Spartina Eradication Program
2013 Progress Report

Washington State Department of Agriculture

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Cover photo provided by Mackenzie Watson (WSDA)
Other photos provided by Dave Heimer, Les Holcomb (WDFW).

Cover Photo: Clone of *Spartina anglica* found in Fisherman Bay, Lopez Island, San Juan County.

AGR PUB 809-406 (N/3/14)

PROGRESS OF THE 2013 *SPARTINA* ERADICATION PROGRAM

March 2014

Washington State Department of Agriculture

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Concepts or Definitions used in this report:

Solid Acres	A measure of how many acres a dispersed population would occupy if all *Spartina* plants were grouped together.
Affected Acres Treated	A measure of how many acres had one or more *Spartina* occurrence points.
Spartina Occurrence Point	Any *Spartina* identified within approximately one square meter.
Survey/Treatment Lap	Refers to a single detailed survey of all susceptible habitat in the referenced area.
Surveyed Acres	A measure of how many acres were surveyed for *Spartina,* a minimum of once, during a given year.
Site Eradication Criteria	Requires that six consecutive negative survey events occur over the course of three or more years. Also specifies that a maximum of two qualifying negative survey events can occur in any year.

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Executive Summary

Washington State Department of Agriculture (WSDA) has served as the lead state agency for the eradication of invasive *Spartina* since 1995. WSDA facilitates the cooperation of local, state, federal, and tribal governments; universities; interested groups; and private landowners responsible for the tremendous success of the program. From a statewide high of over 9,000 solid acres infested in 2003, the program has reduced *Spartina* to a projected seven solid acres in 2014. These final, seven solid acres are a collection of individual plants and small clumps spread along thousands of miles of shoreline in the Puget Sound, around the Olympic Peninsula, and estuaries along Washington State's Pacific Coast.

Spartina, commonly known as cordgrass, is an aggressive noxious weed that has severely disrupted the ecosystems of native saltwater estuaries in Washington State. Left unchecked, *Spartina* out competes native vegetation and converts mudflats and estuaries into monotypic *Spartina* meadows. As a result, important migratory shorebird and waterfowl habitats are lost, the threat of flooding is increased, and the state's shellfish industry is severely impacted.

The next two years will be pivotal as the cooperators continue to survey the intertidal waters of Washington State to find and eradicate the remaining infestations. WSDA remains confident that with continued funding the goal of eradication can be reached. Figure 1 is a projection of *Spartina* reduction within Washington State over the next two years assuming continued funding.

Specific knowledge regarding the distribution and extent of invasive *Spartina* within Washington State is fundamental to a successful eradication program. In 2013, as part of an increasingly detailed survey effort, project partners inspected over 80,000 acres of saltwater estuaries and more than a thousand miles of shoreline in 14 counties for evidence of *Spartina*. As part of this effort in 2013 the cooperators found and recorded 14,567 *Spartina* occurrence points. This eradication program is an unprecedented success story; however, the last few acres of *Spartina* will by far be the most difficult to find and eradicate.

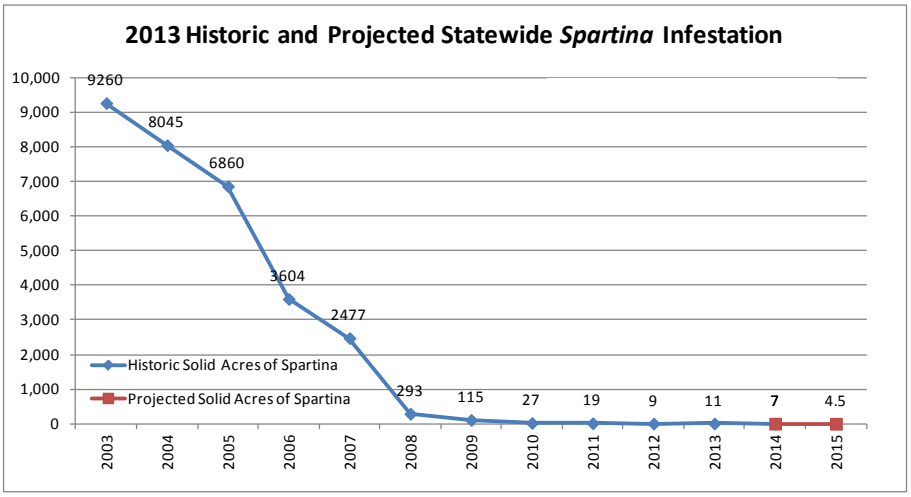

Figure 1: Solid acres of *Spartina* by year statewide based on WSDA estimates. The blue line represents historic *Spartina* infestation since 2003. The red line indicates the projected *Spartina* infestation level through 2015. Projection assumes continued funding.

Pacific County

The 2013 Pacific County treatment program was a success with all known infestations treated. The cooperators' combined 2013 Pacific County effort located and treated 1.02 solid acre of *Spartina* (2,258 occurrence points), which is a 36% reduction from the 1.6 solid acres treated in Pacific County during the 2012 season. In 2013, the program continued to eradicate the scattered infestations and individual plants remaining throughout the bay. WSDA estimates that 0.6 solid acre of *Spartina* will remain in Pacific County during the 2014 treatment season.

Grays Harbor County

In 2013,WSDA, Washington State Department of Fish and Wildlife (WDFW), and United States Fish and Wildlife Service (USFWS) cooperatively treated all known infestations. During the 2013 season, a total of 0.0032 solid acre of *Spartina* was found and treated. Of the 0.0032 solid acre treated in Grays Harbor County, 0.0008 solid acre were *S. alterniflora* (69 points) and 0.0024 solid acre were *S. densiflora* (209 points). This is an 85% decrease from the approximate 0.021 solid acre of *Spartina* treated in Grays Harbor County during the 2012 season. WSDA estimates that 0.002 solid acre of *Spartina* will remain in Grays Harbor County during the 2014 treatment season.

Puget Sound Counties

In 2013, approximately 10 solid acres of *Spartina* representing 12,031 occurrence points was found and treated in Puget Sound counties. This represents a 35% increase from the 7.4 solid acres located in 2012. A number of factors contributed to the increase in *Spartina* found, including: the most detailed survey to date, increased access to infested lands, increased funding for staff in the Puget Sound and the use of Puget SoundCorps (PSC) crews (see appendix A). WSDA estimates that fewer than 7 solid acres of *Spartina* will remain in Puget Sound in 2014.

2013 Trends

Recognizing that 90% of the state's remaining *Spartina* infestation was contained within Puget Sound counties the cooperators increased emphasis on the Puget Sound infestation in 2013. Washington State Department of Natural Resources (DNR) funded PSC crews were made available in Snohomish, Skagit and Island counties. Increased funding was also provided to the WDFW Puget Sound crew to survey and treat the most heavily infested areas of Snohomish and Island counties. With the additional staff and funding, the North Puget Sound cooperators were able to expand their eradication efforts resulting in an increase in the amount of *Spartina* found and treated compared to 2012.

An encouraging development is depicted in Figure 2 where 12 new black triangles represent previous *Spartina* infestations declared eradicated in 2013. Four sites previously declared eradicated were found to contain small populations in 2013. This brings the total number of previously infested sites declared eradicated to 21.

The next two years will be pivotal as the cooperators continue to survey the vast intertidal waters of Washington State to find and eradicate the remaining infestations. Continued funding is imperative during the coming years to meet the program's goal of eradicating *Spartina*.

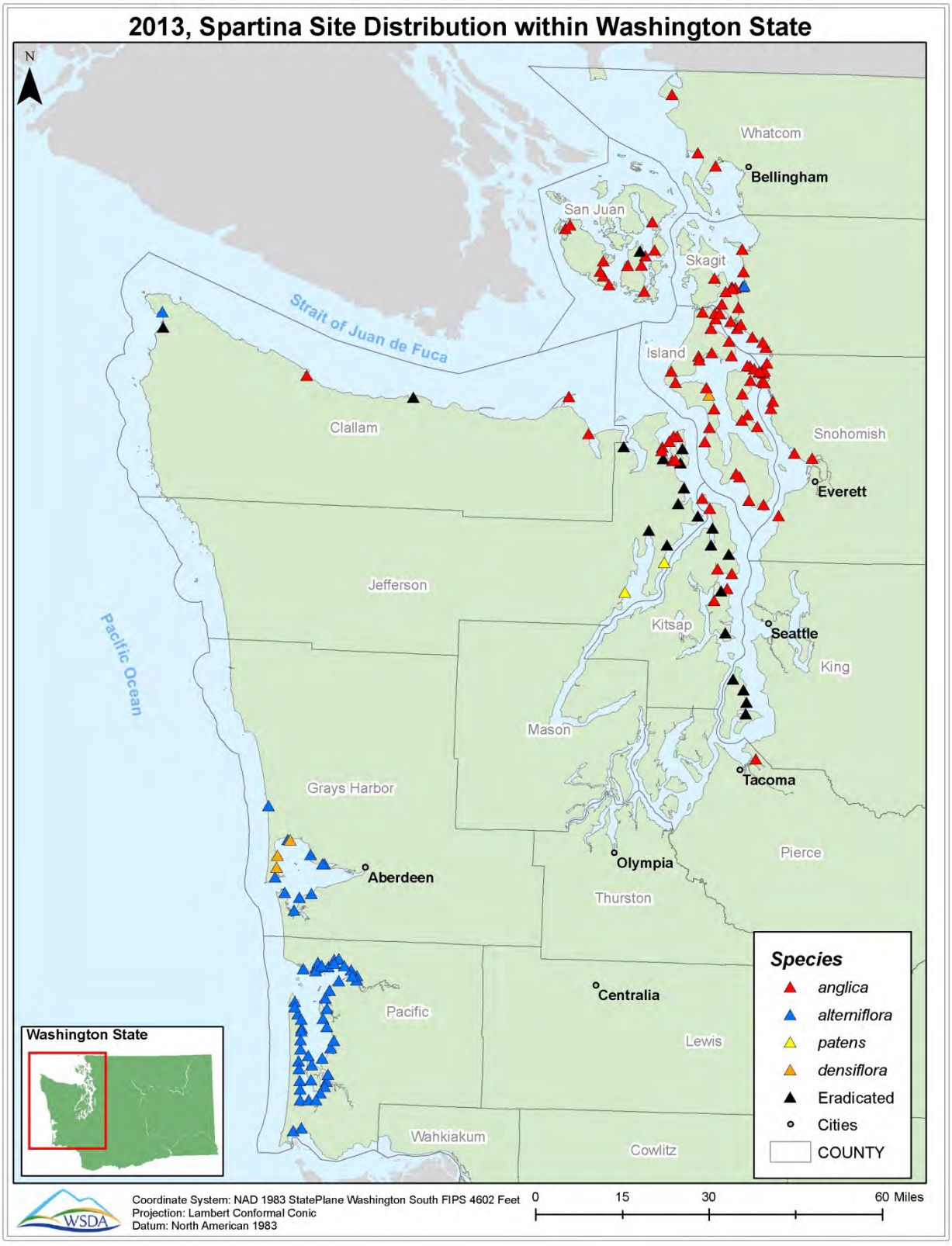

Figure 2: Distribution of invasive *Spartina* sites in Washington State, 2013.

Spartina Eradication Program

WSDA *Spartina* Program

In 2013, the WSDA *Spartina* Eradication Program worked collaboratively with partner agencies to continue *Spartina* eradication.

WSDA hired, equipped, and managed personnel to survey and treat infestations in Whatcom, San Juan, Clallam, Jefferson, King, Pierce and Kitsap counties; assisted the Swinomish, Suquamish, Makah, Puyallup, and Tulalip tribal communities and the noxious weed control boards in Skagit, Snohomish, and Island counties with eradication work; worked cooperatively with WDFW, Washington State Department of Ecology (DOE), and the USFWS in Puget Sound and Grays Harbor County; worked cooperatively with the DNR, WDFW, USFWS, The Nature Conservancy (TNC), the Shoalwater Tribe, Pacific County, the aquaculture industry, University of Washington, and Washington State University (WSU) on infestations in Pacific County.

WSDA continued to administer the Department of Ecology National Pollutant Discharge Elimination System (NPDES) general permit required for *Spartina* eradication activities.

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

In 2013, WSDA continued to allocate funding for resources and *Spartina* work crews in counties with the majority of the infestations. In Willapa Bay, $150,000 was designated for Pacific County to continue the transition toward greater county involvement. In the Puget Sound, WSDA provided resources totaling $193,500 by entering into agreements with the noxious weed control boards in Skagit, Island, Whatcom, and Snohomish counties, the Swinomish Tribe, and WDFW. WSDA staff participated in field activities throughout the control season and facilitated coordination meetings to ensure contract priorities were addressed. WSDA continued working with WDFW, DNR, WSU, and USFWS to explore the potential for restoration of once-infested tidelands to functioning shorebird and waterfowl habitat.

During 2013, WSDA participated in ongoing efforts related to the West Coast Governors' Agreement on Ocean Health. In this agreement the governors of Washington, California, and Oregon committed to eradicate all non-native *Spartina* on the western U.S. coast by 2018. As part of this agreement, knowledge and developments are actively shared with representatives from the three states, federal government, tribal governments, non-governmental organizations, and the Province of British Columbia. The continued high level of intergovernmental cooperation will aid ongoing eradication programs and enhance future control efforts.

A key accomplishment during the 2013 season occurred when WDFW and WSDA staff consulted with and assisted our British Columbia and Whatcom County partners to address cross-border *Spartina* eradication needs. The results of this collaboration and the continued cooperation between Ducks Unlimited Canada and the British Columbia Ministry of Environment led to the first ever aquatic herbicide treatments in British Columbia. Due to the proximity of the Canadian infestation to the northern border of Washington State, the importance of British Columbia implementing a well funded and successful *Spartina* eradication program is vital to the Pacific Coast States ability to effectively eradicate *Spartina*.

Additionally, an opportunity was provided to the Puget Sound partners during the 2013 summer *Spartina* survey season. With funding appropriated to the Washington State Department of Natural Resources (DNR) through the Jobs Now Act of 2012, Puget SoundCorps (PSC) crews were established and employed to assist cooperators in a variety of projects including riparian weed control and *Spartina* survey and eradication. With the additional personnel, the cooperators were able to expand the *Spartina* eradication effort into new areas and provide increasingly detailed surveys in active infestation sites. Consequently, the PSC crew contribution to the 2013 Puget Sound *Spartina* control effort resulted in an increase in the amount of *Spartina* found and treated. The Puget Sound partners appreciate the opportunity provided by the DNR to work with the PSC crews and are optimistic that the crews will be available for future noxious weed control surveys. For more information on PSC crew involvement and funding background please see appendix A of this report.

Budget

WSDA allotted $1.8 million of the appropriation from the Aquatic Lands Enhancement Account (ALEA) for statewide *Spartina* activities during the 2013-2015 biennium. Table 1 describes how WSDA allocated funds to conduct *Spartina* survey and eradication activities throughout Western Washington.

Table 1: WSDA *Spartina* Budget Activity – FY14 and FY15

Activity	Fiscal Year 2014 (July 1, 2013 thru June 30, 2014)	Fiscal Year 2015 (July 1, 2014 thru June 30, 2015)	Biennial Totals (July 1, 2013 thru June 30, 2015)
WSDA Eradication & Coordination Activities	$472,000.00	$480,000.00	$952,000.00
Purchased Services			
Pacific County	$150,000.00	$150,000.00	$300,000.00
Skagit County	$25,000.00	$25,000.00	$50,000.00
Island County	$50,000.00	$50,000.00	$100,000.00
Snohomish County	$50,000.00	$50,000.00	$100,000.00
Whatcom County	$2,500.00	$2,500.00	$5,000.00
Swinomish Tribe	$6,000.00	$6,000.00	$12,000.00
WDFW Puget Sound	$60,000.00	$60,000.00	$120,000.00
WDFW Pacific County	$20,000.00	$20,000.00	$40,000.00
WDFW Grays Harbor	$20,000.00	$40,000.00	$60,000.00
DNR State Wide	$0.00	$40,000.00	$40,000.00
Currently Unobligated	$0.00	$60,000.00	$60,000.00
Totals	**$855,500.00**	**$983,500.00**	**$1,839,000.00**

Notes for Table 1:

1. WSDA Eradication and Coordination Activities: Expenses include WSDA eradication, survey, restoration activities, salaries and benefits, herbicide, equipment, travel, legal fees, public notification expenses and other goods and services.
2. Purchased Services: WSDA interagency agreements and intergovernmental agreements to accomplish *Spartina* eradication goals.

Other agencies received additional funding for *Spartina* activities during the 2013-2015 biennium. This funding is provided from ALEA, federal agreements, grants and other sources. Table 2 documents additional funds, as reported to WSDA, available to conduct *Spartina* survey and eradication activities in Western Washington.

Table 2: Other Agencies *Spartina* Budget Activity – FY14 and FY15

Agency	Fiscal Year 2014 (July 1, 2013 thru June 30, 2014)	Fiscal Year 2015 (July 1, 2014 thru June 30, 2015)	Biennial Totals (July 1, 2013 thru June 30, 2015)
WDFW Spartina Activities	$250,000.00	$240,000.00	$490,000.00
WDFW Grays Harbor	$74,000.00	$74,000.00	$148,000.00
DNR Spartina Activities	$290,000.00	$290,000.00	$580,000.00
USFWS Willapa Refuge	$65,000.00	$10,000.00	$75,000.00
Totals	**$679,000.00**	**$614,000.00**	**$1,293,000.00**

Spartina Eradication Effort by County

Overview

For programmatic purposes, this geographic region encompasses all tidally influenced shoreline waters of Whatcom, San Juan, Skagit, Island, Snohomish, Kitsap, King, Pierce, Thurston, Mason, Jefferson, Clallam, Pacific and Grays Harbor counties. There are approximately 3,000 miles of tidal shoreline in these waters. Along the shores of these counties four species of *Spartina* are found: *Spartina anglica, Spartina alterniflora, Spartina densiflora* and *Spartina patens* (Fig.3). Figure 2, page 3 depicts the current distribution and species occurrence of *Spartina* within Washington State.

S. alterniflora (Smooth Cordgrass or Saltmarsh Cordgrass) is currently found in Pacific, Grays Harbor, Skagit and Clallam counties. This species was unintentionally introduced to Pacific County (Willapa Bay) during the late 1800's where it spread to more than 8,500 solid acres by 2003. The extent of the infestation in Willapa Bay spurred one of the largest and most successful estuarine eradication programs in the nation's history. Subsequent aerial surveys were conducted in Grays Harbor and the Olympic Peninsula in 1995 which discovered another 10-15 solid acres. Through dedicated funding and aggressive eradication efforts by local, state, and federal agencies, only 1 solid acre of *S. alterniflora* remains in all affected counties, representing a 99.9% reduction from the 2003 peak.

S. anglica (Common Cordgrass) was introduced to Snohomish County in 1961 and the infestation increased to a peak of more than 1,000 acres by 1997. This introduction quickly spread to Skagit and Island counties and to a lesser extent the counties of Whatcom, San Juan, Clallam, Jefferson, King, and Kitsap. A small infestation (60 ft^2) was also discovered in Pierce County in 2010 near the Port of Tacoma. This intentional introduction is also implicated in the Boundary Bay and Tsawwassen Delta *S. anglica* infestations in BC. Of these four species of *Spartina, S. anglica* is currently the most abundant and accounts for 90% of Washington State's infestation. As of 2013, the largest infestations of *S. anglica* are found within Snohomish (5.95 solid acres), Island (3.23 solid acres) and Skagit (0.76 solid acre) counties. Approximately 10 solid acres of *S. anglica* remain in the infested counties of Washington State representing a 99% reduction from the 1997 peak.

S. densiflora (Dense-Flowered Cordgrass) is an aggressive South American species discovered at Bills Spit in Grays Harbor and at Race Lagoon in Island County in the fall of 2001. This species exhibits bunchgrass type growth and blends in well with the native saltmarsh flora making survey and treatment difficult. Consequently, despite aggressive eradication efforts the infestation in Bills Spit showed an increase in solid acreage from 2008 (0.17 solid acre) to 2009 (0.28 solid acre). Cooperators also documented the continued spread of *S. densiflora* from Bills Spit to North Bay near the mouth of the Humptulips River. In 2009, a transect or grid system methodology was implemented in the heavily infested area of Bills Spit (Refer to the 2010 and 2011 WSDA *Spartina* reports). From 2009 to 2012 a 99% decrease in *S. densiflora* solid acreage was achieved using the transect methods. Since *S. densiflora* remains green year round, additional winter and spring surveys conducted north of Bills Spit to the mouth of the Humptulips River have also

contributed to the decline of *S. densiflora* solid acreages in Grays Harbor. During extensive surveys conducted in 2013, approximately 0.0024 solid acre (104.5 ft^2) of *S. densiflora* was manually removed by crews from WDFW and WSDA in Grays Harbor.

S. patens (Saltmeadow Cordgrass), also known as salt marsh hay, is a species of cordgrass native to the Atlantic Coast and was discovered in the 1990's at Dosewallips State Park (Jefferson County) on Hood Canal. Historically, Jefferson County has contained the only known infestation of *S. patens* in Washington State. During the 2013 season the WSDA survey crew discovered a new infestation of *S. patens* on Hood Canal across from Naval Base Kitsap-Bangor in Jefferson County on Toandos Peninsula. Due to this find occurring late in the season, and the need to notify and work with the Navy to gain access, this site was not treated during 2013. Recent successes coordinating with the Navy are encouraging; this new *S. patens* site will be a priority for survey and treatment in 2014. *S. patens*, like *S. densiflora*, also exhibits physical characteristics that blend in well with the native saltmarsh flora making survey and treatment difficult. In 2013, 0.04 solid acre of *S. patens* was treated representing a significant increase from the 0.0004 solid acre treated in 2012. Permission to access and survey private lands located near the Dosewallips State Park infestation explains the increase in solid acreage treated in 2013. In the future this site will require detailed survey and treatment efforts in order to achieve eradication.

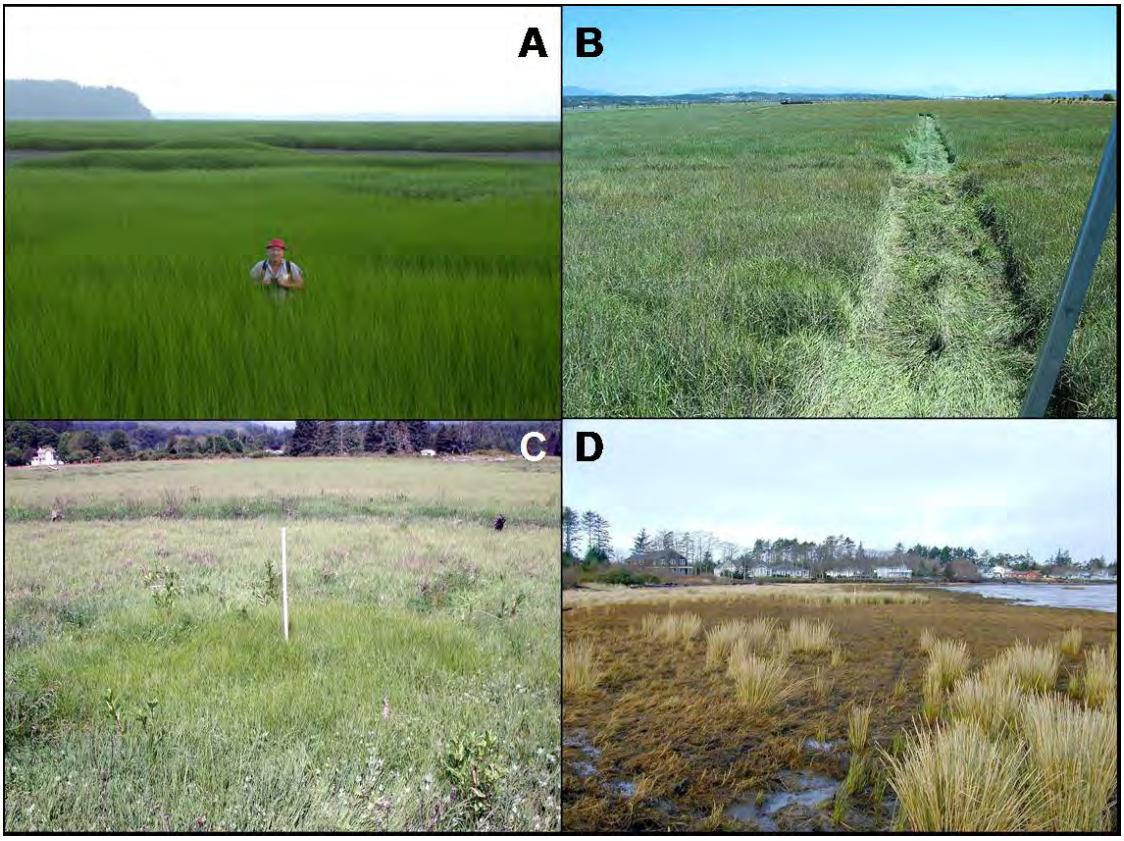

Figure 3: The four species of *Spartina* present in Washington. A) A meadow of *S. alterniflora* in Willapa Bay (2003), B) A meadow of *S. anglica* in Skagit Bay (2003), C) *S. patens* at Dosewallips (2001), and D) clones of *S. densiflora* in Grays Harbor County (2001).

With continued reductions in *Spartina* occurring statewide, an encouraging development for 2013 can be seen in Figure 2 page 3, where the 21 black triangles represent *Spartina* sites that have met the criteria for eradication. Eradication criteria have been developed in collaboration with the members of the West Coast Governors' Agreement on Ocean Health. The criterion requires that six consecutive negative survey events occur over the course of three or more seasons and that a maximum of two survey events can occur in any season. As the program approaches eradication, the need to evaluate if sites meet this criterion requires detailed tracking of the distribution and extent of the known infestation.

The 2013 control season was successful; below are some highlights of the 2013 treatment season. Following these brief highlights are detailed county by county reports.

- In 2013 - 12 additional *Spartina* sites were declared eradicated.
- King County is the first historically infested County to be declared eradicated after all County sites met the eradication criterion.
- Four monitor sites previously thought to be eradicated were found to contain small populations.
- One previously unknown *S. anglica* site was discovered on Blakely Island in the San Juan Islands.
- One previously unknown *S. patens* site was discovered in Jefferson County.
- DNR provided PSC crews; increasing both the area covered and the staff available to conduct detailed surveys in Snohomish and Skagit counties.
- Additional funds were provided to WDFW Puget Sound allowing the crew to increase *Spartina* activities in Snohomish, Skagit and Island counties.
- Approximately 11.02 solid acres of *Spartina* were located and treated in Washington State during 2013. This represents a 21% increase from the 9.1 solid acres treated in 2012. The PSC crews and additional funding provided to WDFW were key factors in locating this additional *Spartina*.
- The statewide survey was the most detailed to date. The cooperators continue to evaluate and refine the survey effort. In 2013 all infestations located on Washington State's Pacific Coast were treated. A few newly discovered infestations in Snohomish, Skagit and Jefferson counties were not treated as they were discovered late in the treatment season. These sites will be prioritized during the 2014 season.
- Location data was recorded, documenting the extent of the known infestation.
- The WSDA *Spartina* program has achieved over a 99% reduction in *Spartina* from the peak statewide infestation of more than 9,000 solid acres in 2003.

Pacific County

Spartina alterniflora is the only species of invasive *Spartina* infesting Pacific County. The overwhelming majority of *Spartina* in Pacific County lies within Willapa Bay. All of Willapa Bay was surveyed two or more times during the 2013 season, and all infestations located within Pacific County were treated. This season the program continued efforts aimed at eradicating the scattered infestations and individual plants remaining throughout the Bay.

WSDA estimates that, during the 2013 season, approximately 1.02 solid acres of *Spartina* remained in Pacific County. This estimate is based on the treatment data reported by the cooperators. Figures 4 and 5 identify areas of Willapa Bay treated and the cooperators conducting the treatments.

In 2013, the affected acres treated declined to 1,169 representing a 95% reduction from the peak of 25,430 affected acres recorded in 2009. This is a positive indication that the program is not only proving to be effective at reducing overall solid acres of *Spartina* but trending toward eradication in some areas of the county. With the large reduction in the infestation, manual removal of *Spartina* has become cost effective when limited numbers of single plants are present. This has allowed the cooperators to augment the eradication effort and extend the treatment season.

The decline in affected acres treated does not reduce the need to have a detailed monitoring program in place throughout the county. In 2013 the cooperators surveyed over 30,000 acres of potential *Spartina* habitat, most of it two or more times during the course of the season. The cooperators collected global positioning system (GPS) data for all known *Spartina* occurrence points in Pacific County. A *Spartina* occurrence point was roughly defined as 'any *Spartina* identified within approximately one square meter.' In 2013, the cooperator surveys yielded a combined total of 2,258 *Spartina* occurrence points, with a vast majority of these points representing a single plant. This level of vigilance and documentation will be necessary during the coming years in order to achieve eradication.

Over the past ten years, the combined effort in Pacific County has been extremely effective and has reduced the overall infestation from a high of 8,500 solid acres in 2003 to 1.02 solid acres in 2013. This is an overall reduction of 99.9% achieved in nine treatment seasons. If the 2013 treatment season meets expectations and achieves an overall efficacy of 40% or greater, WSDA estimates that 0.6 solid acre of *Spartina* will be present in Pacific County during the 2014 treatment season.

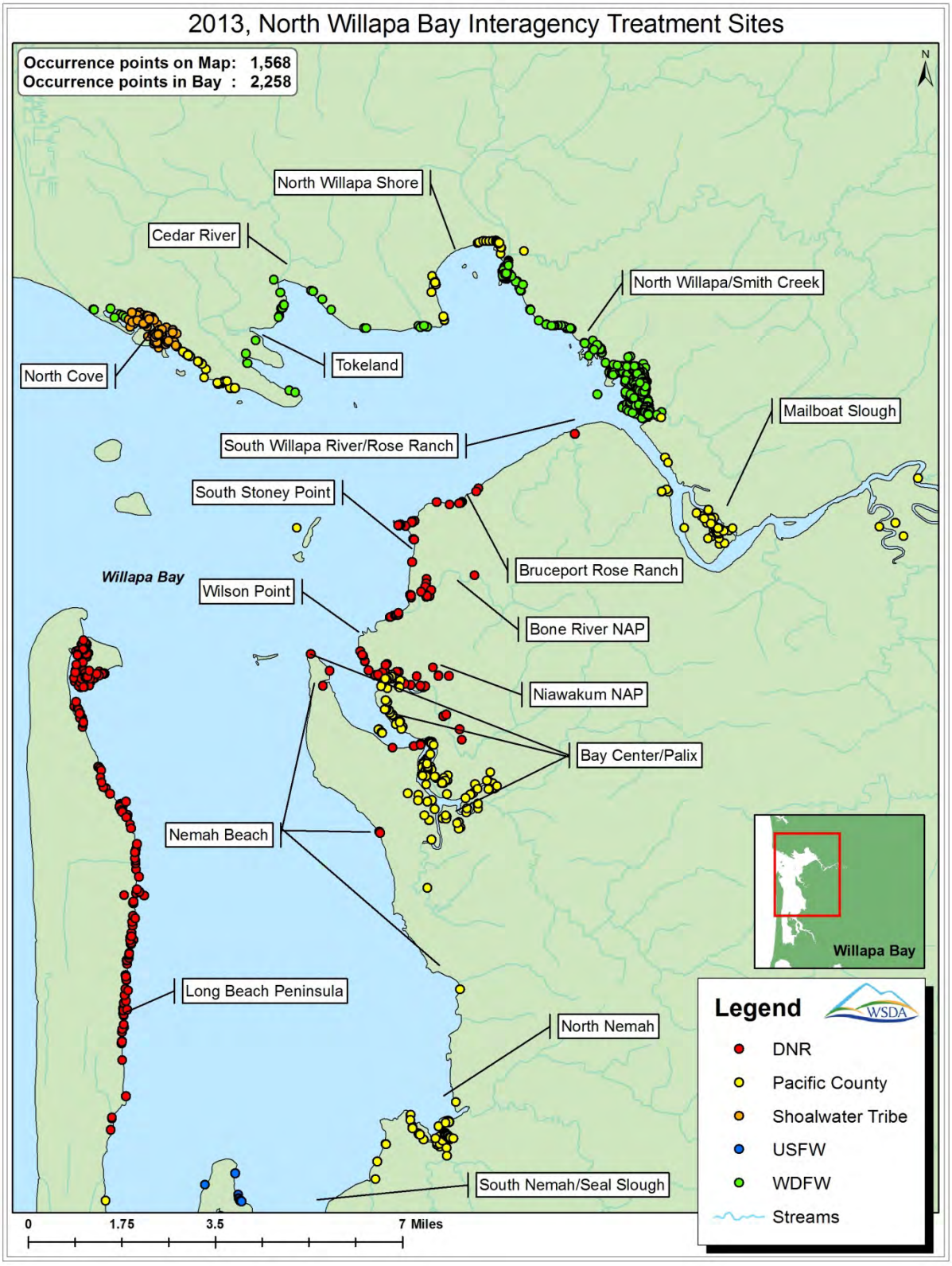

Figure 4: 2013 North Willapa Bay interagency *Spartina* treatment sites.

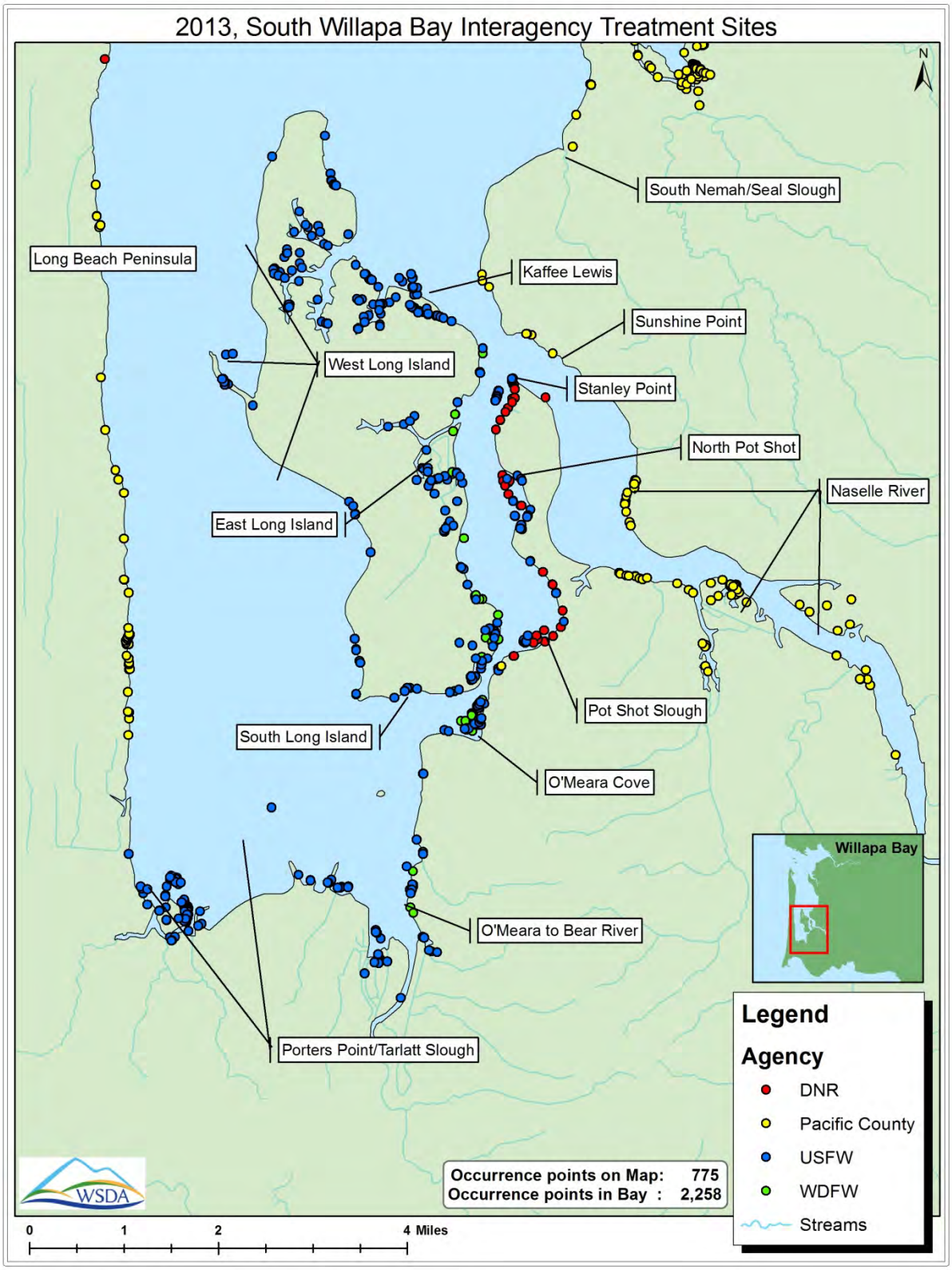

Figure 5: 2013 South Willapa Bay interagency *Spartina* treatment sites.

Roles of Cooperators in Pacific County for 2013

- **WSDA** – Provided resources, equipment, and herbicide to WDFW and Pacific County to ensure proper treatment of all sites. Administered a $300,000 contract with Pacific County and a $40,000 contract with WDFW for eradication activities during the current biennium.

- **DNR** – Conducted eradication activities in Columbia River, Palix River, Nemah Beach, Wilson Point, Naselle River, Rose Ranch, Stony Point, South Willapa River, and the Natural Area Preserves. DNR also cooperatively treated the Long Beach Peninsula with Pacific County.

- **WDFW** – Conducted eradication activities from Toke Point to the Willapa River Meadow.

- **USFWS** – Conducted eradication activities on Long Island and from the Stanley Point area south to the northern boundary of the Tarlatt Slough treatment area.

- **Pacific County –** Conducted eradication activities on the Long Beach Peninsula in cooperation with DNR. Treated Ellan Sands, North Nemah, South Nemah, and Seal Slough. Conducted treatments between North Cove and Toke Point in cooperation with the Shoalwater Tribe. Pacific County also cooperatively treated the Palix River and Bay Center areas with DNR. Provided staff time to conduct Class A Noxious Weed compliance activities for *Spartina alterniflora*.

- **Shoalwater Tribe –** Worked closely with state and federal partners. Provided staff time to evaluate previous treatments and consult regarding 2013 activities. Conducted eradication activities on tribal-owned lands between North Cove and Toke Point in cooperation with Pacific County.

- **TNC –** Worked closely with the cooperators in the Technical Committee. Cooperated with Pacific County to treat Ellsworth Slough in the Naselle River.

Pacific County Recommendations

With the successes of the past 10 years and the massive reductions of *Spartina* in Pacific County, continued support and funding are more important than ever. The transition from the large-scale treatments of meadows has required an increase in the numbers of personnel on the ground to give individual attention to areas that helicopters or large machines were previously able to cover in a relatively short amount of time. As the large meadows have broken up into small, scattered plants under the pressure of eradication, the amount of herbicide needed to treat the infestation has declined. Manual removal of *Spartina* has become cost effective, in some areas, and provides for a longer treatment season. This programmatic shift has resulted in lowered herbicide costs and increased labor costs. Under this regime, WSDA anticipates the overall cost of re-treating scattered infestations in 2014 will not differ significantly from the cost of conducting the previous large-scale applications. Furthermore, it is anticipated that with continued programmatic success the cost of conducting *Spartina* eradication in Pacific County in 2014 and beyond will begin to decrease. With the successful eradication of over 8,000 solid acres of *Spartina* in Pacific County over the past ten years, it is critical that program continuity is maintained.

Figure 6 is a projection of *Spartina* reduction within Pacific County over the next two years with continued funding.

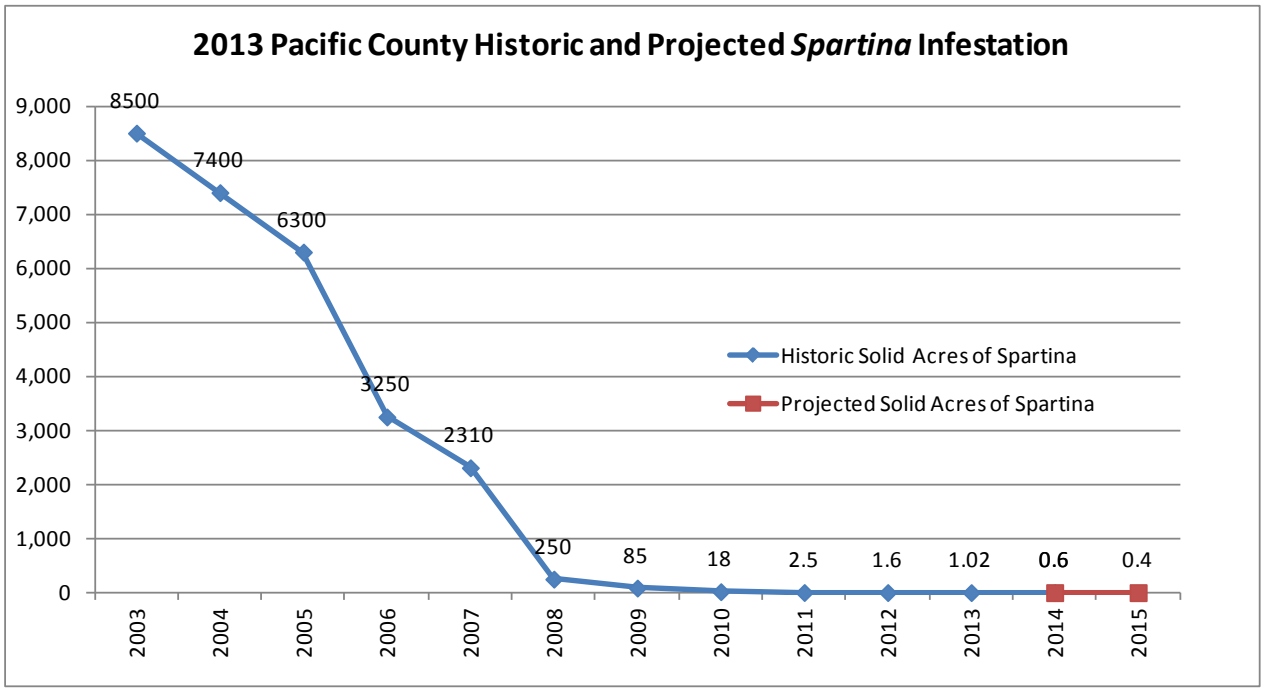

Figure 6: Solid acres of *Spartina* in Pacific County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2015. Projection assumes continued funding.

Grays Harbor County

Two species of *Spartina* infest Grays Harbor County. Historically the most prevalent species was *Spartina alterniflora*, discovered in the early 1990's. The most prevalent species in 2013 was *Spartina densiflora,* discovered in 2001. *S. densiflora* is a South American cordgrass species that tends to grow higher in the intertidal zone and blends in well with native grasses. Unlike the other invasive *Spartina* species in Washington State *S. densiflora* remains green year round. The project partners have determined that this trait makes it most effective to survey for *S. densiflora* in the late fall to early spring when the surrounding native species are senesced. These 'winter surveys' have resulted in an increased rate of *S. densiflora* detection and eradication.

In 2013, with the opportunity furnished by continued federal funding from the USFWS Nisqually National Wildlife Complex and approximately $100,000 in state funds, crews from WSDA and WDFW completed two survey laps of Grays Harbor. The crews found and treated approximately 140 ft^2 (0.0032 solid acre) of *Spartina* within Grays Harbor County. (Figure 7) Of this total, roughly 35 ft^2 (0.0008 solid acre) were *S. alterniflora* and 105 ft^2 (0.0024 solid acre) were *S. densiflora.* This is an 85% reduction from the approximate 915 ft^2 (0.021 solid acre) of *Spartina* treated in 2012.

Survey and control work started in Grays Harbor County in 1995. However, due to the overwhelming size of the *Spartina* infestation in Pacific County, resources to conduct a comprehensive survey in Grays Harbor County were not available until 2005. An aerial survey in late summer of 2005 located an estimated 10 solid acres of *Spartina* and spurred an effort to undertake a more thorough survey and treatment program. The experience gained during the 2005 and 2006 treatment seasons led the project partners to conclude that a more aggressive effort was needed to achieve eradication in Grays Harbor County.

As a result, in 2007 staff from WSDA, USFWS and WDFW combined forces to achieve the most thorough survey and treatment in the harbor to that point. Approximately 25,000 acres of intertidal lands in Grays Harbor and its tributaries with the potential for *Spartina* infestation were surveyed. Additionally, a coastal aerial survey revealed a 0.7 solid acre infestation of *S. alterniflora* in Grass Creek and also a relatively large infestation of *S. alterniflora* just south of Cape Flattery. In the Bills Spit area of Grays Harbor a dense population of *S. densiflora* exists, therefore a transect or grid system methodology is used to maximize detection of *S. densiflora* plants hidden among native vegetation. Transect system methods are discussed in both the 2009 and 2010 WSDA *Spartina* reports.

Over the past eight years, the combined effort in Grays Harbor County has been extremely effective and reduced the overall infestation of *S. alterniflora* to less than 0.0008 solid acre from a high of approximately 10 solid acres in 2005 and reduced the overall infestation of *S. densiflora* to roughly 0.0024 solid acre from a high of 0.28 solid acre in 2009. This is a reduction of over 99% for each species. Because of the significant reductions of *Spartina* infesting Grays Harbor County, digging has become cost effective and has been the primary means of control since 2011. In fact, during the 2013 control season, digging was the only control technique utilized. However, if larger infested areas are located during future surveys herbicide treatments remain an option.

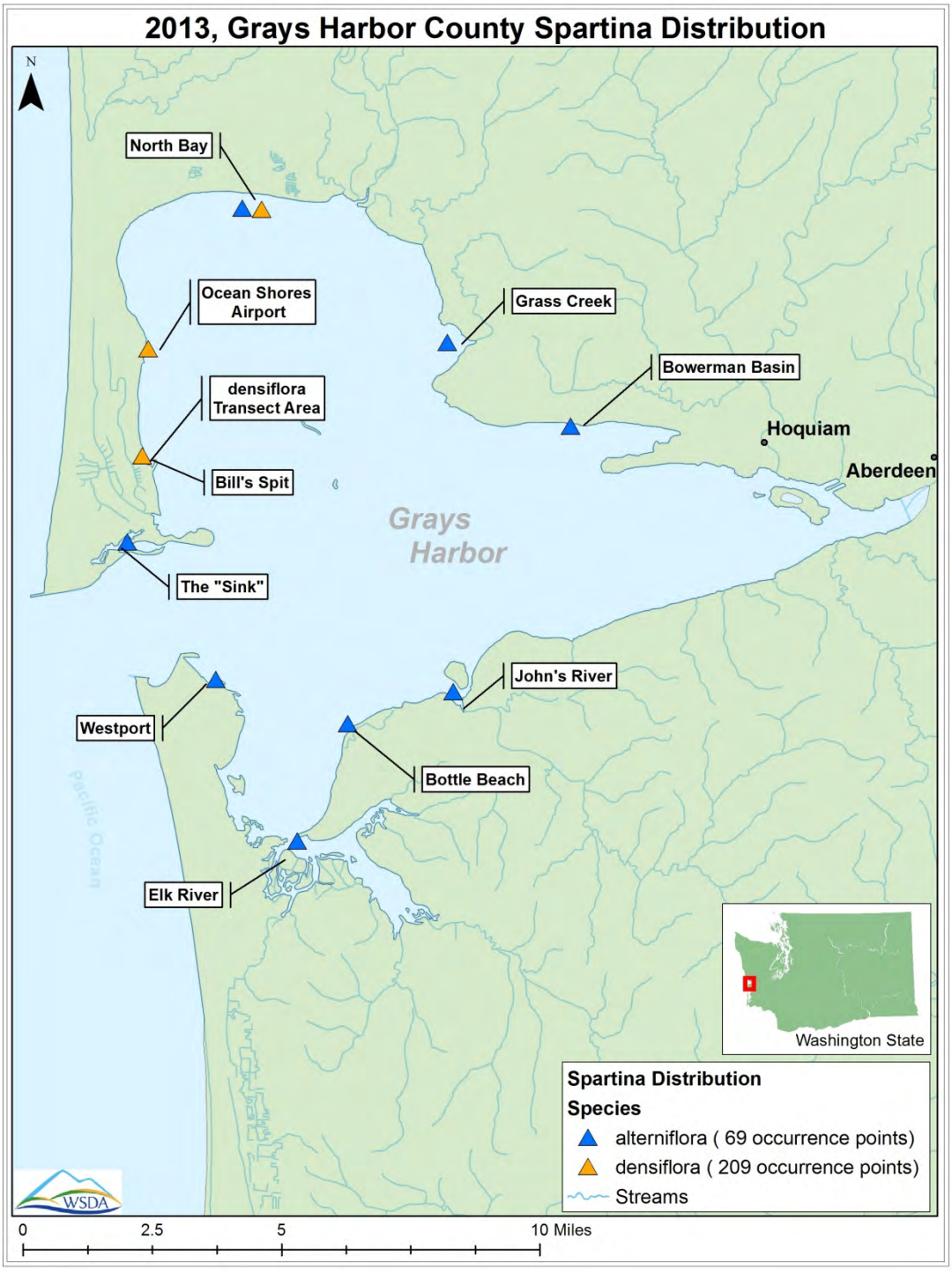

Figure 7. *Spartina* distribution *S. alterniflora* (blue) and *S. densiflora* (yellow), Grays Harbor County, 2013.

Grays Harbor County Recommendations

With the successes of the past nine years and the large reductions of *Spartina* in Grays Harbor County, continued support and funding are more important than ever. As clones have broken up into scattered plants under the pressure of the eradication effort, the amount of herbicide needed to treat the infestation has declined. Manual removal of *Spartina* has become cost effective and provides for a longer treatment season. This programmatic shift has resulted in lowered herbicide costs and increased labor costs. Under this regime, WSDA anticipates the overall cost of finding and controlling the scattered infestations in 2014 will not differ significantly from the previous costs of conducting the program.

After the success of the 2013 season, WSDA projects that less than 0.002 solid acre of *Spartina* will be present in Grays Harbor County during the 2014 treatment season (Figure 8).

Specific recommendations for the 2014 Grays Harbor County survey and treatment season include:

1) Conduct a minimum of two comprehensive survey/treatment laps throughout Grays Harbor County with emphasis on high salt marsh areas.
2) Conduct *S. densiflora* surveys utilizing transect methodology and advanced GPS technology in Bills Spit. Conduct winter *S. densiflora* surveys throughout Grays Harbor.
3) Integrate new GPS technologies such as iForm and cloud based data collection into all Grays Harbor County *Spartina* survey activities.
4) Continue to perform coastal surveys and extend the Grays Harbor survey well inland of the salt marsh and all the way to the main channels on the mud flats to insure that no outlying infestations are missed.

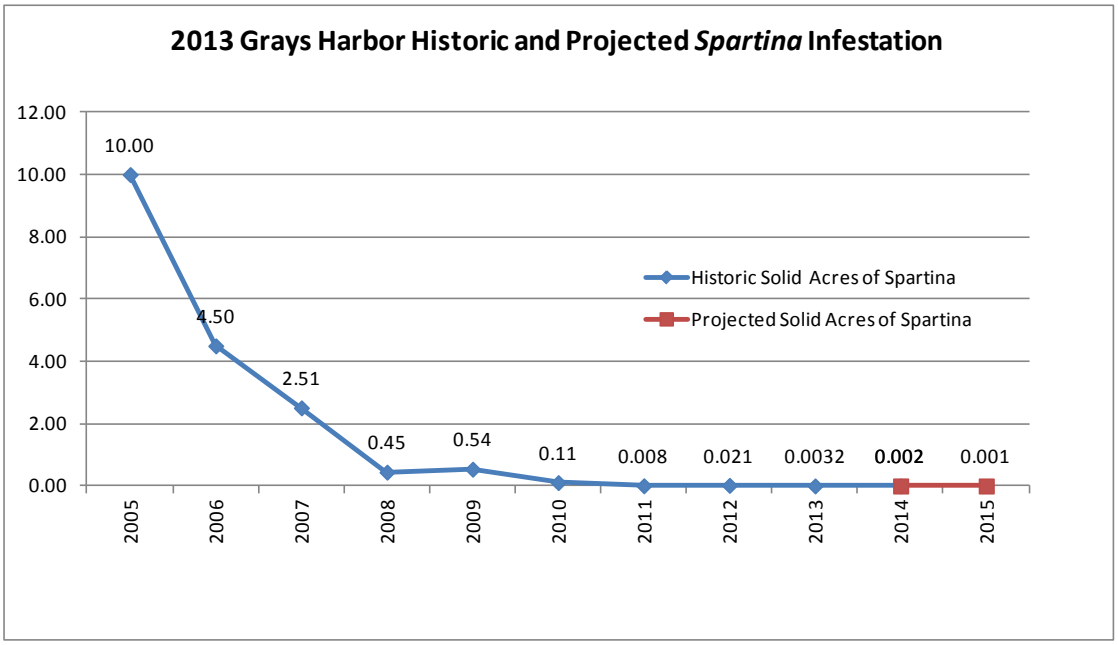

Figure 8: Solid acres of *Spartina* in Grays Harbor County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2005. The red line represents the projected *Spartina* area through 2015. Projection assumes continued funding.

Snohomish County

In 2013, the largest *Spartina* infestation in Washington State was located in Snohomish County. The Snohomish County Noxious Weed Control Board (SCNWCB), WDFW, TNC and the Tulalip Tribal Nation found and treated 5.95 solid acres (5,596 occurrence points) of *Spartina anglica* in 2013 (Figure10). This is a 61% increase from the 3.70 solid acres present in 2012. WSDA provided Snohomish County $50,000 for *Spartina* eradication activities in 2013.

The increase in solid acreage found is linked to increased funding for WDFW in the Puget Sound and the additional staff and resources made available by the Jobs Now Act of 2012. Puget SoundCorps (PSC) crews were employed to assist cooperators in a variety of projects including *Spartina* survey and eradication. For more information on PSC crew involvement and funding background please see appendix A of this report.

The majority of the infestation in Snohomish County was controlled by the WDFW where 4.45 solid acres of *Spartina* were found and treated. North Leque Island (3.15 solid acres) and the WDFW owned land located in Southeast Skagit Bay (1.30 solid acres) produced the largest amounts of solid acreage within Snohomish County.

SCNWCB controlled 0.96 solid acre in Snohomish County contained mostly within the South Skagit Bay area (0.77 solid acre) and the areas of South Pass East and Johnson's Dike (0.11 solid acre). SCNWCB also worked closely with the Tulalip Tribal Nation to treat 0.001 solid acre of *Spartina* within the Tulalip Bay tribal area in 2013. The 2013 effort in Tulalip Bay represents a 97% decrease from the 0.25 solid acre treated in 2011. Continued cooperation from the Tulalip Tribe is paramount in the efforts to eradicate *Spartina* from Snohomish County.

In addition, TNC treated (manual and chemical) 0.53 solid acre of *S. anglica* within their 4,100 acre saltmarsh located in the Port Susan Bay Preserve (PSBP) just south of Stanwood. TNC contracts with an EarthCorps crew of five to six individuals to survey and treat the vulnerable habitat within the PSBP. The 0.53 solid acre treated in 2013 represents a 79% reduction from the 2.56 solid acres treated in 2006. For the 2014 treatment season, TNC will continue to contract with EarthCorps to survey and treat the PSBP and will also coordinate with the SCNWCB to survey areas that are accessible only by boat.

For the 2014 treatment season, WSDA will assist the SCNWCB in the survey of problematic areas and areas accessible only by watercraft. These future cooperative efforts among partnering agencies in problematic areas will be paramount in the efforts to eradicate *Spartina* from Snohomish County.

Figure 9 is a projection of *Spartina* reduction within Snohomish County over the next two years with continued funding.

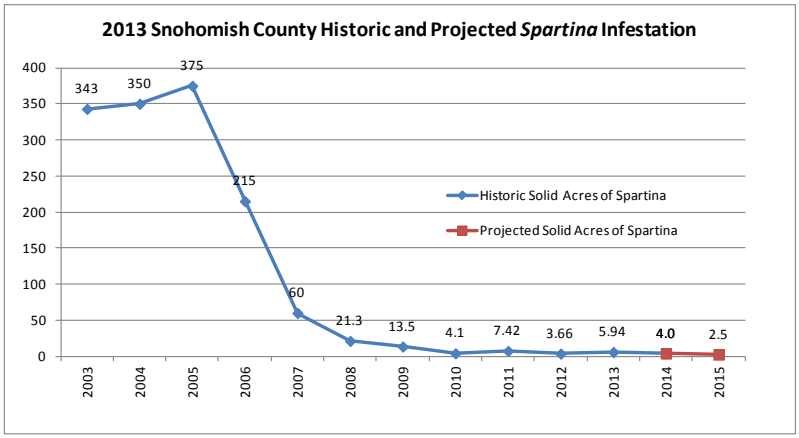

Figure 9: Solid acres of *Spartina* in Snohomish County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2015. Projection assumes continued funding.

Figure 10: 2013 Snohomish County *Spartina* distribution by species.

Island County

In 2013, Island County contained the second largest infestation of *Spartina* in the State. The Island County Noxious Weed Control Board (ICNWCB) and WDFW conducted the *Spartina* eradication work in Island County. A total of 3.23 solid acres of *Spartina* (*S. anglica*/*S. densiflora*) representing 4,531 occurrence points were found and treated in 2013 (Figure 12). This represents a 13% increase from the 2.86 solid acres treated in 2012. WSDA provided Island County $50,000 for *Spartina* eradication activities in 2013.

The increase in solid acreage found is linked to increased funding for WDFW in the Puget Sound and the additional staff and resources made available by the Jobs Now Act of 2012. Puget SoundCorps (PSC) crews were employed to assist cooperators in a variety of projects including *Spartina* survey and eradication. For more information on PSC crew involvement and funding background please see appendix A of this report.

ICNWCB and its contractor Wildlands Management controlled the major *Spartina* infestations and seed sources on Whidbey Island in 2013. 0.81 solid acre of *Spartina* were treated by Wildlands Management throughout Island County in 2013. This represents a 25% decrease from the 1.08 solid acres treated in 2012. Cultus Bay (0.11 solid acre) and Maylors Marsh (0.175 solid acre) contained the majority of *S. anglica* treated in 2013.

In addition, Wildlands Management mechanically removed Puget Sound's only known infestation of *Spartina densiflora* in Race Lagoon located on Whidbey Island. Approximately 9 ft^2were located and manually removed at this site in 2013. Continued survey and treatment efforts aimed at eradication of this infestation will remain a high priority. Due to *S. densiflora's* cryptic nature within the native salt marsh, survey and treatment (mechanical) efforts will be conducted during the early spring and winter months of 2014 and 2015.

WDFW treated a total of 2.42 solid acres in Island County in 2013. This represents a 35% increase from the 1.79 solid acres treated in 2012. The majority of the *Spartina* infestation occurred in Emericks Island (1.68 solid acres) and Prices Island (0.75 solid acre). Additionally, in one survey/treatment lap spanning two work days, 0.27 solid acre were treated as part of a County/WSDA cooperative effort in Hancock Lagoon. In the future this site will require repeated cooperative surveys due to limited access and difficult terrain.

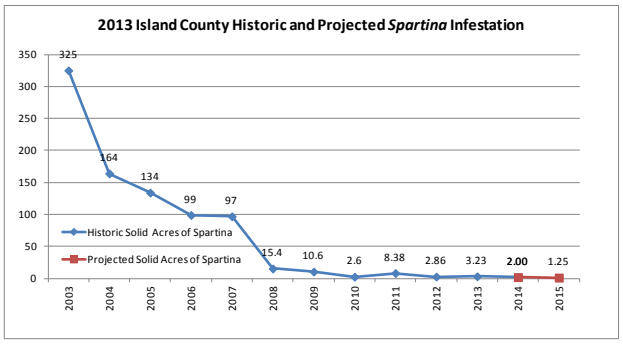

Figure 11: Solid acres of *Spartina* in Island County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2015. Projection assumes continued funding.

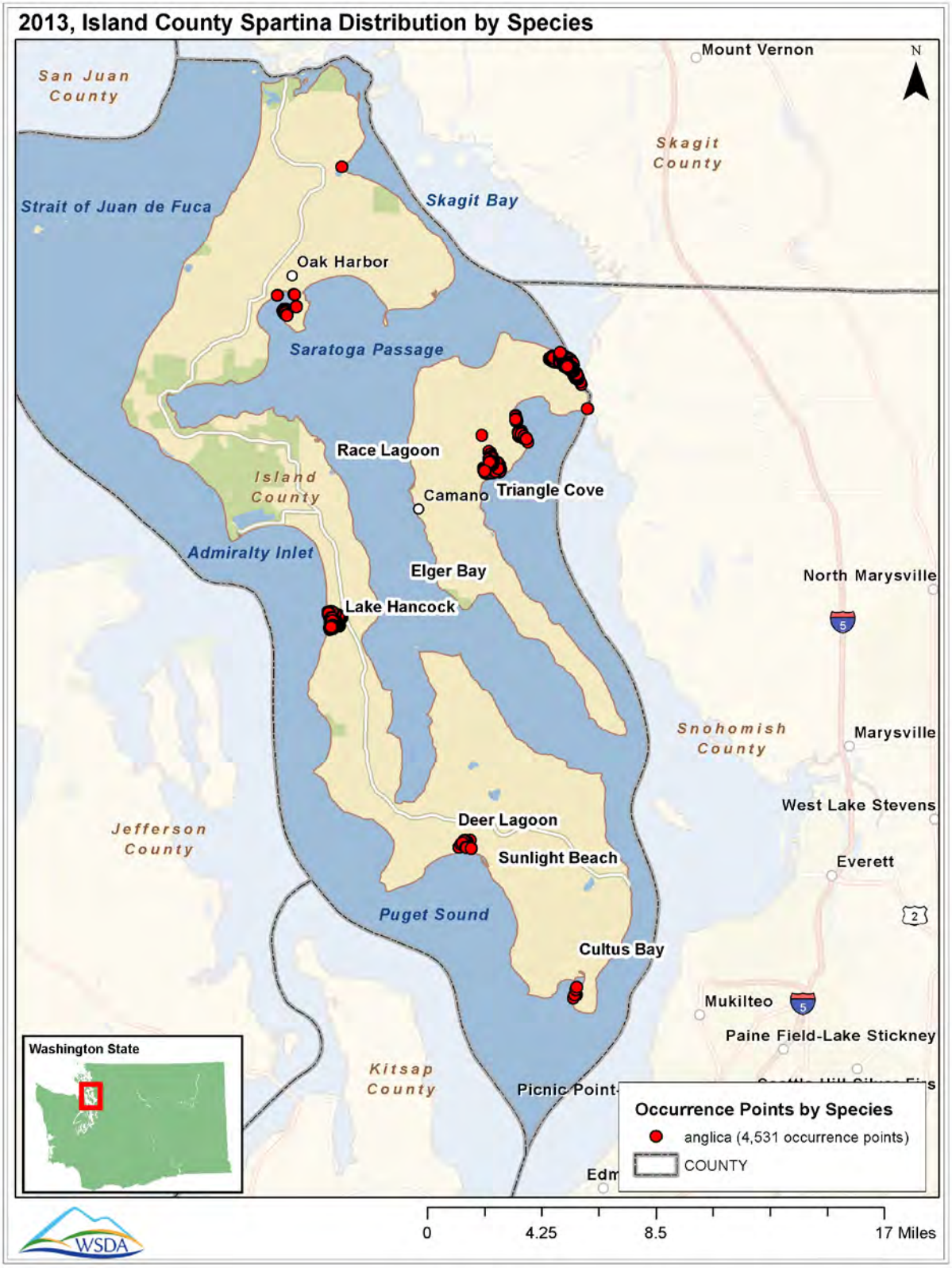

Figure 12: 2013 Island County *Spartina* distribution by species.

Skagit County

In 2013, Skagit County contained the third largest infestation of *Spartina* in Puget Sound. Approximately 0.76 solid acre of *Spartina anglica* representing 1,607 occurrence points were found and treated in 2013 by the Skagit County Noxious Weed Control Board (SCNWCB), DOE, WDFW, WSDA, and the Swinomish Tribal Nation (Figure14). This represents a 7% decrease from the 0.82 solid acre treated in 2012. WSDA provided $25,000 to SCNWCB and $6,000 to the Swinomish Tribal Nation for *Spartina* eradication activities in 2013.

The SCNWCB treated a total of 0.70 solid acre of *Spartina* in 2013. Most of the survey and treatment efforts by SCNWCB occurred in the areas near Fir Island. For 2014, in addition to the Fir Island infestations, WSDA will assist the SCNWCB in the survey and treatment of all outlying islands including Ika Island and the tide flats between Craft and Ika Islands. These areas were not surveyed in 2013 due to lack of access and are a priority for the 2014 treatment season.

The Swinomish Tribal Nation engaged in *Spartina* control on their lands. In 2013, two rounds of survey and treatment were completed by the Swinomish Tribe throughout their land. A total of 0.054 solid acre of *Spartina anglica* was treated. This represents a 94% decrease from the 0.94 solid acre treated in 2012. Turners Cove historically contained the largest amount of *Spartina* within the Swinomish Tribal area with 2.47 solid acres treated in 2008. At the conclusion of the 2013 treatment season, Turners Cove produced 0.015 solid acre representing a 99% reduction from the 2008 value. The Swinomish Tribal Nation's continued cooperation and treatment efforts are essential to eliminate *Spartina* from Skagit County.

DOE has controlled *Spartina* on their Padilla Bay Estuarine Research Reserve since 1996. Two species of *Spartina* exist in Padilla Bay, *Spartina anglica* and *Spartina alterniflora*. In the 2013 treatment season, DOE treated/dug 0.0007 solid acre (30 ft^2) of *S. anglica* and 0.00008 solid acre (3.4 ft^2) of *S. alterniflora.*

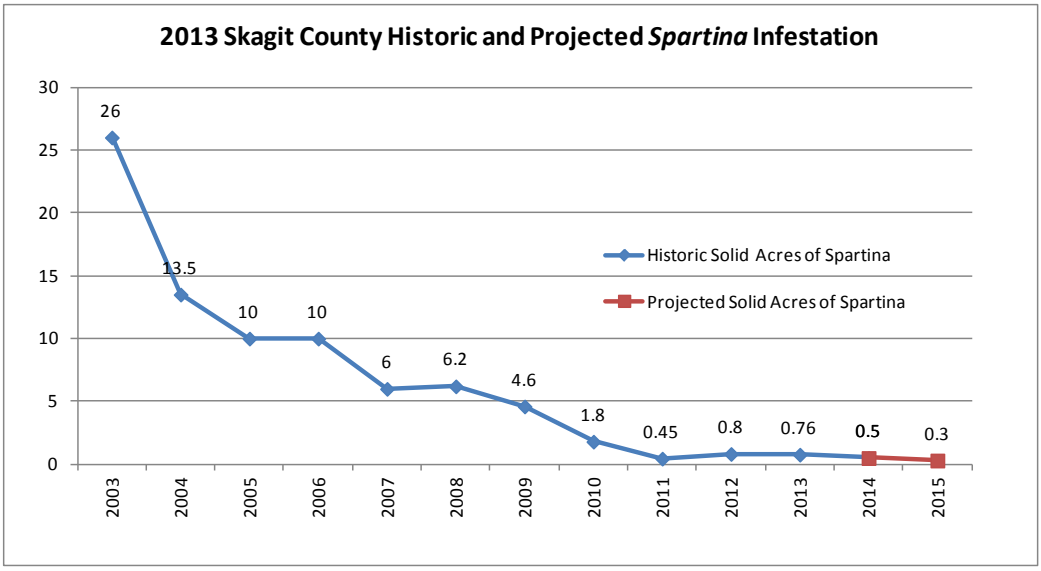

Figure 13: Solid acres of *Spartina* in Skagit County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2015. Projection assumes continued funding.

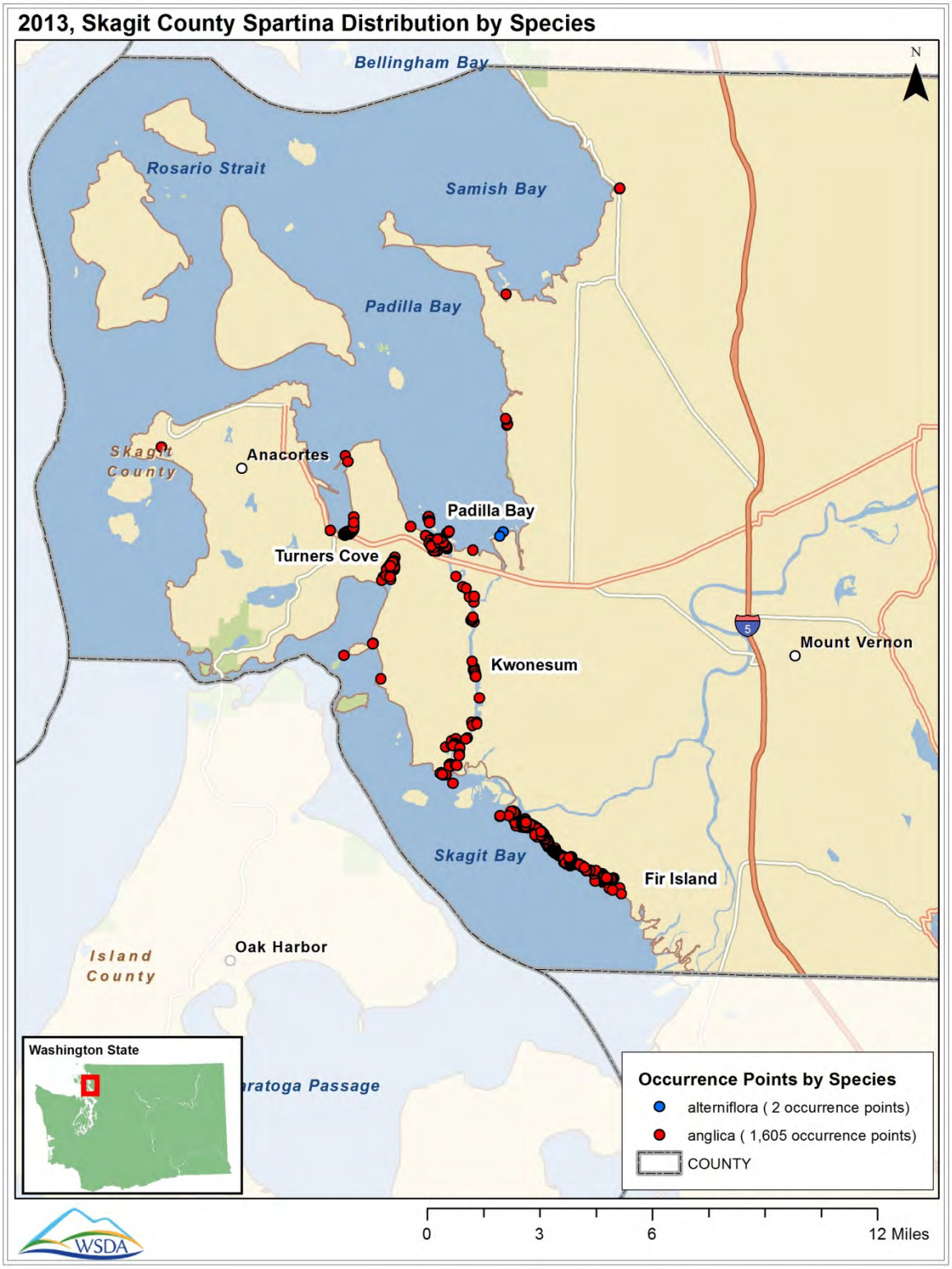

Figure 14: 2013 Skagit County *Spartina* distribution by species.

Whatcom County

In Whatcom County, *Spartina anglica* clones were discovered on the Nooksack Delta within the Lummi Reservation in 2010. These clones were not treated, but were designated as a high priority for the 2011 treatment season. In 2011, a collaborative effort with the Lummi Nation, the Whatcom County Noxious Weed Control Board (WCNWCB), People for Puget Sound and WSDA located and dug approximately 100 ft^2or 0.0023 solid acre of *S. anglica* in this area. With the continued cooperation of the Lummi Tribe, surveys were again conducted in 2012, where a total of 55 ft^2 (0.0013 solid acre) of *S. anglica* were dug and removed in the Red River/Nooksack Delta area. For the 2013 survey and treatment effort, WSDA and the WCNWCB located and removed 89 ft^2 (0.002 solid acre) of *S. anglica.* This is an 11% decrease from the first treatments conducted in 2011. For the 2014 season, WSDA will continue to assist Whatcom County and the Lummi Tribe with the survey and treatment of their lands. WSDA has provided $5,000 to the WCNWCB to survey potential *Spartina* habitats located within the County.

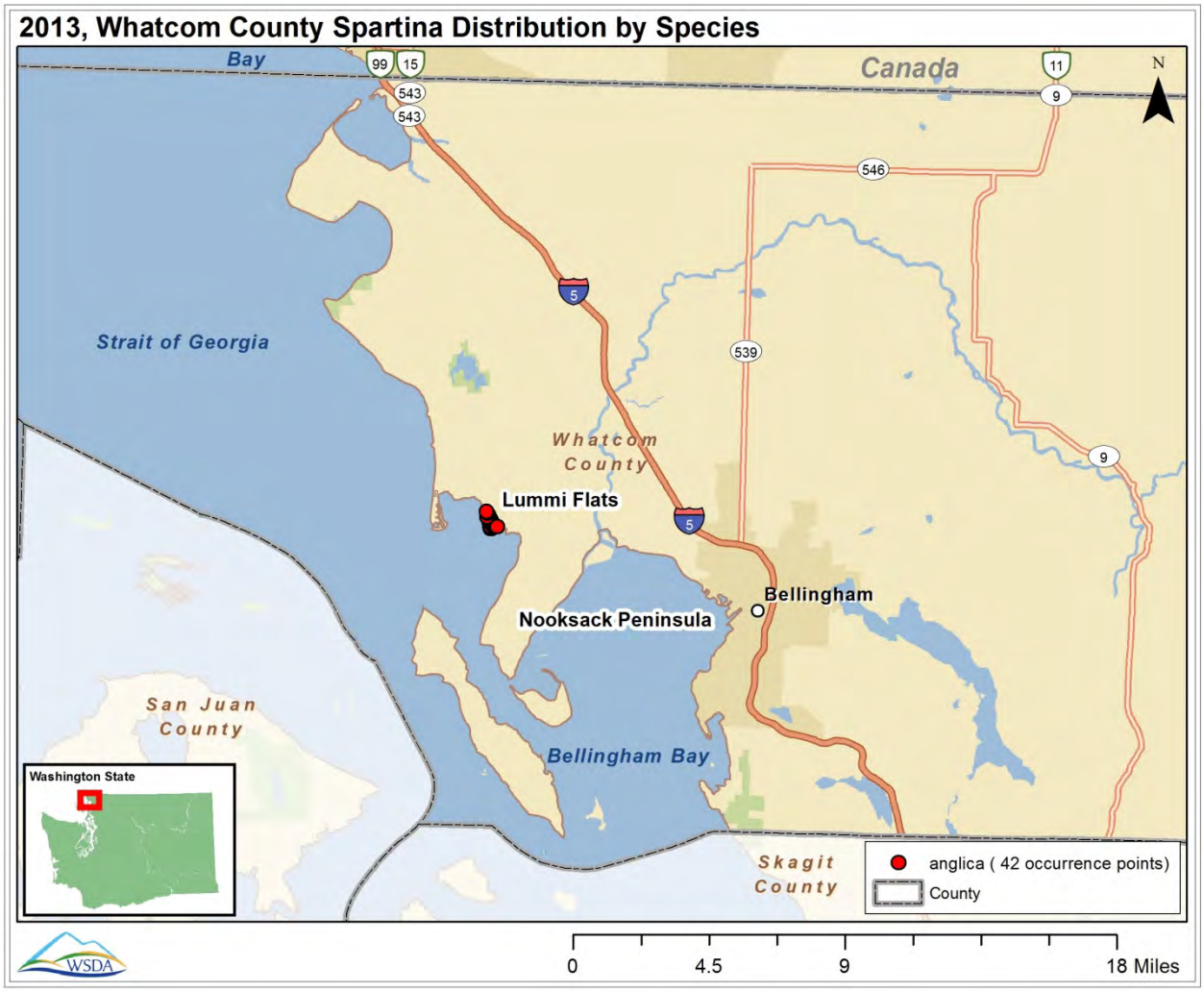

Figure 15: 2013 Whatcom County *Spartina* distribution by species.

San Juan County

Approximately 0.002 solid acre or 66 $ft^2$of *Spartina anglica* were dug or treated with herbicide in San Juan County in 2013. This is a slight reduction from the 76 ft^2 found and treated in 2012. The historically infested areas such as Fisherman's Bay, Low Point, Sculpture Park and White Point continue to produce *Spartina* although in small scattered amounts. A new infestation (3 ft^2) was found in Thatcher Bay on Blakely Island during a shoreline survey. These isolated infestations are a major source of seed to all of vulnerable habitat located within San Juan County. Locating and treating these isolated infestations will be a priority for the 2014 treatment season and will require extensive shoreline surveys of San Juan County. WSDA will continue to assist the San Juan County Weed Board in the survey and treatment of all vulnerable habitat located within the county.

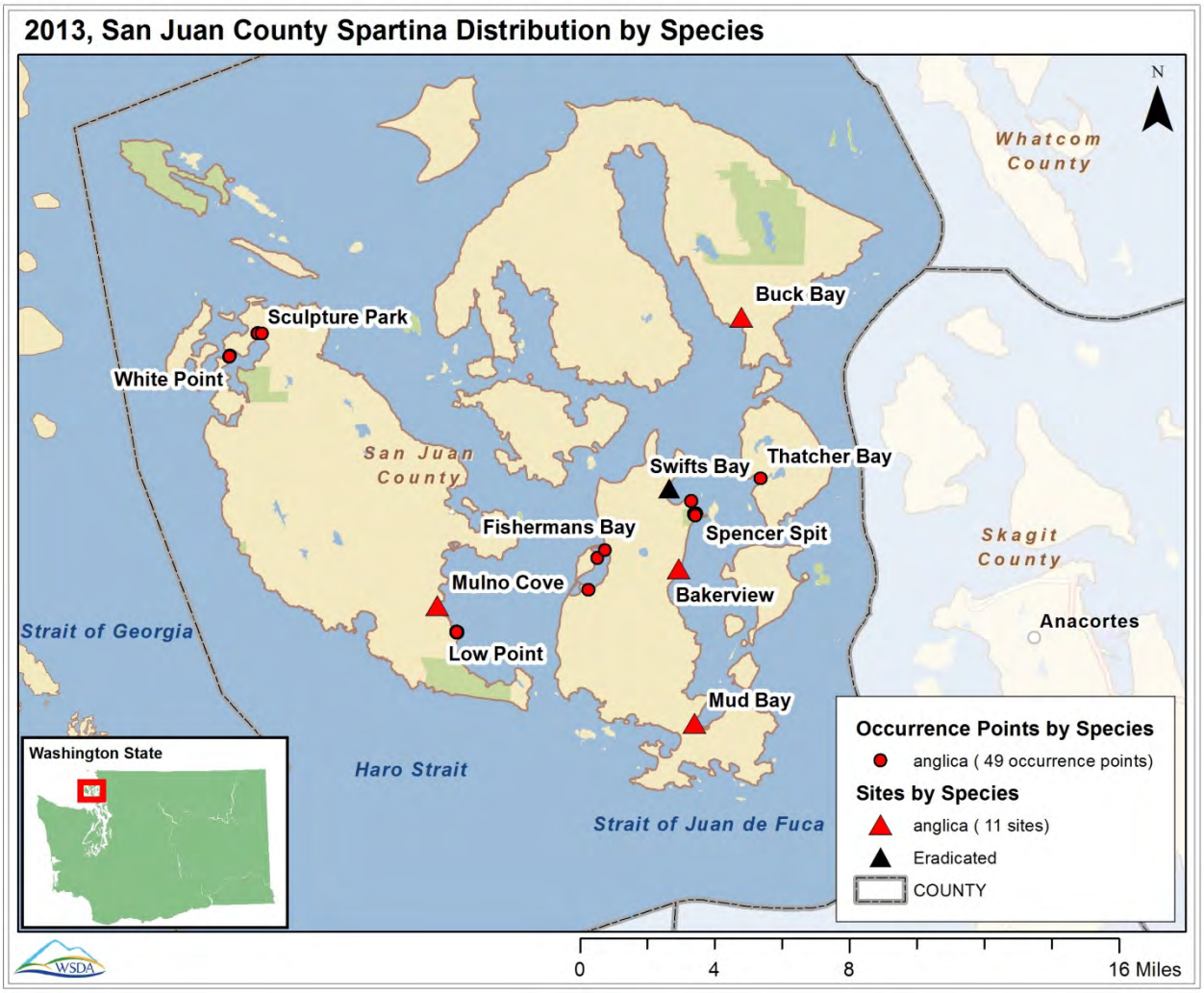

Figure 16: 2013 San Juan County *Spartina* distribution by species.

Clallam County

In 2013, WSDA continued to work with the Clallam County Noxious Weed Control Board, USFWS, and the Makah Tribal Nation to conduct surveys and control *Spartina* in Clallam County. These cooperators played an important role in all aspects of integrated weed management from consent to control work in the 2013 season.

In 2007, aerial and shoreline surveys discovered two species of *Spartina* totaling approximately one acre. *Spartina alterniflora* was found on the Sooes and Waatch Rivers while *Spartina anglica* was located at Salt Creek, Dungeness Spit and the Pysht River. Multiple surveys and treatments of each site since 2007 have greatly reduced the *Spartina* infestation in Clallam County.

In 2013, detailed ground and kayak surveys yielded 9 *Spartina* occurrence points totaling approximately 330 ft^2 (0.004 acre) within the county. This is a county wide reduction of over 99% since 2007. With landowner consent, WSDA crews surveyed Gibson Spit where 327 ft^2 of *S. alterniflora* was found and treated. Additionally, with access granted from the Merrill Ring Corporation, approximately 3 ft^2 of *S. anglica* was found and removed from the mouth of the Pysht River.

In addition to a minimum of two visits to all known sites in 2014, thorough ground and kayak surveys of all vulnerable *Spartina* habitat in Clallam County is recommended. Figure 17 depicts the 2013 distribution of *Spartina* in Clallam County including site names.

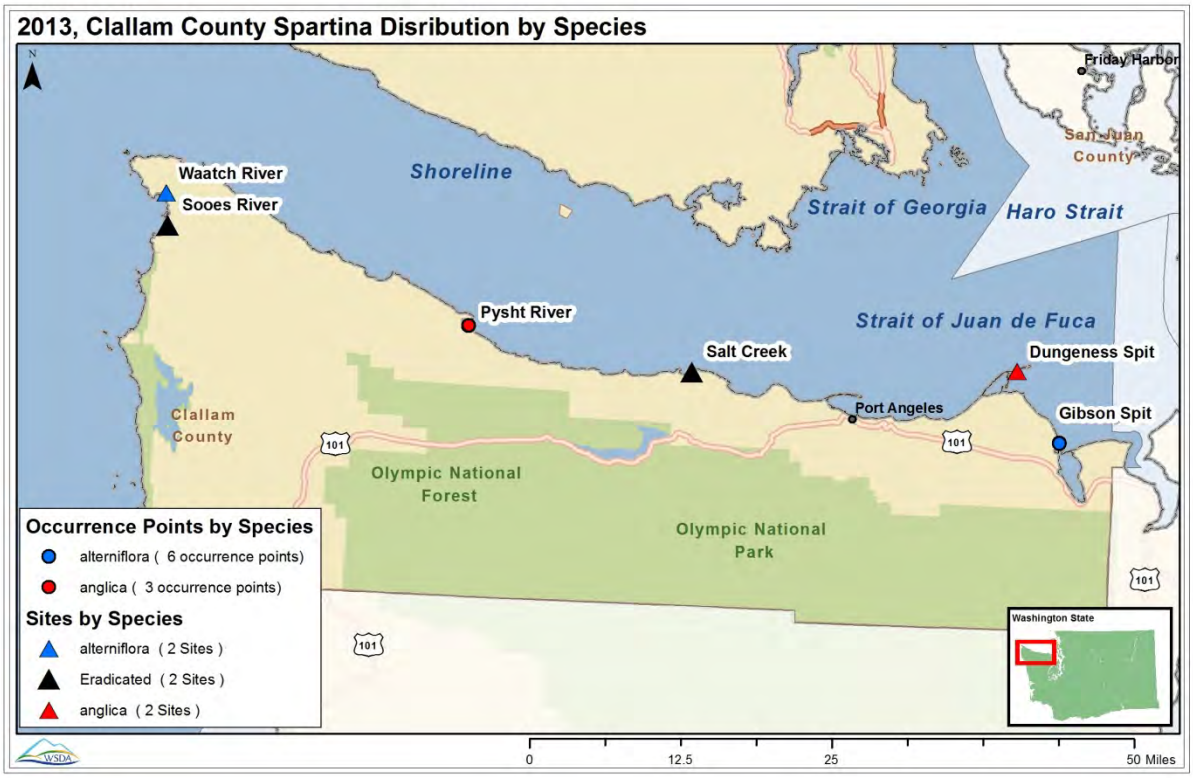

Figure 17: 2013 Clallam County *Spartina* distribution by species.

Kitsap County

In Kitsap County, a total of 0.006 solid acre (253 ft^2) of *Spartina* (126 occurrence points) was treated or manually removed in 2013. WSDA, WDFW and the Suquamish Tribe worked together to treat the largest known infestation in the central Puget Sound located at Doe-Kag-Wats. This site has significant challenges with continually shifting driftwood that litters the cove and makes surveying difficult and dangerous. In 2013, 0.005 solid acre (234 ft^2) of *Spartina* was treated at Doe-Kag-Wats representing an 87% decrease from the 0.04 solid acre (1,742 ft^2) treated in 2012. With the continued cooperation of the Suquamish Tribe, eradication at this site will require repeated visits in the coming years.

Additionally, small infestations were present in Manzanita Bay (14 ft^2), Foulweather Bluff (2 ft^2) and Coon Bay (3 ft^2). For 2014, WSDA crews will continue to survey the estuarine habitat of Kitsap County to ensure that no new outlying infestations exist.

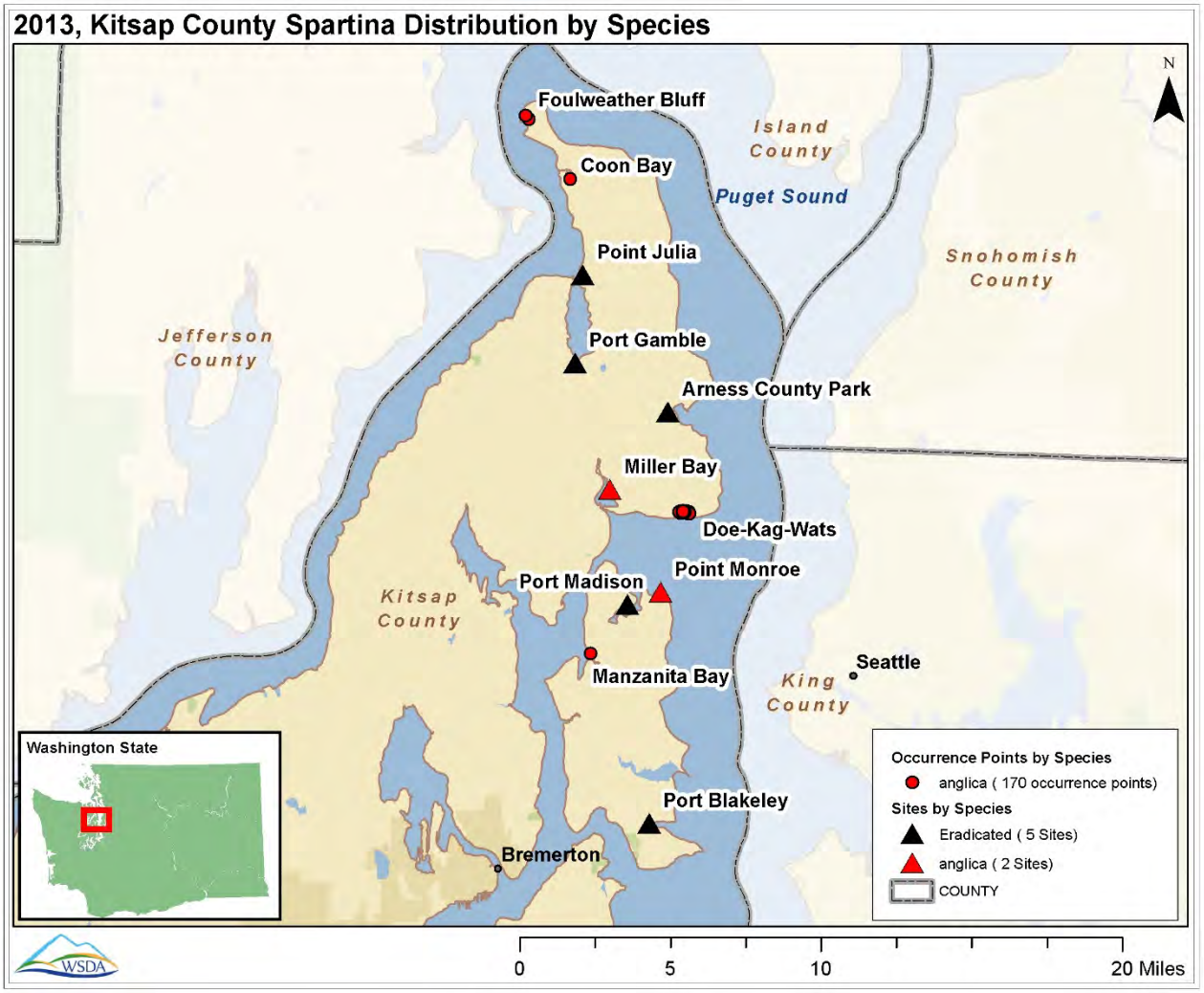

Figure 18: 2013 Kitsap County *Spartina* distribution by species.

Jefferson County

WSDA continues to work with the Jefferson County Noxious Weed Board, U.S. Navy, Washington State Parks, and private landowners to conduct surveys and control *Spartina* in Jefferson County. These cooperators played an important role in all aspects of integrated weed management practices during the 2013 season.

Two species of *Spartina* infest Jefferson County. Volunteer surveys in the 1990's revealed scattered infestations of *Spartina anglica* at several locations within in the county. *Spartina patens* was discovered in the 1990's at Dosewallips State Park on Hood Canal by Evergreen State College professor Dave Milne while on a field trip with his class. Multiple visits to all known sites over the last several years have lead to a vast reduction of *Spartina* within the county.

In 2013, extensive ground and kayak surveys yielded 26 *Spartina* occurrence points totaling approximately 1,562 ft^2 (0.04 acre) within Jefferson County. WSDA crews dug and removed roughly 5 $ft^2$of *S. anglica* at Walan Point, 5 ft^2 from Oak Bay and 2 ft^2 from Chimicum Creek. Working in cooperation with Washington State Parks and local landowners, WSDA crews made four separate visits to Dosewallips State Park conducting extensive surveys of *S. patens*. As a result, approximately 1,550 ft^2 (0.036 acre) of *S. patens* was treated in 2013. This represents a significant increase from the 20 ft^2 (0.0004 acre) treated in 2012. Permission from landowners to access adjacent areas not previously surveyed explains the increase in *S. patens* solid acreage.

During the 2013 season the WSDA survey crew discovered a new infestation of *S. patens* on Hood Canal across from Naval Base Kitsap-Bangor in Jefferson County on Toandos Peninsula. Due to this find occurring late in the season, and the need to notify and work with the Navy to gain access, this site was not treated during 2013. Recent successes coordinating with the Navy are encouraging; this new *S. patens* site will be a priority for survey and treatment in 2014.

In 2014, continued shoreline surveys in Jefferson County are recommended to locate and eradicate *Spartina*. Additionally, landowner support to the north and south of Dosewallips State Park will be crucial in the effort to further survey and eradicate *S. patens* from Washington State.

Figure 19 depicts the 2013 distribution of *Spartina* in Jefferson County including site names.

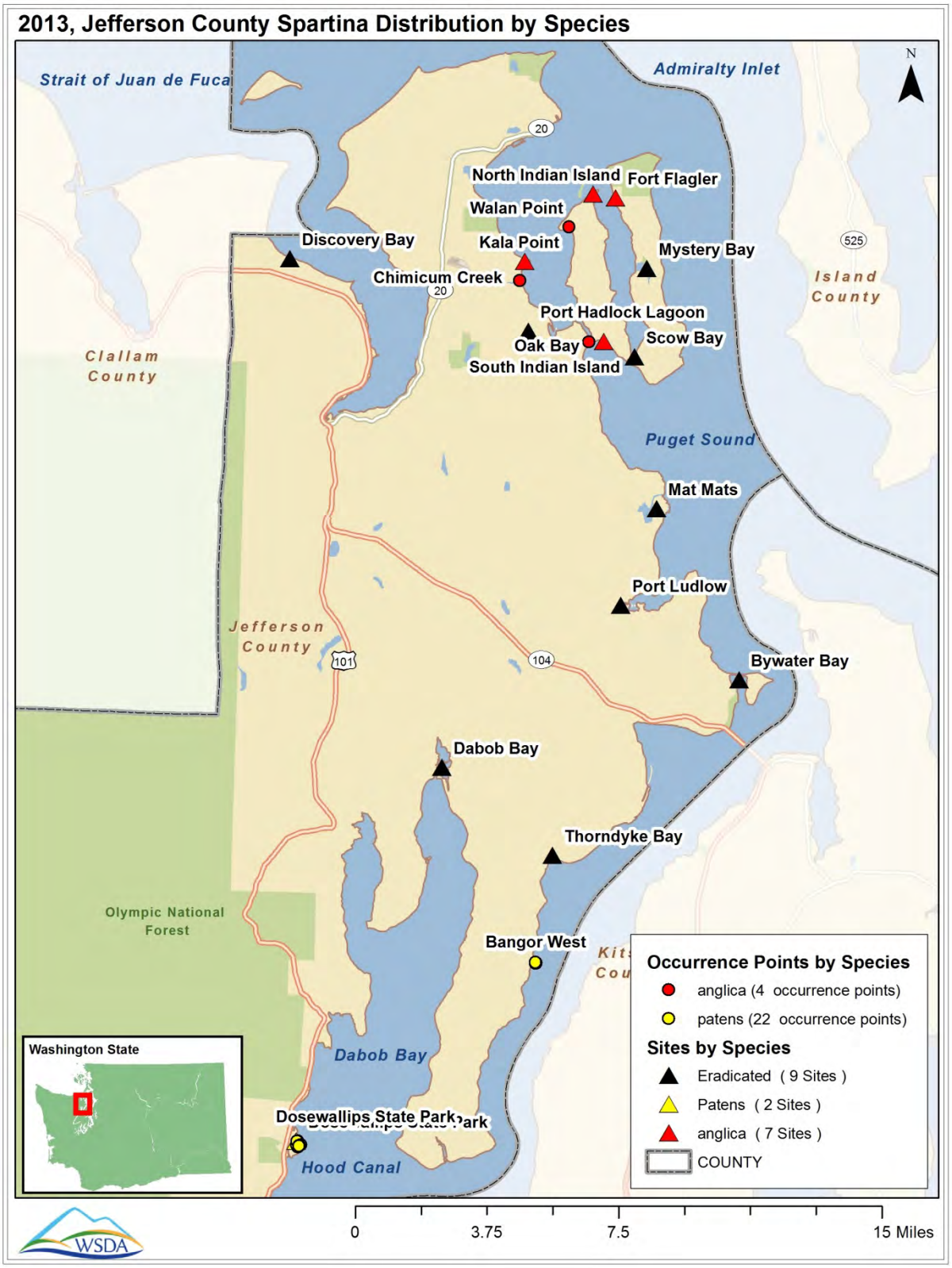

Figure 19: 2013 Jefferson County *Spartina* distribution by species.

Pierce County

Spartina anglica was discovered for the first time in Pierce County in 2010 at Squally Beach/Commencement Bay along the Hylebos Waterway in the Port of Tacoma (Figure 20). At this site, approximately 60 ft^2 (0.0014 solid acre) of *Spartina* was manually removed by crews from the WSDA and WDFW. In 2011, WSDA crews conducted three rounds of survey and digging at the site, finding and removing 18 ft^2 (0.0004 solid acre) of *Spartina*. Two survey/treatment laps were conducted in 2012 where 6 ft^2 (0.00014 solid acre) were manually removed. In 2013, two rounds of survey were conducted where 1 ft^2 of *anglica* was removed. From 2010-13 there has been a 98% reduction in *Spartina* at this site. WSDA will continue to cooperate with the Pierce County Noxious Weed Control Board and the Puyallup Tribe to survey the vulnerable habitat in Pierce County.

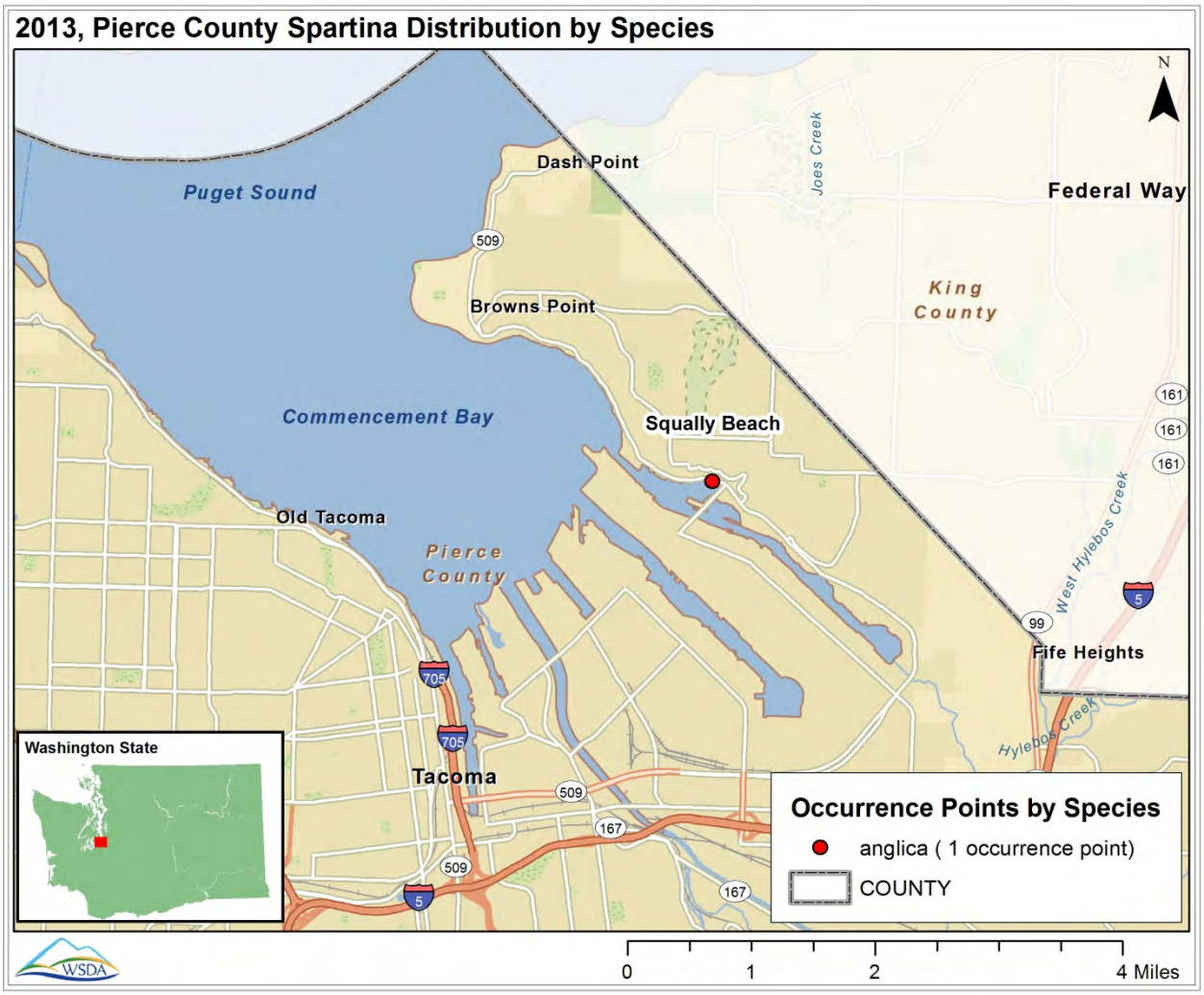

Figure 20: 2013 Pierce County *Spartina* distribution by species.

King County

Historically, small infestations of *S. anglica* were found on Vashon Island near Rabs Lagoon, Point Heyer, Gorsuch Road and Fern Cove. However, in 2013, surveys conducted by WSDA and the King County Noxious Weed Control Board (KCNWCB) revealed no new *Spartina* infestations. As per the eradication declaration procedures set forth on page seven of this report, King County was designated as "eradicated" following negative survey events during the 2013 treatment season. WSDA and KCNWCB will continue to monitor the estuarine habitat of King County to ensure that no new infestations occur.

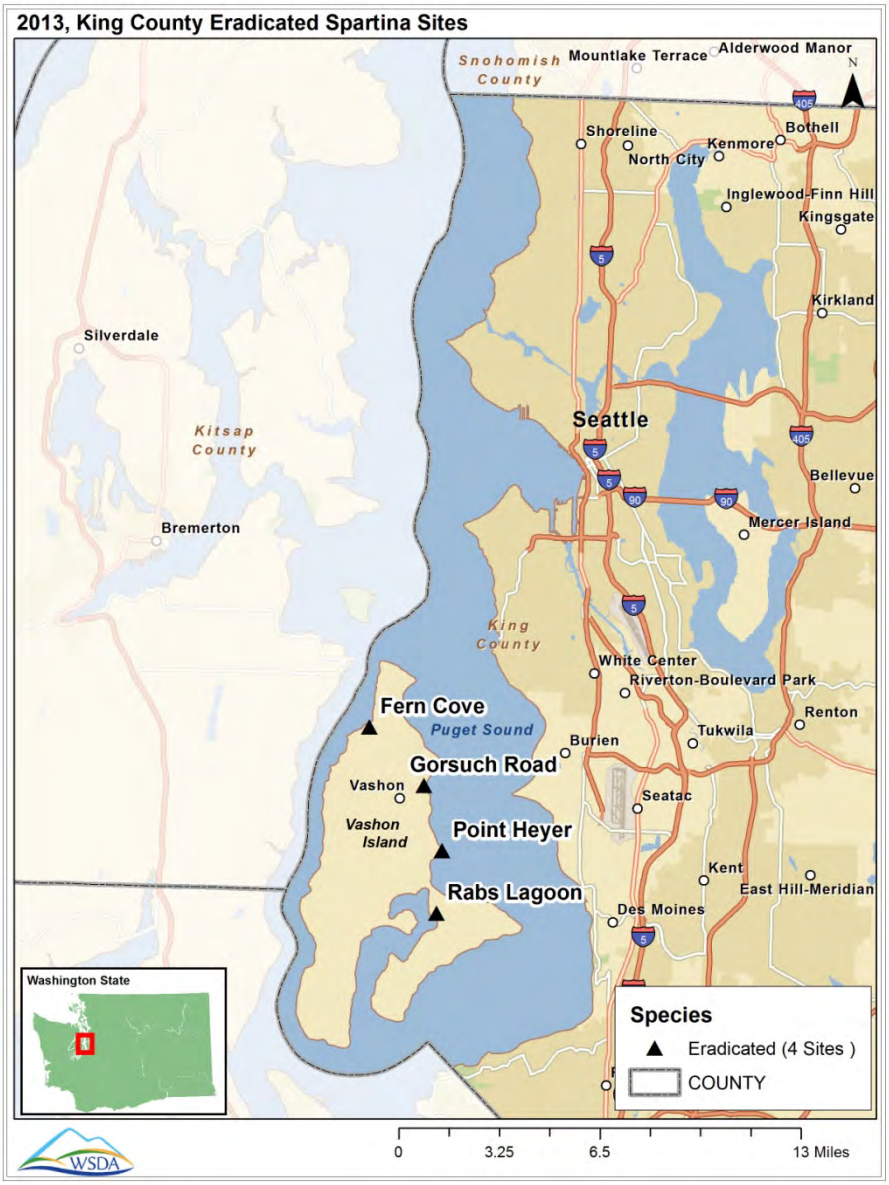

Figure 21: Historic King County *Spartina* distribution by species.

Appendix A

DNR Aquatic Invasive Species Program control work using Puget SoundCorps crews
Submitted by Todd Palzer & Todd Brownlee, DNR Aquatic Resources Division

The 2012 Washington State Legislature passed the Jobs Now Act, which included a $940,000 appropriation for the Washington State Department of Natural Resources' (DNR) Aquatic Resources Division for FY 2013 and FY 2014. These funds were used to control aquatic noxious weeds as part of a larger jobs fund package.

DNR, along with the Washington State Department of Ecology (Ecology) and EarthCorps, established 11 Puget SoundCorps crews to perform noxious weed and invasive plant control for select watersheds flowing into the greater Puget Sound and its marine shorelines. DNR's Aquatic Invasive Species Program partnered with county noxious weed control boards and conservation districts with established partnerships with state and federal agencies, tribal governments, conservancy organizations, and private landowners. The combination of these partnerships, a pre-existing infrastructure, and local experience maximized overall productivity and on-the-ground accomplishments.

The Puget SoundCorps crews were instrumental in the very successful 2013 *Spartina* eradication season. The addition of the two North Puget Sound crews made it possible to further expand treatments of *Spartina*, a Class A noxious weed in Washington. These crews made significant contributions to the *Spartina* eradication effort, helping to expand the area coverage and lending the necessary staff to increase the level of detail in summer surveys. The North Puget Sound crews were also able to treat yellow flag iris, hairy-willow herb, tansy ragwort, and butterfly bush.

A crew is composed of one crew lead and five crew members provided by Ecology's Washington Conservation Corp (WCC) or EarthCorps. A total of 675 crew days, at a cost of $1,240 per crew per day, equaled a total of $837,000 spent on invasive species control by Puget SoundCorps crews in FY 2013-FY 2014. To help manage the crews, two Veterans Corps positions were hired through the Washington Department of Veteran Affairs at a cost of $2,450 per month each for the 2013 field season. Jon Clevenger and Aurelio Elliot were the successful veteran candidates hired for six months at a final cost of $29,400 for the two positions.

The Puget SoundCorps crews, EarthCorps crews, and Veterans Corps positions created a total of 68 jobs at a cost of $866,400. DNR oversight was provided by Kirk Thomas, Field Operation Coordinator, for the agency's Asset and Property Management Division; Todd Brownlee, Invasive Species Operations Coordinator, Aquatic Resources Division; and Todd Palzer Shellfish and Invasive Species Programs Manager. DNR oversight totaled approximately 0.75 FTE for nine months. DNR used existing invasive species funds to cover its employees' costs and did not charge any of its staff time against the Jobs Act Now funding for these projects.

For more information about the 2013 Puget SoundCorps crews, please contact Kirk Thomas at 360-902-1645.