Spartina anglica* (Table 2). Almost 100 miles were in Clallam and Jefferson alone, well exceeding the program goal to survey at least 75 miles of this new territory. The region-wide map in Figure 3 shows the location of surveys, as well as the method used. This map illustrates the use of foot surveys on the Juan de Fuca coastline's rugged shores. All told, 177 miles were surveyed by kayak and 23 by foot, an impressive contribution of paddles in the water and boots on the beaches! The good news is that very little, in fact only one clone in the Pysht Delta, new Spartina was found in almost 100 miles of surveying in Clallam and Jefferson counties. See Appendix 2 for the full complement of region, county and infestation scale GIS maps.

Table 2: 2011 *Spartina* Survey Results

Region	Volunteers	Surveys	Miles Surveyed	Spartina Found (m^2)
Clallam	3	10	43.8	1
Island	8	2	5.2	7
Jefferson	16	6	65	0
Kitsap	2	4	21.9	0
Pierce	2	1	7.9	0
Skagit	21	8	54.2	65.7
Whatcom	30	6	27.3	41.5
Soundwide	**82**	**37**	**225.3**	**115.2**

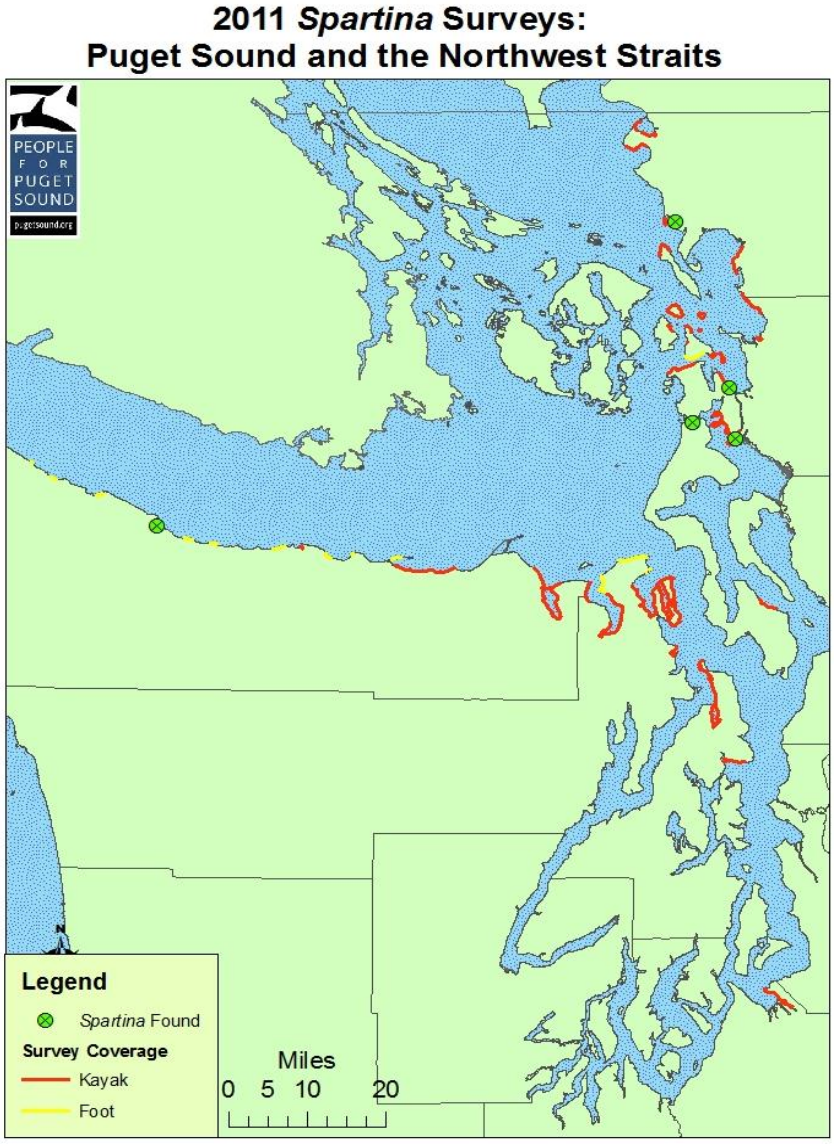


Figure 3: Region-wide surveys by type, foot or kayak

DISCUSSION: The majority of the 115 square meters of *Spartina anglica* documented this year was located in Skagit and Whatcom Counties. While much of this was in ongoing infestations that paddlers have been monitoring for 2-4 years, there was also a significant amount of previously unknown *Spartina* located by paddlers in 2011, especially in the Swinomish Channel where over 30 square meters of clones were

located. These infestations are in areas that have been part of ground zero for *Spartina* control, and the fact that citizen scientist volunteers continue to locate new clones is alarming and suggests that the need for such surveys in these areas remains.

In addition, one clone was located near the Pysht River. The story of this clone is an excellent example of how this program represents science in action- in many cases, control work follows immediately after the data is provided. In early September foot-based surveys located this clone near the Pysht River Delta (Figure 4). The WSDA crew had just been in the area to treat plants in the delta itself, but had not located this isolated outlier. Following the report, the crew headed back out the very next week to eliminate this clone.

Figure 4: Outlier *Spartina anglica* clone located outside of the Pysht Delta, Clallam County. Photo: R. Benbrook

This year also saw some big steps in control efforts of ongoing infestations. Two in particular, the Dredge Islands in Skagit and the Red River Delta (also known as Lummi Bay) in Whatcom County, deserve special mention. Progress at these sites reflects two important roles People For Puget Sound and the Skagit MRC are playing in the statewide eradication effort- as watchdogs monitoring infestations to identify those that are slipping through the cracks and potentially getting missed by controllers, and as facilitators of cooperation between the state crews from WSDA and local, or in this case, tribal officials.

Figure 2: Volunteer kayakers examine a *Spartina* sample on the Dredge Islands. Photo: B. Hardwick

The Dredge Islands are located just above the north entrance to the Swinomish Channel near Anacortes, WA. These low lying, sandy islands are constructed of dredged material from the channel and are a somewhat artificial shoreforms for the Northwest- similar in appearance and function to the barrier islands of the Atlantic Coast. They are home to an extensive waterbird population and are situated at the SW end of Padilla Bay, where vast eelgrass and mudflat habitats have been threatened by *Spartina* in the past. An unchecked infestation on the Dredge Islands could threaten to re-infest this biologically rich area. This area was first paddled in 2010 and a significant *Spartina* infestation was documented. Local controllers were informed and stated that this area had just been treated with herbicide and these plants should be dying off soon. In light of this, it was surprising to return in 2011 and document an even more extensive infestation (see Appendix 3 for maps). This data was brought to the attention of the state and local controllers to make sure this growing infestation is addressed. Through dialogue with local controllers, People For Puget Sound learned that this site has been difficult to control; there is some concern that plants are emerging on a different schedule and thus getting missed, or that there may possibly be some herbicide resistance developing in this population. This area will remain on the list of local priority shorelines to continue monitoring of this infestation in cooperation with local entities to ensure that treatment is effective.

The Red River Delta, also known as Lummi Bay, is one of two river deltas located on the Lummi Nation lands north of Bellingham in Whatcom County. This is a rich shellfish area with an extensive salt marsh, and is also adjacent to the tribe's sea ponds that are used for aquaculture. *Spartina* could spread aggressively and have a severe impact on these shorelines. In 2008, kayak surveyors discovered 3 small clones of *Spartina anglica* in the delta. People For Puget Sound assisted in control efforts to remove one clone in 2008, and continued to monitor in 2009 and 2010 where we saw significant growth in the infestation. This year, People For Puget Sound collaborated with the Lummi Nation Natural Resources Department to conduct the most thorough surveys yet of the delta- with disturbing results. Through these efforts, over 40 clones were found, several of them quite large at 2 meters or more. This was likely the single largest infestation left in Puget Sound, and poised to really explode if not dealt with. People For Puget Sound's North Sound Restoration Ecologist worked with WSDA and the tribe to arrange for the WDFW airboat and a crew of diggers to come up to Whatcom County. Several hundred pounds of vegetative matter, roots, and sand, amounting to approximately 41.5 square meters of *S. anglica*, was removed and all known clones were eradicated. Appendix 4 includes maps of the Red River infestation from 2008-2011.

Figure 3: Digging *Spartina* in the Red River Delta with the crew from WSDA. Photo: B. Hardwick

These two sites, the Dredge Islands and the Red River Delta, both serve as examples of how citizen science survey efforts are contributing to the *Spartina* eradication efforts in the Northwest Straits region. Additional survey efforts in 2011 have added over 220 miles the list of "clean" shorelines- as these are presence/absence surveys this data of where *Spartina* is not is also very valuable.

NEXT STEPS: People For Puget Sound and the Skagit MRC have been involved in Spartina control efforts for over a decade, and this period has seen a dramatic reduction in the Spartina infestation from a peak of almost 1,000 acres to less than 20 acres region-wide. In light of this progress, it is important to evaluate the need for continued surveys. People For Puget Sound has committed to one more year of extensive Spartina surveys, and then plan to retire or reduce regional efforts. It has become difficult to keep volunteers well trained and motivated when there is so little Spartina to be found out there! However, the Northwest Straits Region has always been ground zero for eradication, and ongoing surveys will be necessary especially in Skagit, Island, and Snohomish Counties due to their proximity to the original infestation in Stanwood, and in Whatcom Counties as the chance for re-infestation from the large *S. anglica* population in Boundary Bay makes it necessary to remain vigilant in this northern-most county.

The main goal of this year's effort was to fill data gaps on the Olympic Peninsula and determine if there were unknown infestations lurking on these remote shorelines. These results generally indicate that no, there appears to not be any extensive unknown infestations in Clallam and Jefferson Counties.

However, finding the clone in the Pysht River outside of the known infestation area in the protected delta does indicate the potential for scattered plants to survive even on these rugged coastlines. While program resources will limit People For Puget Sound's ability to continue to conduct wide-scale surveys in this region, they and the Skagit MRC will continue to monitor priority shorelines in this area wherever possible.

In order to prepare for this upcoming transition, People For Puget Sound staff plans to prepare a GIS map including recommendations for the survey frequency and method for the shorelines we have surveyed. This document will serve as a template for kayakers or beach walkers that want to continue to monitor shorelines in their area, and will capture qualitative observations from the field on habitat quality and help prioritize areas for survey in the future. In this way, shoreline monitoring can be continued by dedicated volunteers, MRCs, kayak clubs, or other citizen science groups such as WSU Beachwatchers.

CONCLUSION: The effort to eradicate invasive Spartina grasses in Puget Sound and the Northwest Straits has spanned almost 2 decades and has been a collaborative effort of state agencies, local governments, tribes, and non-profit organizations. These groups have all come to the table because they recognize the potential this plant had to do severe damage to the critical nearshore habitats in the region. As we look back on the incredible progress that has been made, it is clear that we are engaged in a rare thing indeed- an invasive species eradication success story. There is less than 20 acres of Spartina remaining in Puget Sound, down from a high of close to 1,000 acres. This success has come about through a collaborative approach and dedicated funding to make sure the work gets done. And, it could not have happened without an engaged and active citizenry, which is where survey efforts by People For Puget Sound and the Skagit MRC come in. In 2011, over 223 miles of shoreline in 7 counties was surveyed by citizen scientists- volunteer hikers and kayakers patrolling our shorelines by land and by sea. These dedicated volunteers have demonstrated that one of the greatest tools in defense of the Salish Sea is the residents who are here because they love this great place- its turbulent waters, its rocky shores, and yes, even its stinky mudflats.

APPENDIX 1: SURVEY TRAINING AGENDA AND DOCUMENTS

Contents: Training Agenda, Survey Protocols, and Sample Data Sheet

Spartina Survey Program

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 Google maps to record survey data for those without 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
- 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 ecosyst

vii.) em function tidbits as necessary- teachable moments are everywhere ☺

People For Puget Sound *Spartina* Survey Program
Kayak Survey Protocol

Equipment checklist:

- ❑ Inventory Sheets
- ❑ Aerial Shoreline Photos
- ❑ Clipboard
- ❑Ziploc bag/report cover for papers
- ❑ Two pencils
- ❑GPS unit
- ❑Extra Batteries
- ❑Garbage bags
- ❑Spartina ID card
- ❑ Tide chart
- ❑ Sunscreen
- ❑ Binoculars
- ❑Watch
- ❑Weather appropriate clothing
- ❑ Digital camera (optional)
- ❑ Rite in the Rain Notebook (optional)

Safety Tips:

- Always work in pairs
- Tell someone where you are going
- Watch the tides carefully
- Walk carefully on logs
- Bring water and sunscreen
- Do not trespass on private property

GPS Use:

•If you are borrowing a People For Puget Sound GPS, you are required to check your unit in and out in person, unless other arrangements are made.
•Set your unit to record data in 'decimal degrees' (position format: hddd.dddd°) rather than 'degrees, minutes, seconds' (position format: hddd°mm'ss.s").
•Set the unit so that the Map Datum is set to NAD83 (North American Datum 1983).
•Other GPS settings can be set to the default mode.
•Always attach the unit to yourself or your kayak
•If the unit is dropped in seawater, remove it as quickly as possible, rinse in freshwater and dry thoroughly.

Kayak Survey Protocol:

Safety First! In order to participate in this program, you should be an experienced and capable paddler, comfortable with self and assisted rescues. Complete a safety check prior to leaving shore and DO NOT paddle in an area where you are uncomfortable with water or weather conditions. Be sure to check tides, currents and marine weather information before you leave shore and plan your trip accordingly. **Use extreme caution when paddling around rocky headlands or into areas of rough water. Always paddle with a buddy!** It is safer and easier to carry and use all the equipment, forms and maps with two sets of hands out there.
PFPS recommends that you carry the following safety equipment with you at all times you are on the water:

- •Lifejacket and sprayskirt
- • Bilge pump
- • Signaling devices: VHF Radio, Flares, Whistle, etc.
- • First Aid Kit
- • Extra dry clothing (wool or fleece: cotton kills!)

While Surveying:

Exit boat and walk stretches of beach whenever possible. Do not trespass!
Be aware of private property boundaries, program staff can help with identifying public beaches in your area. When surveying from your kayak, follow the following guidelines:

•Survey for *Spartina* when the tide is between +3 to +7 to maximize the exposure range.
•Paddle as close to shore as possible and note on your inventory form approximately how far your boat is from the *Spartina* patch that you are getting a GPS location for.
•Bring binoculars with you to get a closer scan of the beach from your boat.

Beginning your survey:

•Fill in the information at the top of the *Spartina* inventory form.
•MARK your starting point using the GPS unit, also record the start time.
•Be sure to also record your end time and MARK your end point when you finish your survey.

Recording *Spartina* Found:

To record a *Spartina* patch on the inventory sheet follow these steps:
• Designate a patch number and record it on the inventory sheet
• Use the Mark function on your GPS and record the Latitude and Longitude on the inventory form. Record in the "Offset from Mark" column the distance and direction between the person holding the GPS (the Mark) and the *Spartina* clone.
•Use the key on the bottom of the form to 1) estimate and record the size of the patch and 2) record other relevant details such as substrate, other vegetation present and any notes that will help locate the plant in the "Descriptive Information" column.
•If you are using a digital camera to take a picture, record the photo number under digital photo # on the form.
•Repeat these steps, giving each new clone found its own patch # and recording the GPS coordinates and other data

Using the aerial photos:

If you do not have a GPS, you can use shoreline aerial photos to orient yourself and record data. Please see the attached sheet for more information on how to use this resource.

Returning Forms and Equipment:

Return completed forms and equipment ASAP to People For Puget Sound Main Office. The mailing address is: 911 Western Ave, Suite 580, Seattle, WA 98104. You can also make arrangements for pick up or drop off of forms and equipment with Rachel at 360-230-1353/ spartina@pugetsound.org. The fax number at the office 206-382-7006 if you wish to fax in your inventory forms.

Additional Contact Information:

People For Puget Sound-
spartina@pugetsound.org, 360-382-7007
WA State Department of Agriculture-
pestprogram@agr.wa.gov, 360.902.1923
WA State Invasive Species Council-
invasivespecies@rco.wa.gov, 877.9INFEST
Greater Vancouver Invasive Plant Council (B.C. sightings)-
info@gvipc.ca, 604-880-8358

DATE: 7/10/09 ECOLOGY PHOTO NUMBERS: ________ Time Left: 4PM Time Return: 7PM

SITE LOCATION City OAK HARBOR County Island Embayment Cornet Bay Beach CB Boat Launch

SURVEYOR(S) INFO: Name(s) R. Benbrook Phone 360 333 0051 Email Rbenbrook@pugetsound.org

GPS STARTING POINT			GPS ENDING POINT		
	LAT:	48.40301		LAT:	48.39682
	LONG:	-122.62811		LONG:	-122.63795

Survey Data:

PATCH #	DIGITAL PHOTO #		GPS LOCATION (in Decimal Degrees)	OFFSET FROM MARK: Distance	OFFSET FROM MARK: Direction	ESTIMATED PATCH SIZE (meters) See Key Below	DESCRIPTIVE INFORMATION (ex: zones, tidal height, substrate (see key below), accessibility for removal, other vegetation, flowering or seed heads present etc.)
1	Ben Unk 1	LAT:	48.40316	15ft	N	1-3	cobble/rock beach, below fir driftwood
		LONG:	-122.62803				
2		LAT:	48.40316	10ft	landward	0-0.5	cobble beach - just above Rockweed
		LONG:	-122.62769				
3	Ben Unk 2	LAT:	48.40222	20ft	land.	0-0.5	in pickleweed
		LONG:	-122.63038				
4		LAT:	same	20ft	land	0-0.5	with seed stalks
		LONG:					
5		LAT:	48.4024	20ft	land	0-0.5	in pickleweed
		LONG:	-122.62968				
		LAT:	48.40166				crossed over from patch 5 to this mark - begin survey Cornet Bay
		LONG:	-122.63266				
6	CB2	LAT:	48.39909	5ft	land.	0-0.5	in muddy shelf in bedrock
		LONG:	-122.63366				
7		LAT:	48.39882	0	0	0.5-1	submerged at +6 tide
		LONG:	-122.63166				
8		LAT:	same	6ft	SW	0-0.5	at edge at 6ft tide
		LONG:					
9		LAT:	48.39752	15ft	land	seedling	in high marsh
		LONG:	-122.63802				

KEY FOR PATCH SIZE: seedling, 0-0.5m, 0.5m-1m, 1m-3m, over 3m, meadow

KEY FOR BEACH SUBSTRATE: [illegible], mud, [illegible] beach, sand beach, hardpan, mixed substrate (identify mix)

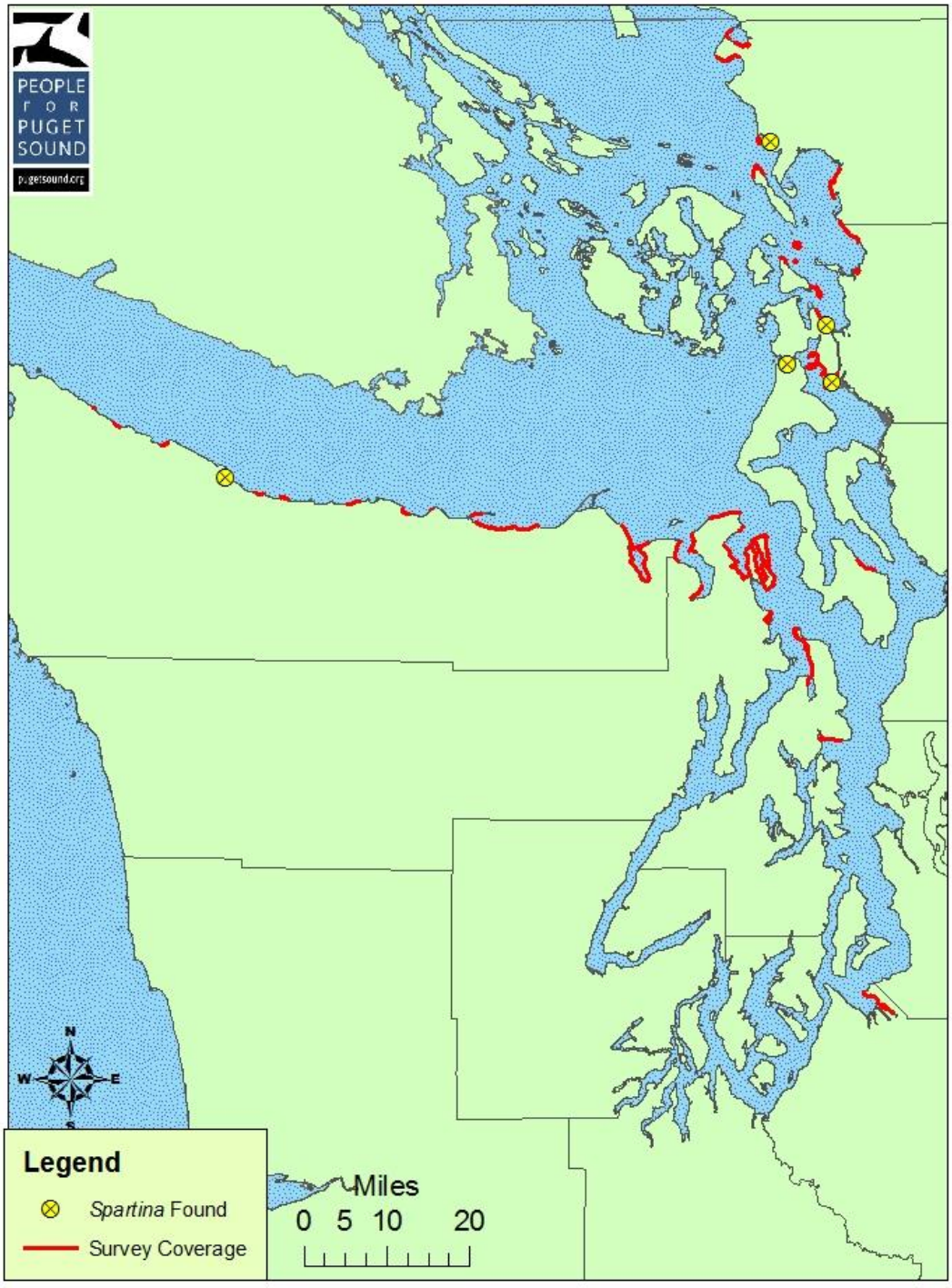
Note: If a sample is collected for verification, place sample in ziploc bag and clearly mark site location, [illegible] the sample was taken from, and your name and contact information. Take care not to spread seeds or root matter at [illegible] in the environment. DO NOT [illegible] yourself; sample must be verified and reported.

And so on... Use back as needed

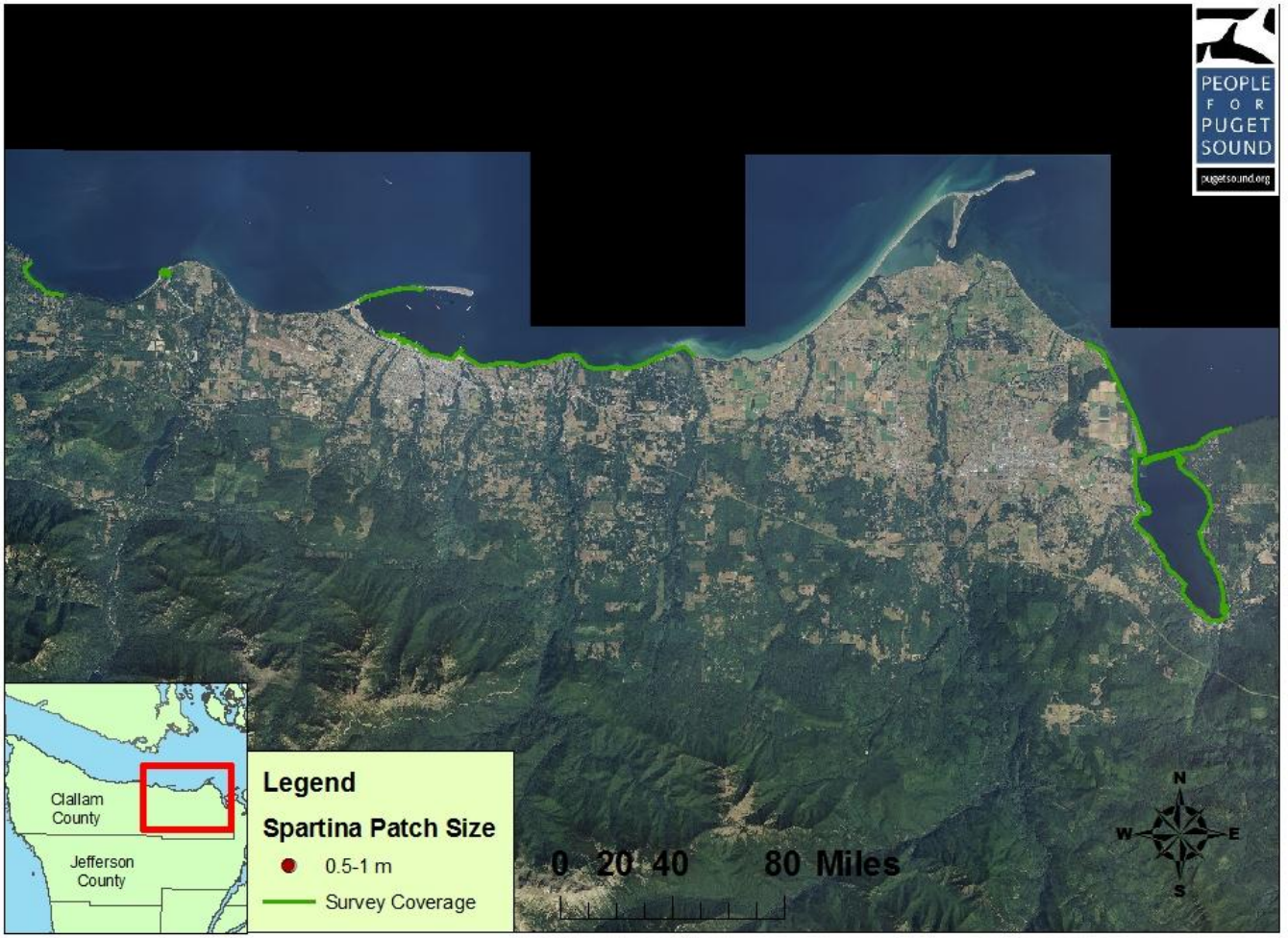
APPENDIX 2: SURVEY MAPS

Contents: Puget Sound wide; Clallam County East and West, Pysht Delta; Island County, Coronet Bay; Jefferson County; Kitsap County; Pierce County; Skagit County, Swinomish Channel, Dredge Islands; Whatcom County, Lummi Bay

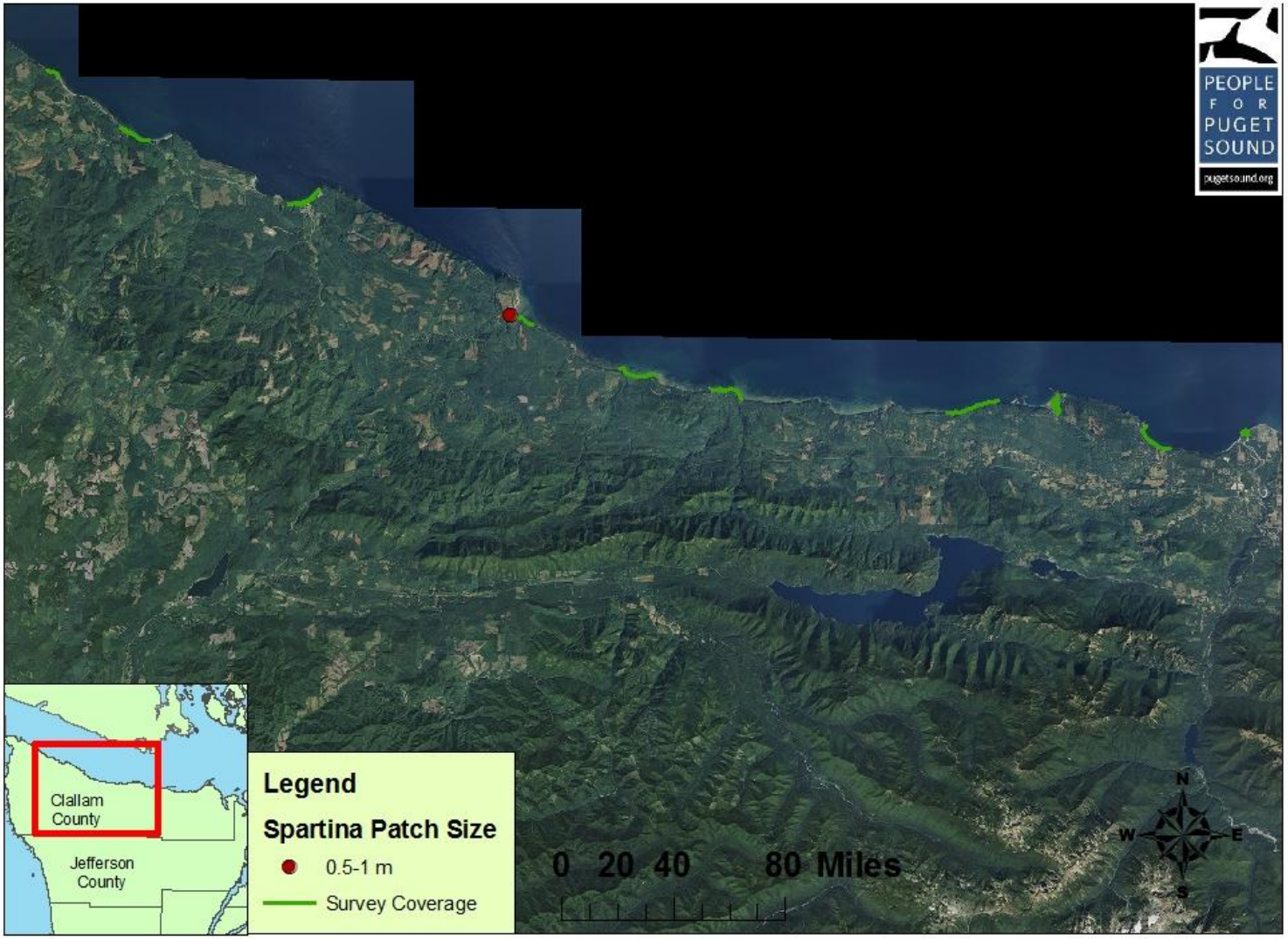
2011 *Spartina* Surveys, Puget Sound



2011 *Spartina* Survey: Clallam County, East

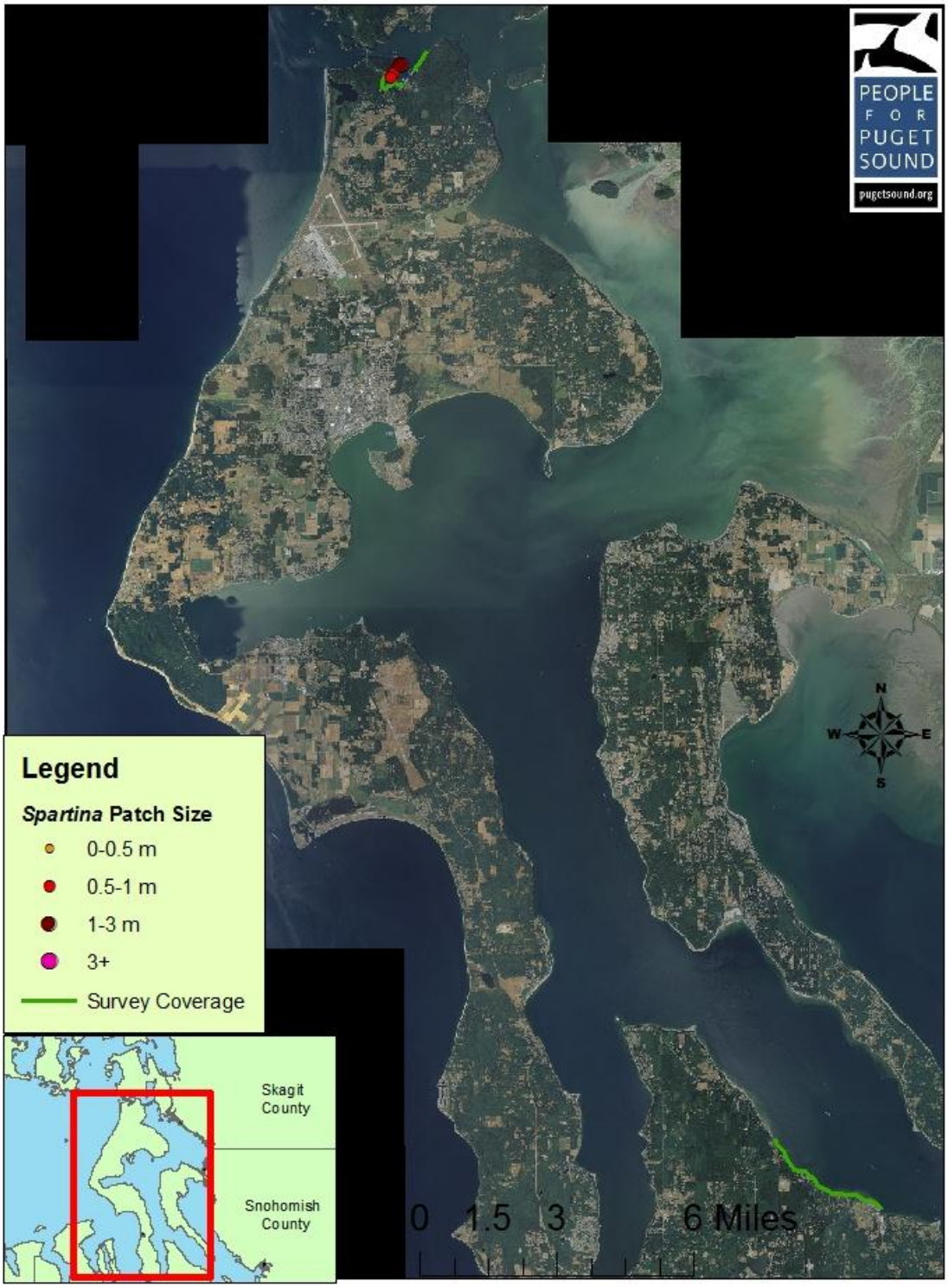


2011 *Spartina* Survey: Clallam County, West

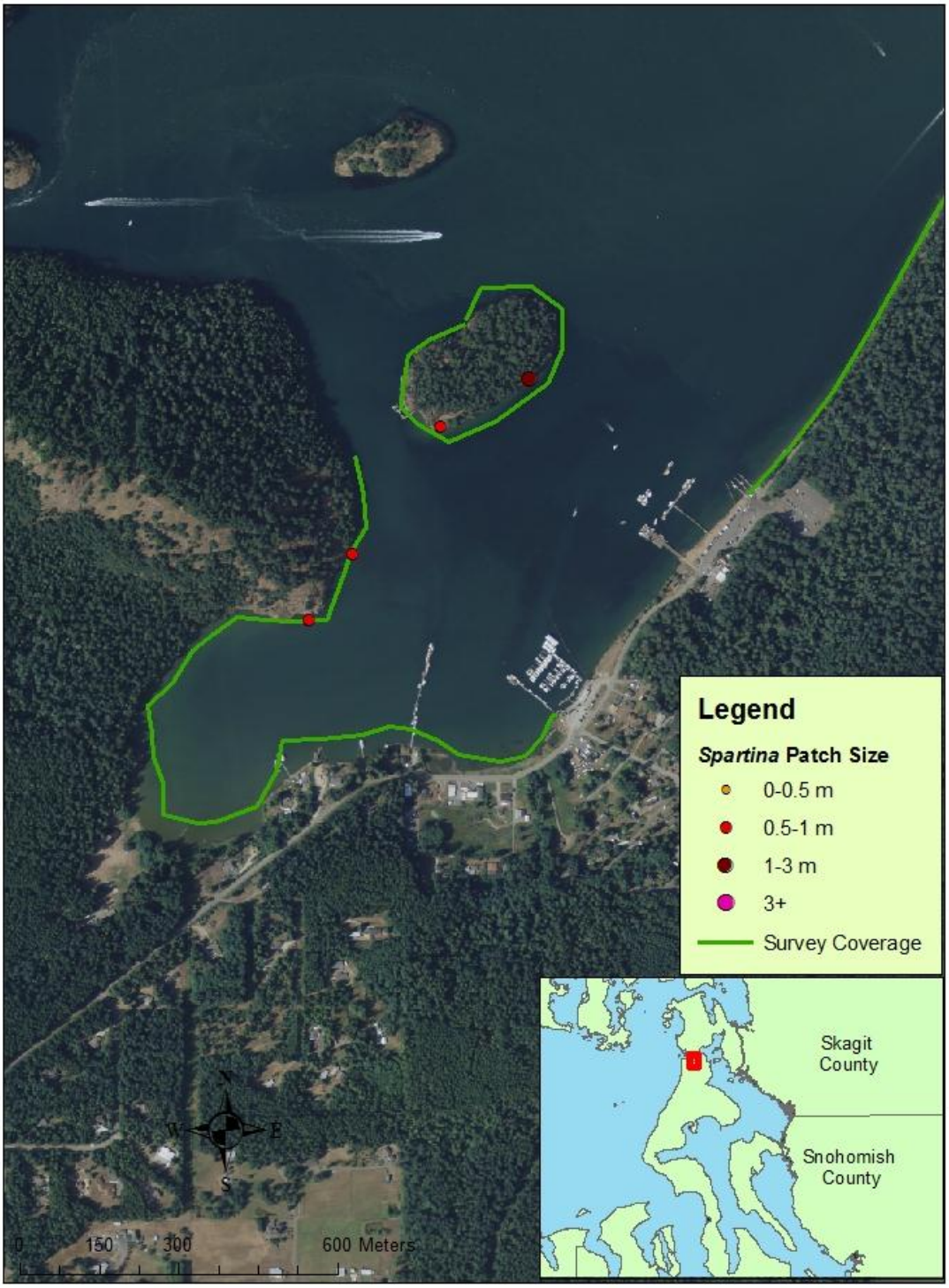


2011 Pysht Delta *Spartina* Survey

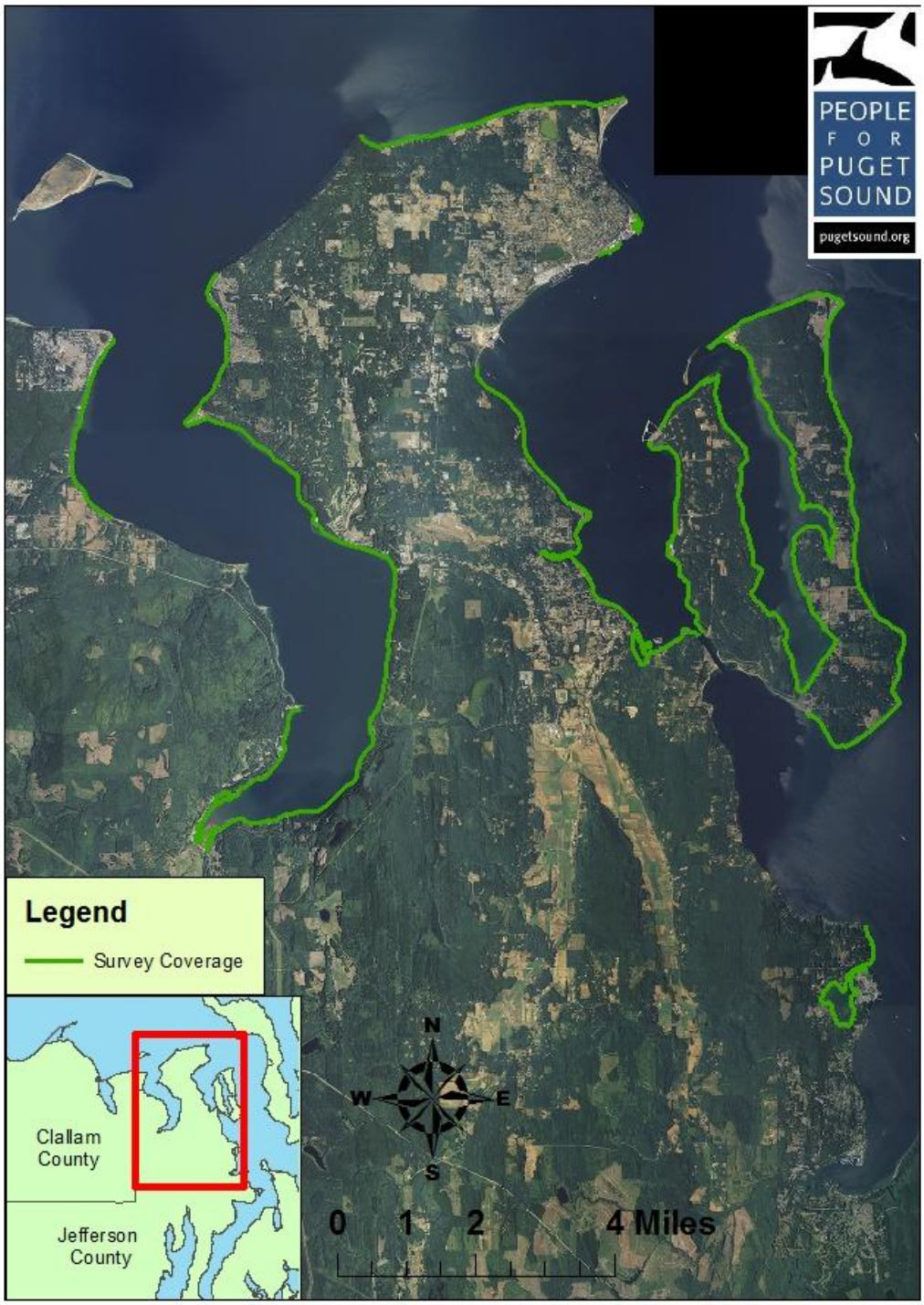
2011 *Spartina* Survey: Island County



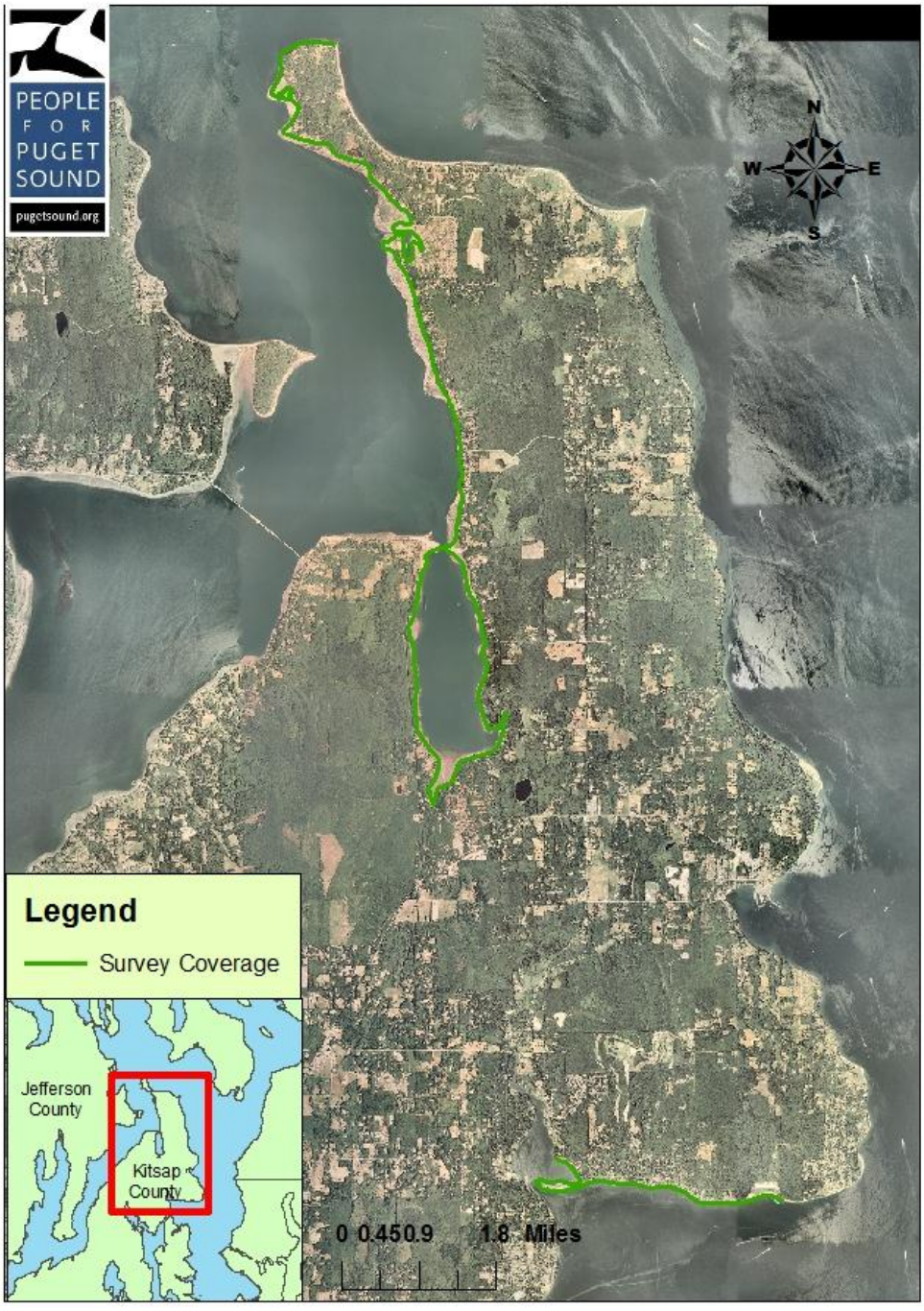
2011 Island County *Spartina* Survey



2011 *Spartina* Survey: Jefferson County

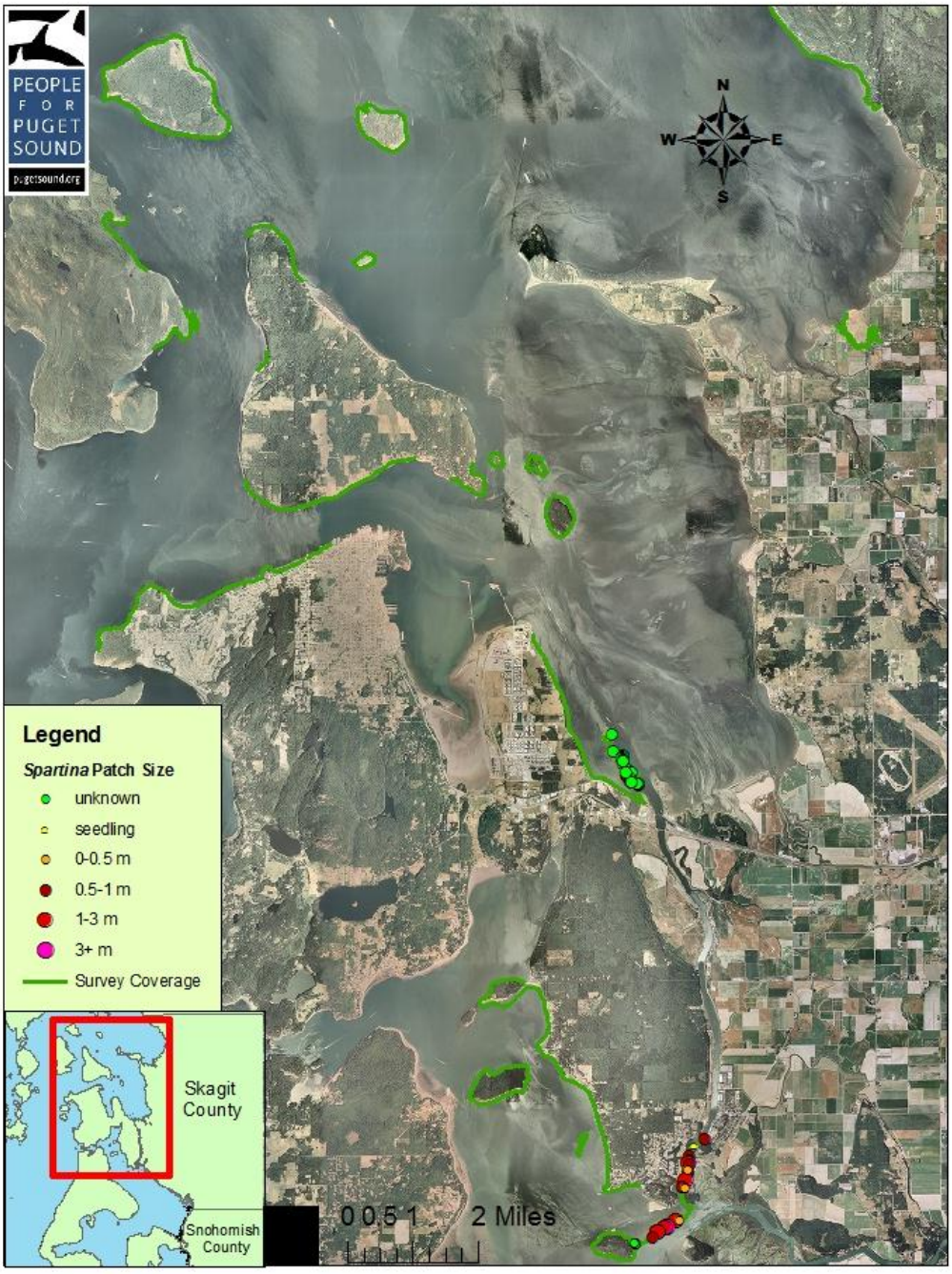


2011 *Spartina* Spartina Survey: Kitsap County

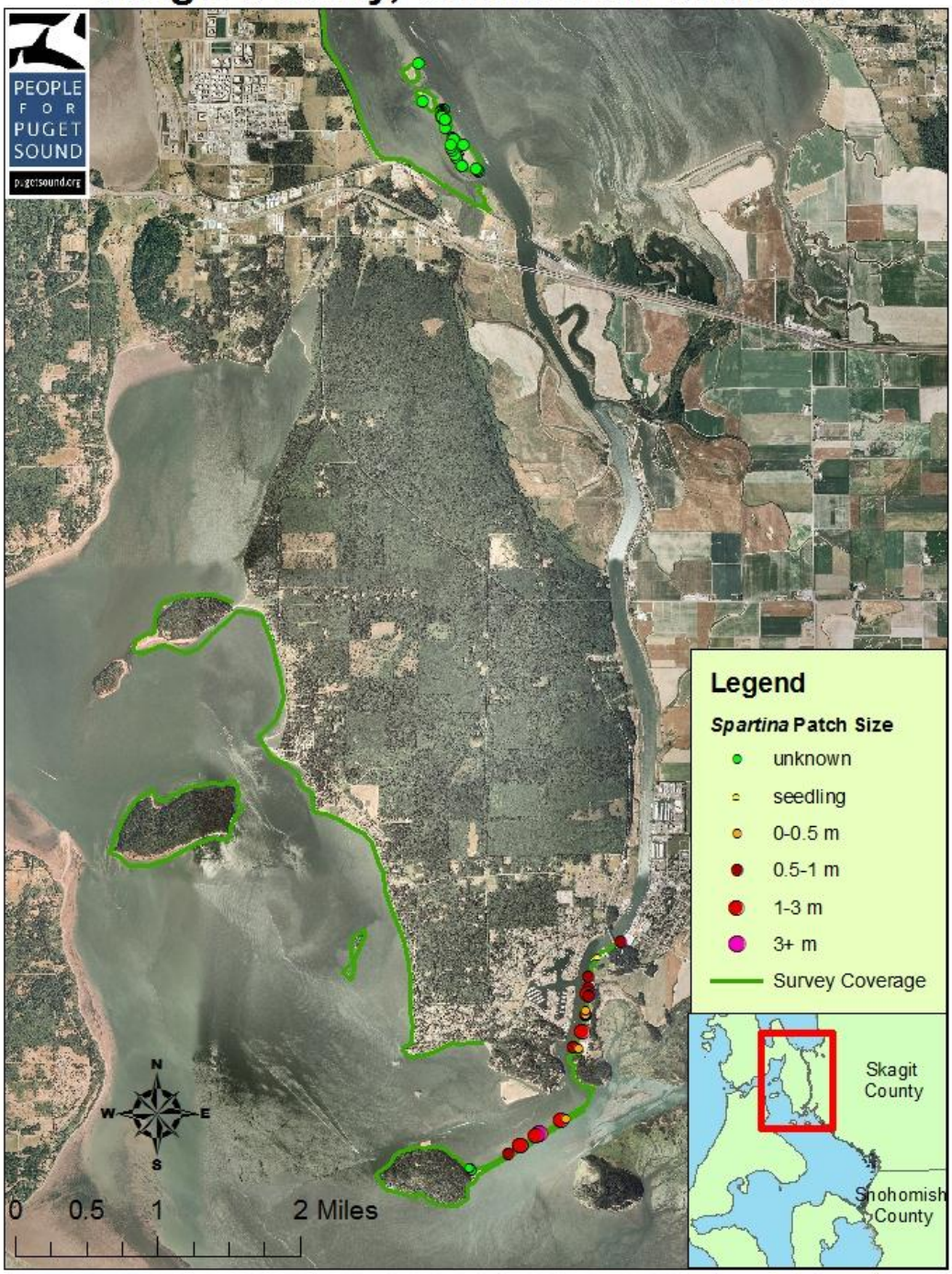


2011 *Spartina* Survey: Pierce County

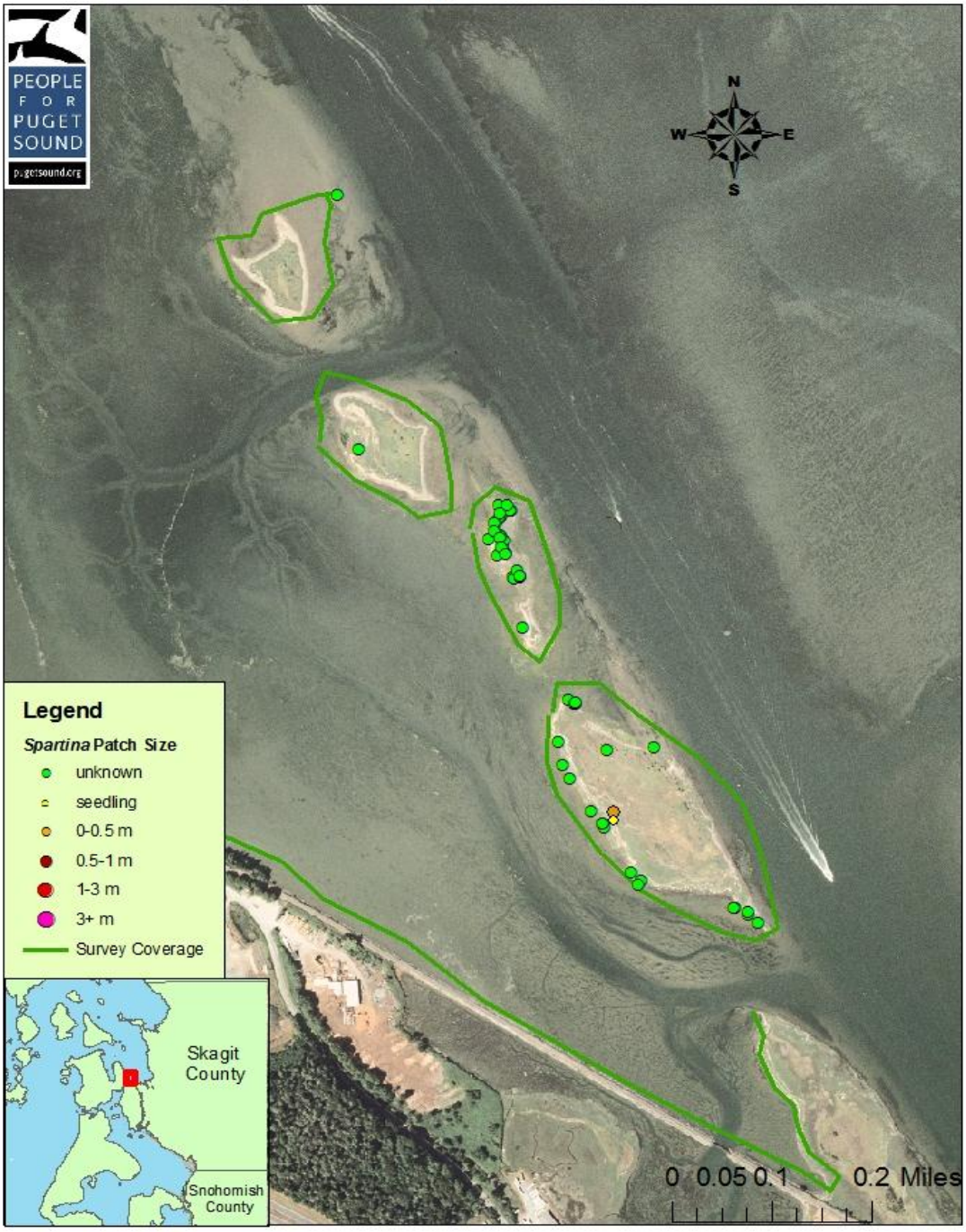
2011 *Spartina* Survey: Skagit County



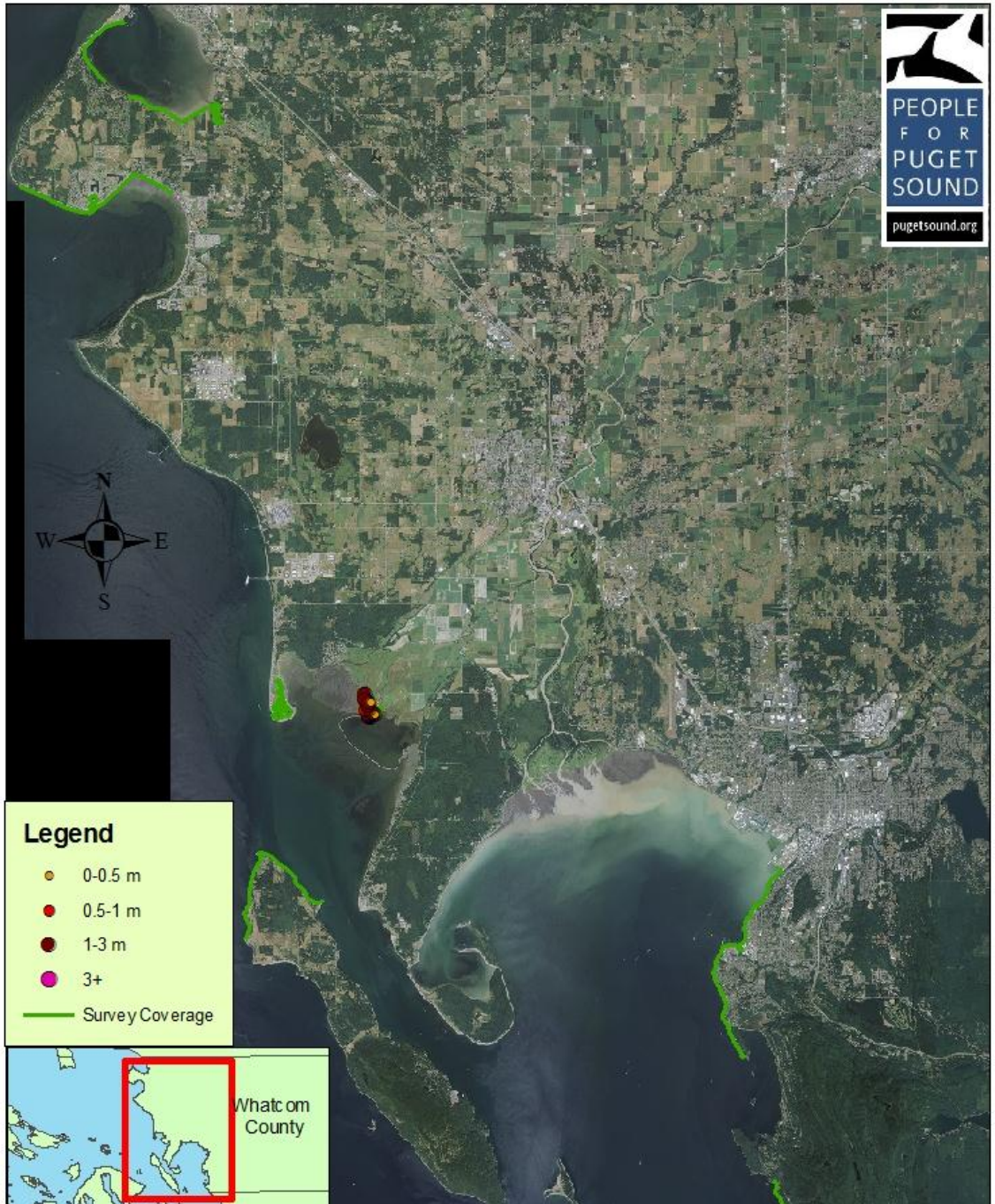
2011 *Spartina* Survey: Skagit County, Swinomish Channel



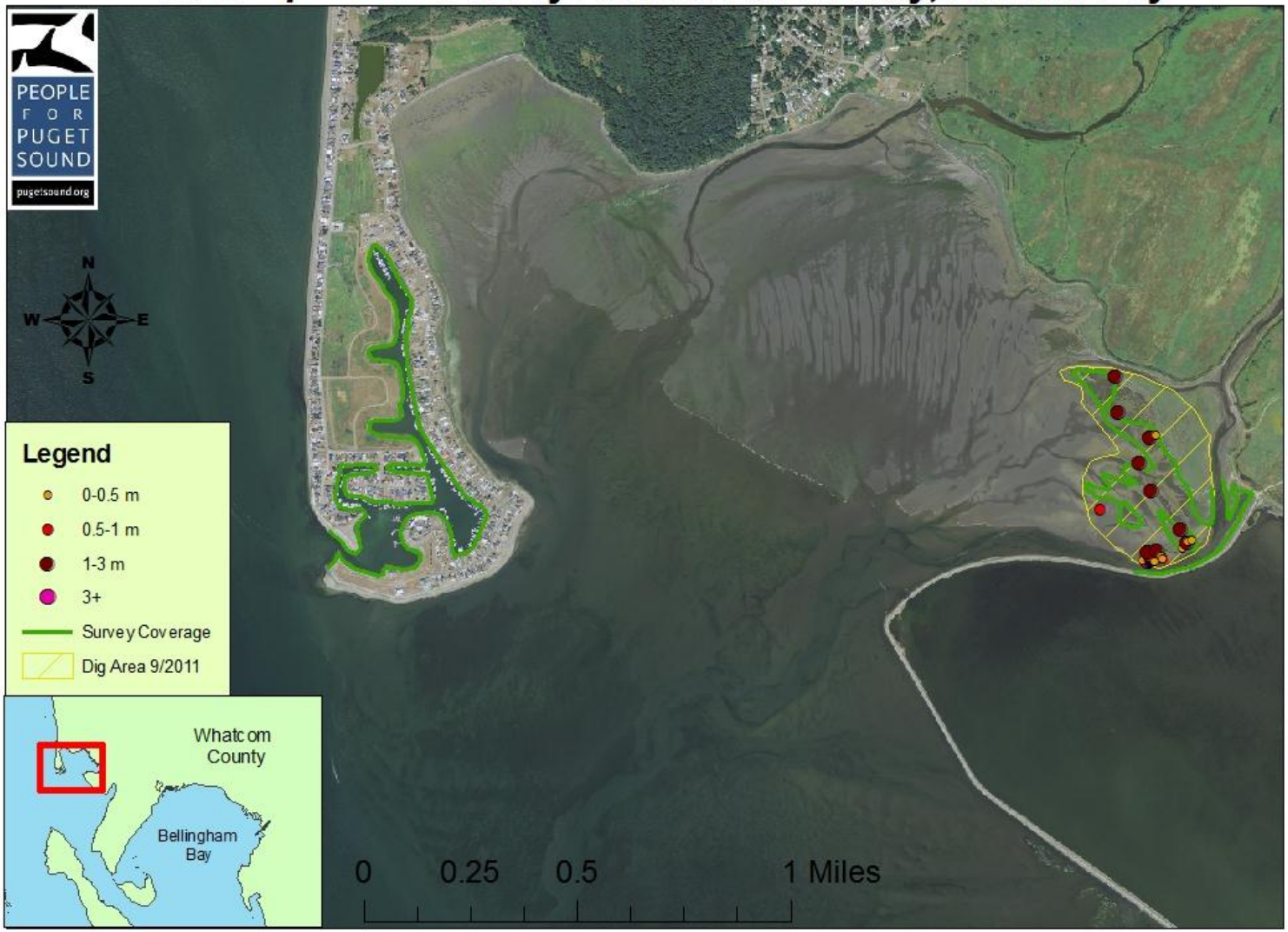
2011 *Spartina* Survey: Skagit County, Dredge Islands



2011 *Spartina* Survey: Whatcom County



2011 *Spartina* Survey: Whatcom County, Lummi Bay



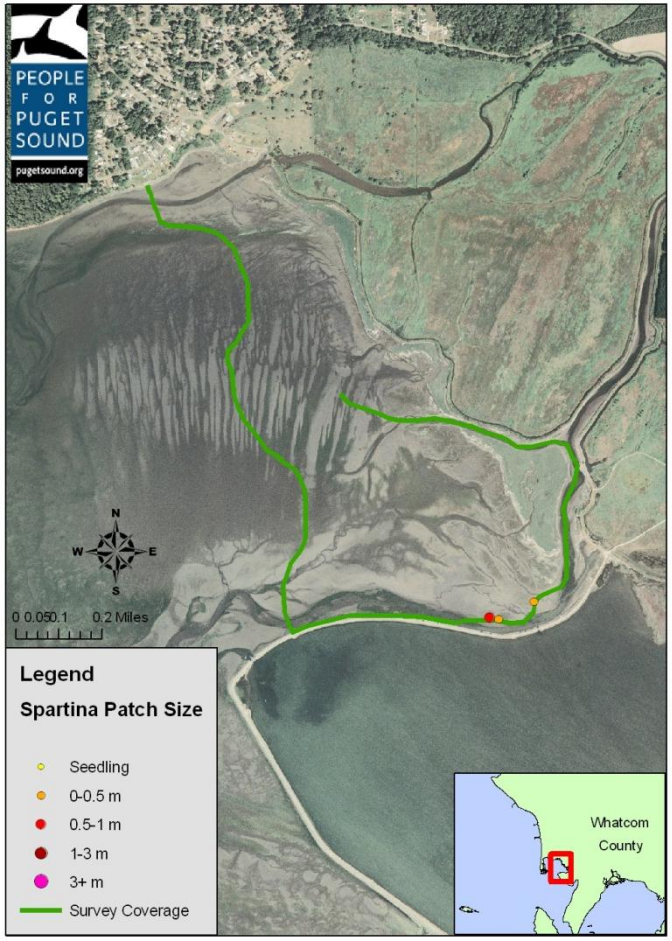
APPENDIX 3: DREDGE ISLANDS SURVEY HISTORY

2010 *Spartina* Survey: Dredge Islands, Skagit County

2011 *Spartina* Survey: Skagit County, Dredge Islands

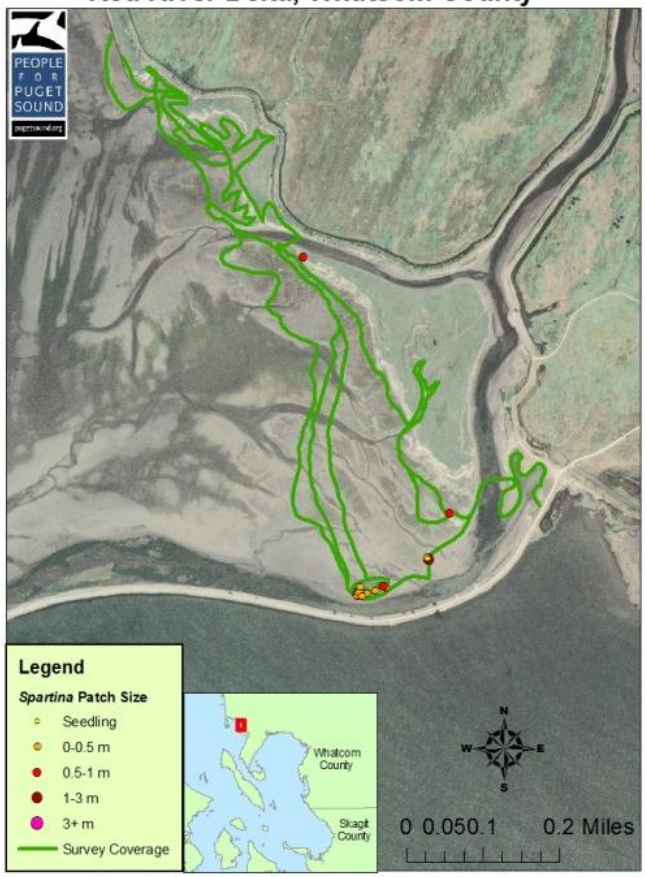
APPENDIX 4: RED RIVER DELTA SURVEY HISTORY

Red River Delta 2008 *Spartina* Survey



2009 Spartina Survey: Red River Delta, Whatcom County

2010 *Spartina* Survey:
Red River Delta, Whatcom County



2011 *Spartina* Survey: Whatcom County, Lummi Bay