Spartina Eradication Program 2012 Progress Report

Washington State Department of Agriculture

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

Cover Photo: Clone of *Spartina anglica* found on Lopez Island in San Juan County; growing at an exposed site in cobble.

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PROGRESS OF THE 2012 *SPARTINA* ERADICATION PROGRAM

March 2013

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 five solid acres in 2013. These final, five solid acres are a collection of individual plants and small clumps spread along thousands of miles of shoreline in the Puget Sound, Willapa Bay, and Grays Harbor.

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 habitat 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 work throughout 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 2012, 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 13 counties for evidence of *Spartina*. All infestations located were treated and location data was recorded. As part of this effort in 2012 the cooperators found and recorded over 28,000 *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.

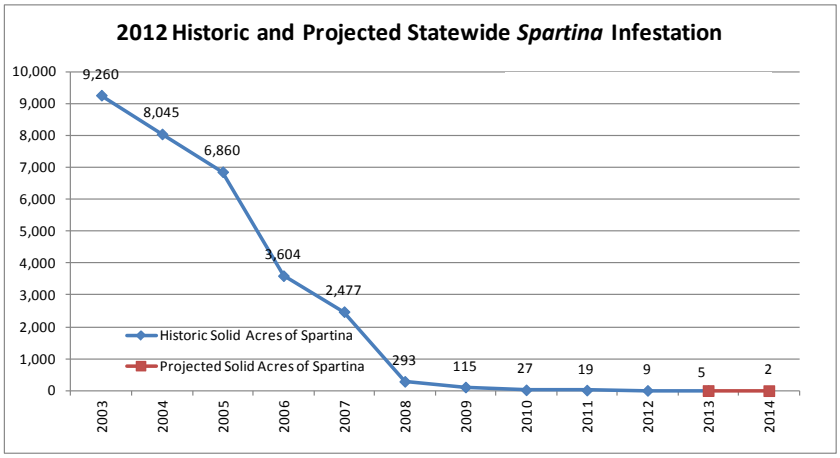

Figure 1: Solid acres of *Spartina* by year statewide based on WSDA estimates. The blue line represents historic *Spartina* infestation since 2003. The red line indicates the projected *Spartina* infestation level through 2014. Projection assumes continued funding.

Pacific County

The 2012 Pacific County treatment program was a success with all known infestations treated. The cooperators' combined 2012 Pacific County effort located and treated less than 1.4 solid acres of *Spartina*, which is a 44% reduction from the approximate 2.5 solid acres treated in Pacific County during the 2011 season. In 2012, the program continued to eradicate the scattered infestations and individual plants remaining throughout the bay. WSDA estimates less than 0.8 solid acres of *Spartina* will remain in Pacific County during the 2013 treatment season.

Grays Harbor County

WSDA, Washington State Department of Fish and Wildlife (WDFW), and United States Fish and Wildlife Service (USFWS) continued to work together to treat all known infestations. The potential habitat in Grays Harbor County was surveyed three times during the 2012 season, with a total of 0.021 solid acres of *Spartina* found and treated. Of the 0.021 solid acres treated in Grays Harbor County, 0.02 solid acres were *S. alterniflora* and 0.0003 solid acres were *S. densiflora*. This is an increase from the approximate 0.008 solid acres of *Spartina* treated in Grays Harbor County during the 2011 season. However, a significant portion of the *Spartina* treated in 2012 was from an approximate 0.02 acre clone of *S. alterniflora* which surprised the cooperators when it was located on mud flats in the middle of the harbor. WSDA estimates that fewer than 0.002 solid acres of *Spartina* will remain in Grays Harbor County during the 2013 treatment season.

Puget Sound Counties

In 2012, approximately 7.4 solid acres of *Spartina* representing 24,666 occurrence points was found and treated in Puget Sound counties. This represents a 55% decrease from the 16.33 solid acres located in 2011. A number of factors contributed to the decrease in *Spartina* found, including: the most detailed survey to date and increased access to infested lands. Continued emphasis on detailed surveys in cooperation with local and state agencies, federal and tribal governments will ensure the success of the Puget Sound *Spartina* program. WSDA estimates that fewer than 4 solid acres of *Spartina* will remain in Puget Sound in 2013.

2012 Trends

Key to the ongoing success of this project is the continued level of state funding provided to WSDA, WDFW, and the Washington State Department of Natural Resources (DNR) as well as federal funding provided by USFWS. Central to this success is continued cooperation of WSDA, WDFW, DNR, other state agencies, universities, USFWS, counties, tribes, private organizations, and private landowners.

With the largest infestations controlled, program efforts have evolved into a 'survey and eradicate' model focused on finding and treating the remaining individual plants and scattered infestations that exist along the Washington coast. The cooperators continue to evaluate and refine this survey effort. An encouraging development is depicted in Figure 2 where two new black triangles represent previous *Spartina anglica* infestations declared eradicated in 2012. This brings the total number of sites eradicated in recent years to 11. For an explanation of the survey criteria used to declare eradication please see page seven of this report.

The next two years will be pivotal as the cooperators work throughout 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*.

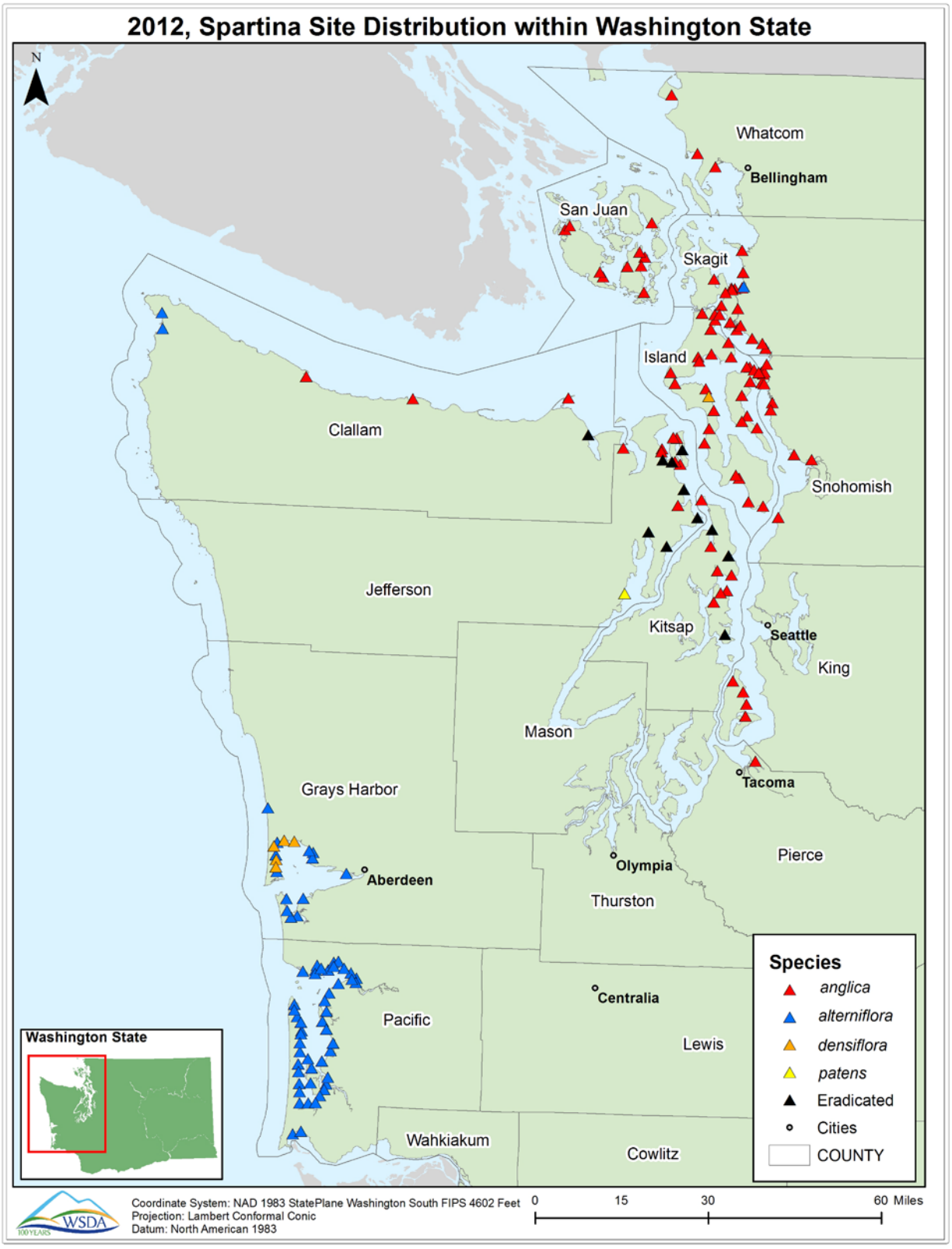

Figure 2: Distribution of invasive *Spartina* sites in Washington State 2012.

Spartina Eradication Program

WSDA *Spartina* Program

In 2012, 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 2012, WSDA continued to allocate funding for resources and *Spartina* work crews in counties with the majority of the infestations. In Willapa Bay, $180,000 was designated for Pacific County to continue the transition toward greater county involvement. In the Puget Sound, WSDA provided resources totaling $156,000 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 2012, 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. This continued high level intergovernmental cooperation will aid ongoing eradication programs and enhance future efforts.

Budget

WSDA allotted $1.8 million of the appropriation from the Aquatic Lands Enhancement Account (ALEA) for statewide *Spartina* activities during the 2011-2013 biennium. Table 1 describes how WSDA allocated funds to conduct *Spartina* survey and eradication activities throughout Western Washington.

Table 1: WSDA *Spartina* Budget Activity – FY12 and FY13

Activity	Fiscal Year 2012 (July 1, 2011 thru June 30, 2012)	Fiscal Year 2013 (July 1, 2012 thru June 30, 2013)	Biennial Totals (July 1, 2011 thru June 30, 2013)
WSDA Eradication & Coordination Activities	$490,000.00	$463,000.00	$953,000.00
Purchased Services			
Pacific County	$165,000.00	$180,000.00	$345,000.00
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	$0.00	$5,000.00	$5,000.00
Swinomish Tribe	$6,000.00	$6,000.00	$12,000.00
WDFW Puget Sound	$20,000.00	$20,000.00	$40,000.00
WDFW Pacific County	$60,000.00	$60,000.00	$120,000.00
WDFW Grays Harbor County	$35,000.00	$40,000.00	$75,000.00
Totals	**$901,000.00**	**$899,000.00**	**$1,800,000.00**

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 2012-2013 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 – FY12 and FY13

Agency	Fiscal Year 2012 (July 1, 2011 thru June 30, 2012)	Fiscal Year 2013 (July 1, 2012 thru June 30, 2013)	Biennial Totals (July 1, 2011 thru June 30, 2013)
WDFW Spartina Activities	$247,000.00	$232,000.00	$479,000.00
DNR Spartina Activities	$323,000.00	$305,000.00	$628,000.00
USFWS Spartina Activities	$300,000.00	$200,000.00	$500,000.00
Totals	**$870,000.00**	**$737,000.00**	**$1,607,000.00**

Spartina Eradication Effort by County

Overview

For programmatic purposes, this geographic region encompasses all 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 specie 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 North Peninsula in 1995 which discovered another 10-15 solid acres. Through dedicated funding and aggressive eradication efforts by local, state, and federal agencies, only 1.77 solid acres of *S. alterniflora* remain 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 square ft.) was also discovered in Pierce County in 2010 near the Port of Tacoma. Of these four species of *Spartina*, *S. anglica* is currently the most abundant and accounts for more than 77% of the infestation. As of 2012, the largest infestations of *S. anglica* are found within Snohomish (3.66 solid acres), Island (2.86 solid acres) and Skagit (0.824 solid acres) counties. Currently, only 7.38 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 specie 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 acres) to 2009 (0.28 solid acres). 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.

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. *S. patens*, like *S. densiflora*, also exhibits physical characteristics that blend in well with the native saltmarsh flora making survey and treatment difficult. In 2012, 0.0004 solid acres of *S. patens* was treated representing a significant reduction from the 0.017 solid acres treated in 2011. In the future this site will require detailed survey and treatment efforts in order to achieve eradication.

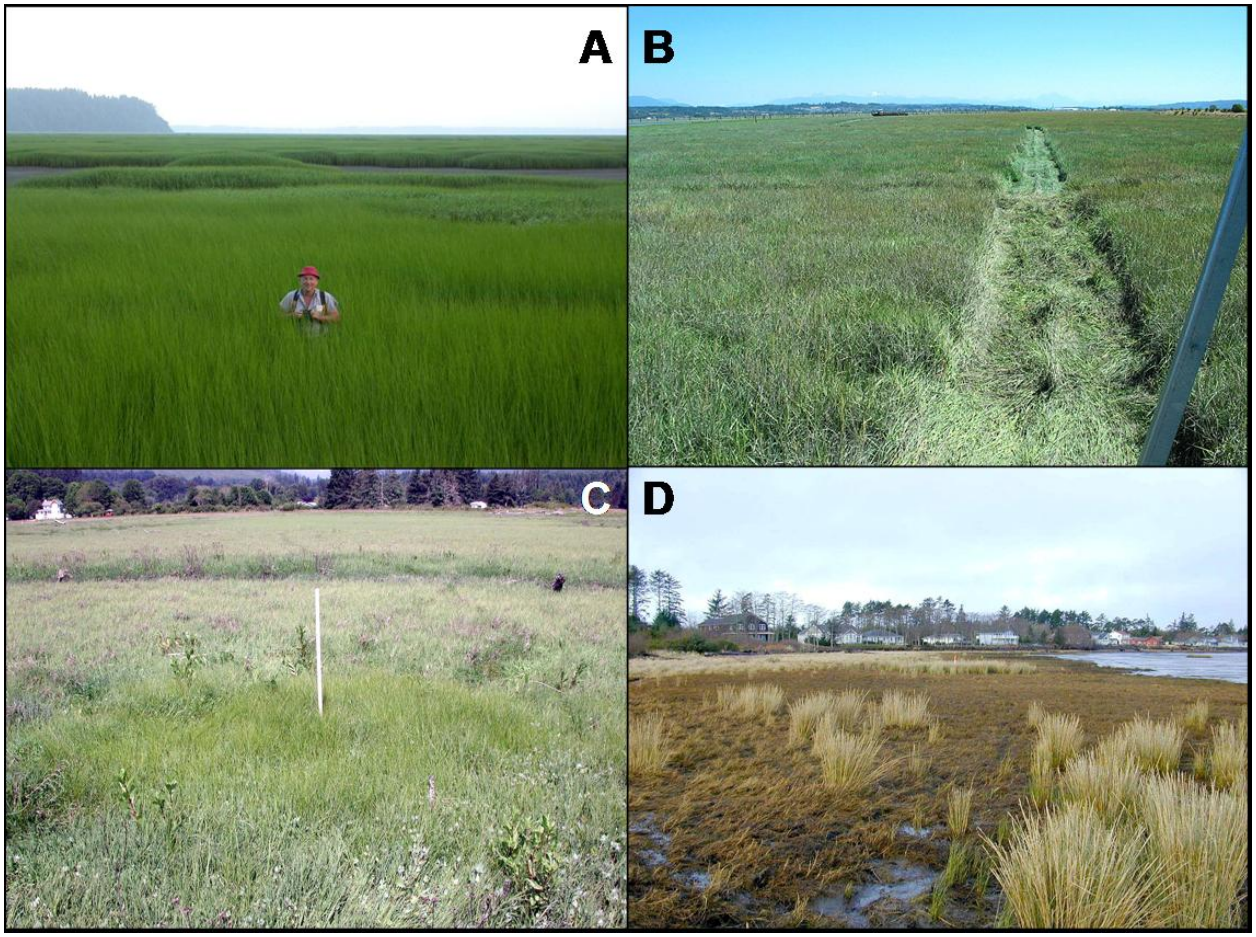

Figure 3: The four species of *Spartina* present in Washington. A) A meadow of *S. alterniflora* in Willapa Bay (2003), B) A meadow of *S. anglica* in Skagit Bay (2003), C) *S. patens* at Dosewallips (2001), and D) clones of *S. densiflora* in Grays Harbor County (2001).

With the large scale reductions in *Spartina* occurring statewide, an encouraging development for 2012 can be seen in Figure 2 page 3, where the 11 black dots represent *Spartina anglica* 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 moves towards eradication the need to evaluate if sites meet this criterion has necessitated that the cooperators track the distribution and extent of the known infestation in increasing detail.

The 2012 control season was successful; below are some highlights of the 2012 treatment season. Following these brief highlights are detailed county by county reports.

- In 2012 two additional *Spartina anglica* sites were declared eradicated.
- Approximately 9.1 solid acres of *Spartina* were located and treated in Washington State during 2012. This represents a 52% reduction from the 19 solid acres treated in 2011.
- The Statewide survey was the most detailed to date. The cooperators continue to evaluate and refine the survey effort. In 2012 all infestations located were treated and 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 infestations within Pacific County were treated during the 2012 season, and most were treated two or more times. This season the program continued efforts aimed at eradicating the scattered infestations and individual plants remaining throughout the county.

WSDA estimates that, during the 2012 season, approximately 1.3 solid acres of *Spartina* were treated 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.

The affected acres treated reached a high of 25,430 in 2009 due to the discovery of additional smaller infestations while many areas of the county continued to required small-scale treatments to scattered plants. In 2012 the affected acres treated declined to 1,650, which is a 36% reduction from the 2,587 affected acres treated in 2011. 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 affected acres manual removal of *Spartina* has become cost effective in some areas when limited numbers of single plants are present. This has allowed the cooperators to augment the eradication effort and extend the treatment season. In 2012 approximately 0.03 solid acres of *Spartina* was dug and removed by the cooperators.

The decline in affected acres treated does not reduce the need to have a detailed monitoring program in place throughout the county. In 2012 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 2012 the cooperator surveys yielded a combined total of 4,198 *Spartina* occurrence points, with a vast majority of these points representing a single plant. This level of vigilance will be necessary during the coming years in order to achieve eradication.

WSDA estimates fewer than 1.75 solid acres of *Spartina* were present in Pacific County over the course of the 2012 treatment season. This estimate is derived from treatment acreages reported by the cooperators (1.3 acres) and includes an additional 5% to compensate for late season emergence, survey, or application misses and other contributing factors. Also included in this total is an estimated 0.25 acre remaining on private land on the Long Beach Peninsula.

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 fewer than 1.75 solid acres in 2012. This is an overall reduction of 99.9% achieved in nine treatment seasons. If the 2012 treatment season meets expectations and achieves an overall efficacy of 60% or greater, WSDA estimates that less than 0.8 solid acre of *Spartina* will be present in Pacific County during the 2013 treatment season.

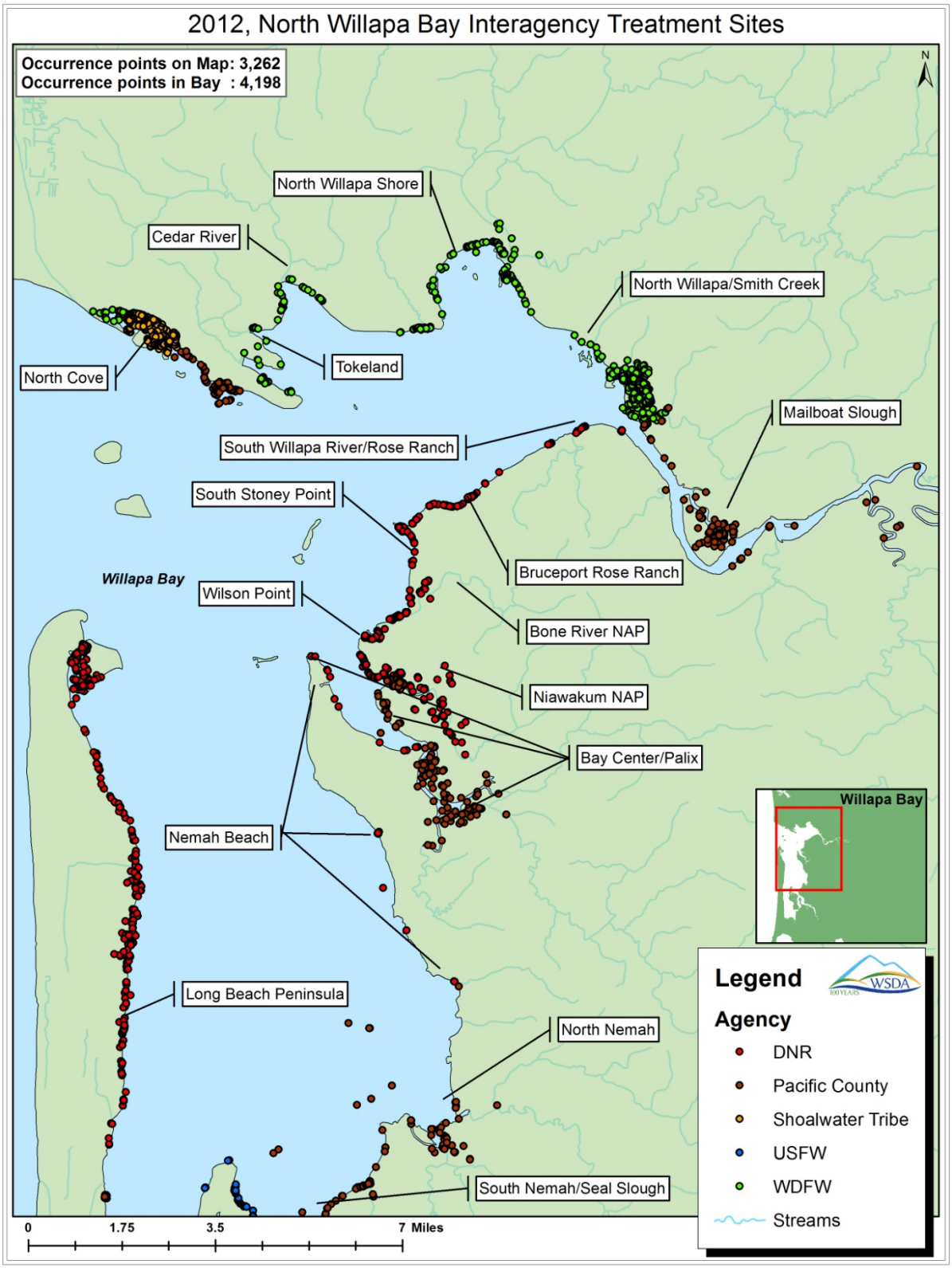

Figure 4: 2012 North Willapa Bay interagency *Spartina* treatment sites.

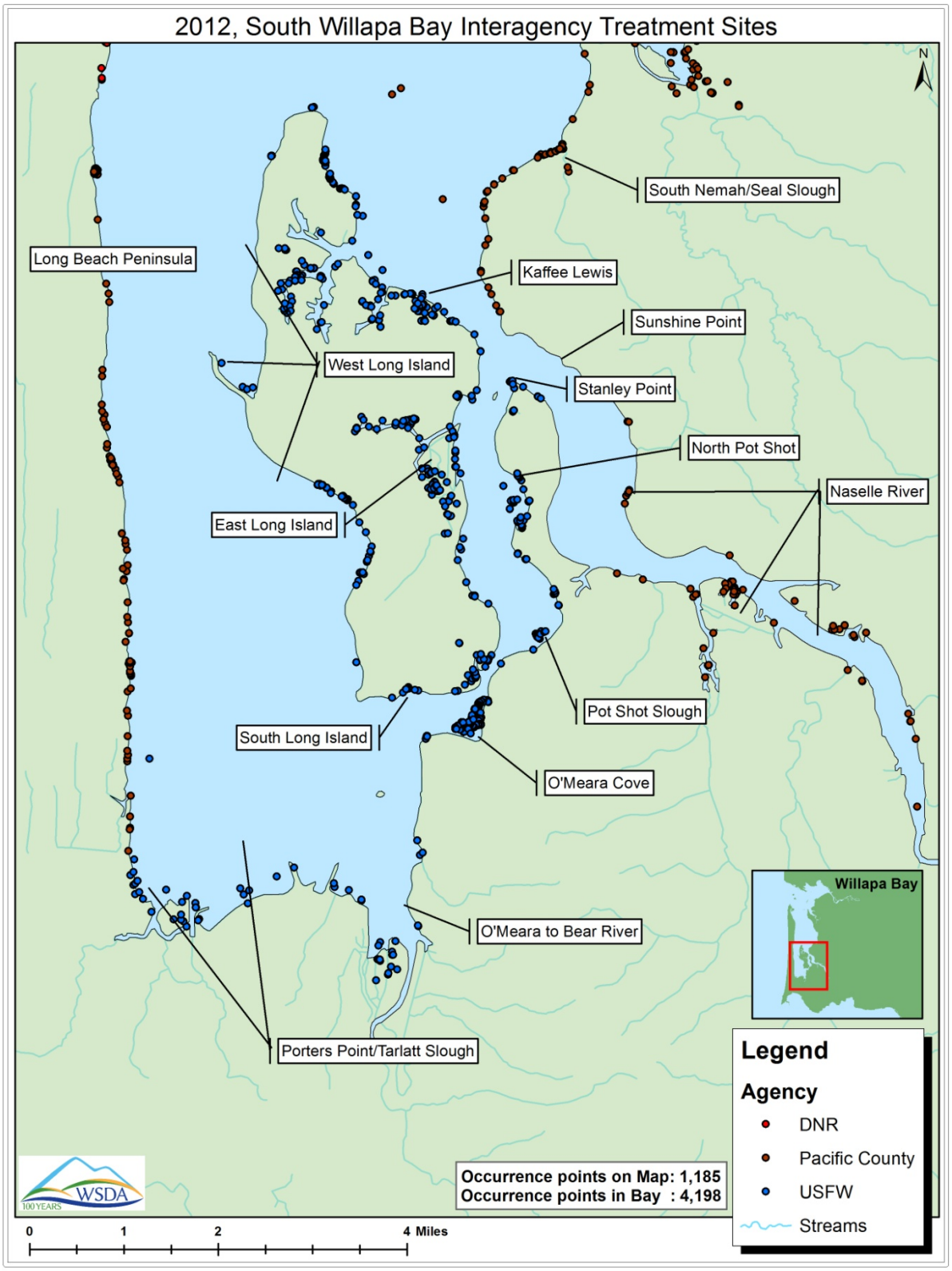

Figure 5: 2012 South Willapa Bay interagency *Spartina* treatment sites.

Roles of Cooperators in Pacific County for 2012

- **WSDA** – Provided resources, equipment, and herbicide to WDFW, DNR, and Pacific County to ensure proper treatment of all sites. Administered $345,000 contract with Pacific County and $120,000 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 2012 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 2013 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 nine 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.

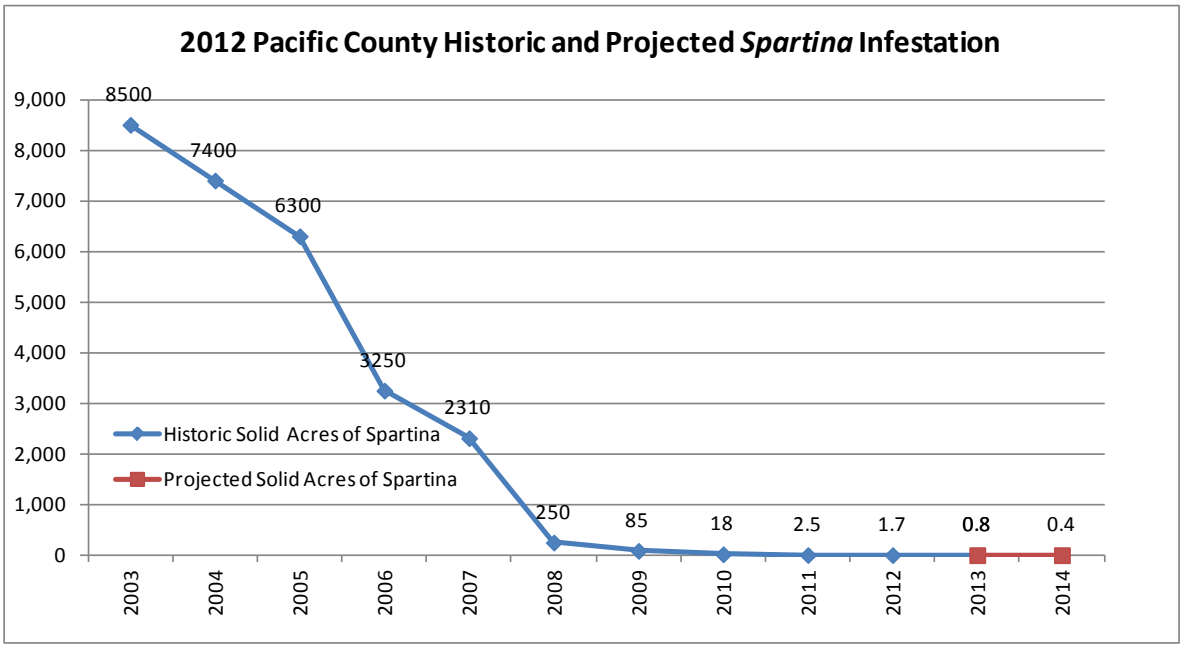

Figure 6: Solid acres of *Spartina* in Pacific County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2014. Projection assumes continued funding.

Grays Harbor County

Two species of *Spartina* infest Grays Harbor County. The most prevalent species is *Spartina alterniflora*, which was discovered the in the early 1990's. *Spartina densiflora,* discovered in 2001, 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 2012, with the opportunity furnished by continued federal funding from the USFWS Nisqually National Wildlife Complex and approximately $100,000 in dedicated state funds, crews from WSDA and WDFW completed three survey laps of all known infestations and treated approximately 915 ft^2 (0.021 acre) of *Spartina* within Grays Harbor County. (Figure 7) Of this total, roughly 900 ft^2 (0.02 acre) were *S. alterniflora* and 15 ft^2 (0.0003 acre) were *S. densiflora.* This is an increase from the approximate 378 ft^2 (0.008 acre) of *Spartina* treated in 2011. However, a significant portion of the *Spartina* treated in 2012 was from an approximate 870 square foot clone of *S. alterniflora* which was unexpectedly located on mud flats during an extreme low tide in the middle of the harbor.

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 regime in the Harbor to that point. Approximately 25,000 acres of intertidal lands in Grays Harbor and its tributaries with the potential for *Spartina* infestations were surveyed. Additionally, a coastal aerial survey revealed a 0.7 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 other 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 0.021 acre from a high of approximately 10 acres in 2005 and reduced the overall infestation of *S. densiflora* to roughly 0.0003 acre from a high of 0.28 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. However, in some heavily infested areas herbicide treatments are still required.

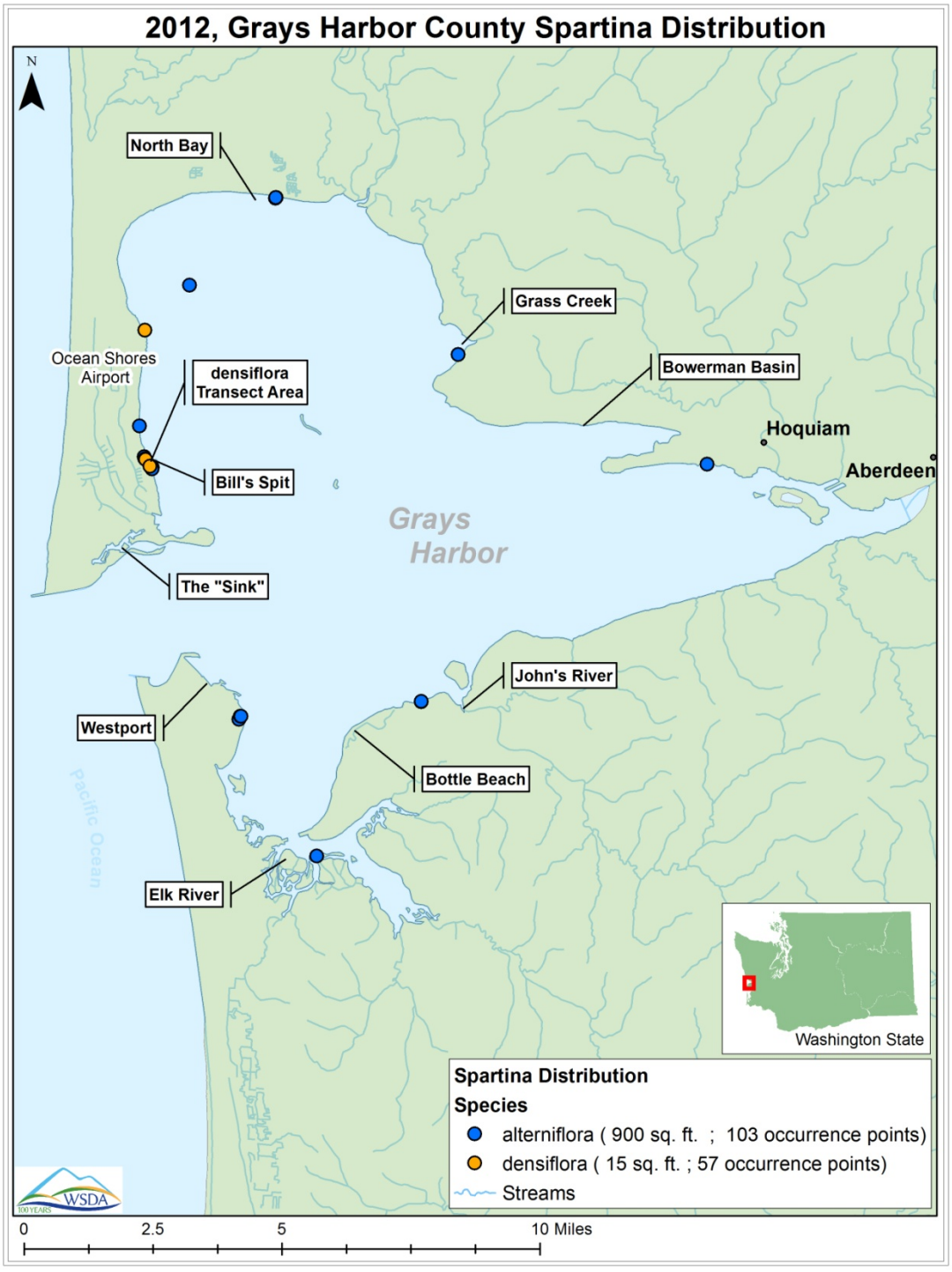

Figure 7. *Spartina* distribution *S. alterniflora* (yellow) and *S. densiflora* (red), Grays Harbor County, 2012.

Grays Harbor County Recommendations

With the successes of the past eight years and the massive reductions of *Spartina* in Grays Harbor County, continued support and funding are more important than ever. As the large clones 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 most 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 2013 will not differ significantly from the cost of conducting the previous large-scale applications.

After the success of the 2012 season, WSDA projects that less than 0.002 solid acres of *Spartina* will be present in Grays Harbor County during the 2013 treatment season (Figure 8).

Specific recommendations for the 2013 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 transect methodology utilizing advanced GPS technology. Conduct winter *S. densiflora* transects in Bills Spit and perform surveys in North Bay.

3) Continue to perform coastal surveys and extend the Grays Harbor survey well inland of the salt marsh and all the way to the channels on the mud flats to insure that no outlying infestations are missed.

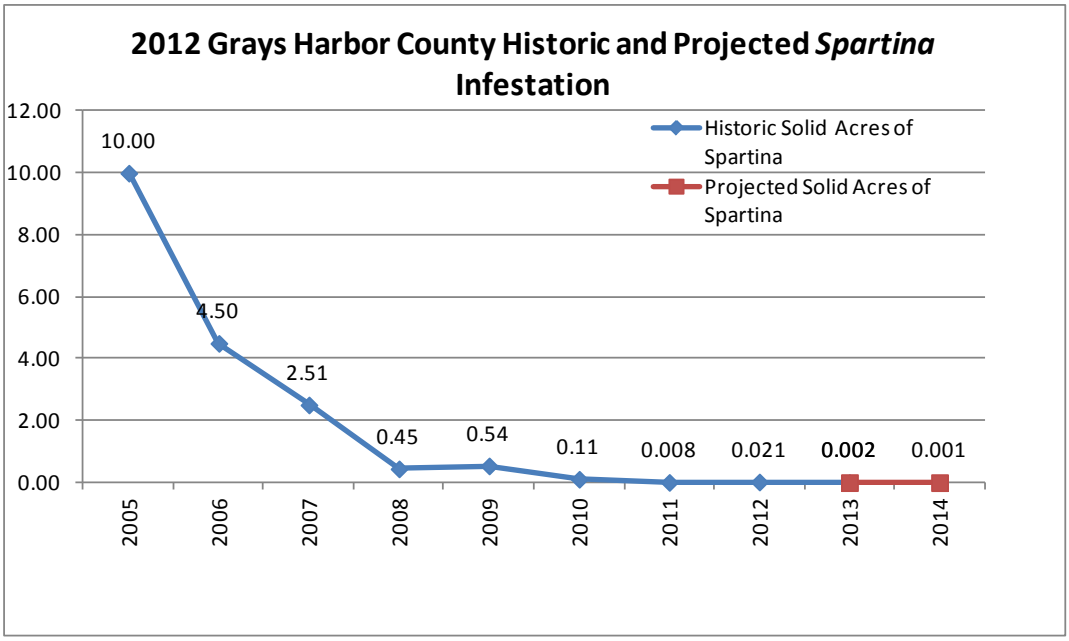

Figure 8: Solid acres of *Spartina* in Grays Harbor County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2005. The red line represents the projected *Spartina* area through 2014. Projection assumes continued funding.

Snohomish County

In 2012 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 3.70 solid acres (10,382 occurrence points) of *Spartina anglica* in 2012 (Figure10). This is a 51% decrease from the 7.42 solid acres present in 2011. WSDA provided Snohomish County $50,000 for *Spartina* eradication activities in 2012.

The majority of the infestation in Snohomish County was controlled by the WDFW where 2.99 solid acres of *Spartina* were found and treated. North Leque island (1.35 solid acres) and the WDFW owned land located in Southeast Skagit Bay (1.37 solid acres) produced the largest amounts of solid acreage within Snohomish County.

SCNWCB controlled 0.67 solid acres in Snohomish County contained mostly within the South Skagit Bay area (0.53 solid acres) and the mouth of the Stillaguamish River (0.12 solid acres). SCNWCB also worked closely with the Tulalip Tribal Nation to treat 0.018 solid acres of *Spartina* within the Tulalip Bay tribal area in 2012. The 2012 effort in Tulalip Bay represents a 93% decrease from the 0.25 solid acres 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) 0.04 solid acres 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 0.04 solid acres treated in 2012 represents a 99% reduction from the 2.56 solid acres treated in 2006. For the 2013 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.

With the large reductions in solid acreages experienced in Snohomish County in 2012 future cooperative efforts among partnering agencies in problematic areas will be paramount in the efforts to eradicate *Spartina* countywide.

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

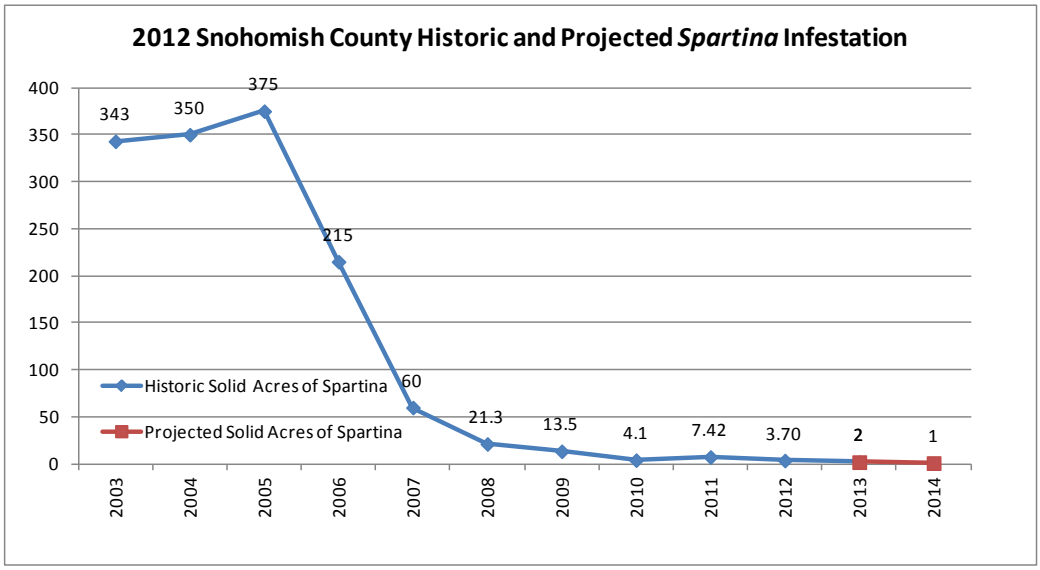

Figure 9: Solid acres of *Spartina* in Snohomish County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2014. Projection assumes continued funding.

Figure 10: 2012 Snohomish County Spartina distribution by species.

Island County

In 2012, Island County contained the second largest infestation of *Spartina* in Puget Sound. The Island County Noxious Weed Control Board (ICNWCB) and WDFW conducted the *Spartina* eradication work in Island County. A total of 2.86 solid acres of *Spartina* (*S. anglica*/*S. densiflora*) representing 12,060 occurrence points were found and treated in 2012 (Figure 12). This represents a 66% decrease from the 8.38 solid acres treated in 2011. WSDA provided Island County $50,000 for *Spartina* eradication activities in 2012.

ICNWCB and its contractor Wildlands Management controlled the major *Spartina* infestations and seed sources on Whidbey Island in 2012. 1.08 solid acres of *Spartina* were treated by Wildlands Management throughout Island County in 2012. Cultus Bay and Maylors Marsh contained the majority of solid acreage treated in 2012.

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^2 were located and manually removed at this site in 2012. 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 2013/14.

WDFW treated a total of 1.79 solid acres in Island County in 2012. The majority of the *Spartina* infestation occurred in Emericks Island (0.94 solid acres) and Prices Island (0.75 solid acres). Additionally, in one survey/treatment lap spanning two work days, 0.39 solid acres were treated as part of a County, WDFW, and WSDA cooperative effort in Hancock Lagoon this season. In the future this site will require repeated cooperative surveys due to limited access and difficult terrain.

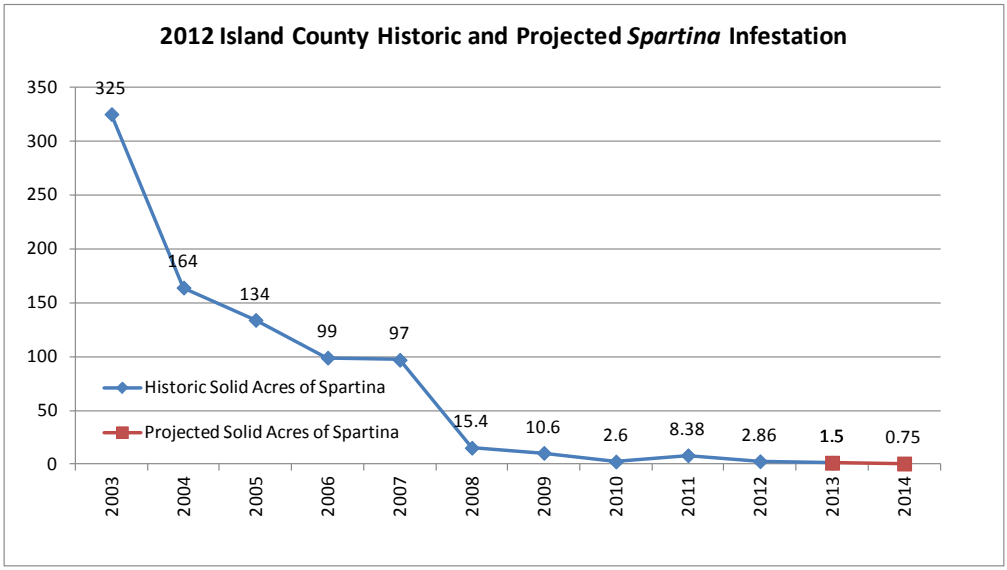

Figure 11: Solid acres of *Spartina* in Island County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2014. Projection assumes continued funding.

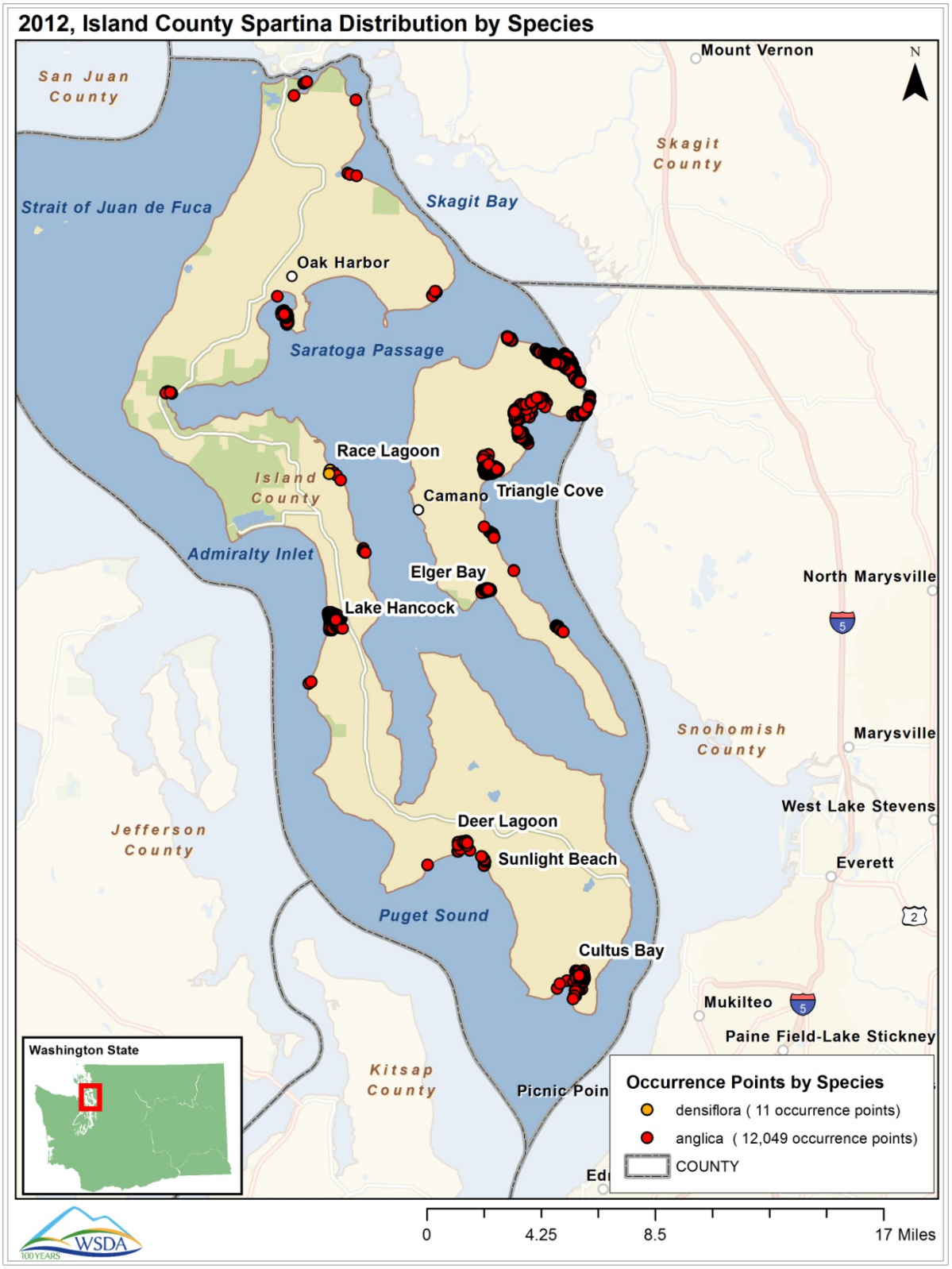

Figure 12: 2012 Island County Spartina distribution by species.

Skagit County

In 2012, Skagit County contained the third largest infestation of *Spartina* in Puget Sound. Approximately 0.82 solid acres of *Spartina anglica* representing 1,921 occurrence points were found and treated in 2012 by the Skagit County Noxious Weed Control Board (SCNWCB), DOE, WDFW, WSDA, and the Swinomish Tribal Nation (Figure14). This represents a 46% increase from the 0.45 solid acres treated in 2011. WSDA provided $25,000 to SCNWCB and $6,000 to the Swinomish Tribal Nation for *Spartina* eradication activities in 2012.

The SCNWCB treated a total of 0.73 solid acres of *Spartina* in 2012. Most of the survey and treatment efforts by SCNWCB occurred in the areas near Fir Island. For 2013, in addition to the Fir Island infestations, the SCNWCB will survey and treat all outlying islands including Ika Island and the tide flats between Craft and Ika islands. These areas were not surveyed in 2012 due to lack of access and are a priority for the 2013 treatment season.

The Swinomish Tribal Nation engaged in *Spartina* control on their lands. In 2012, two rounds of treatment were completed by the Swinomish Tribe throughout their land. A total of 0.94 solid acres of *Spartina anglica* was treated. Kwonesum, located in the Swinomish Channel, was the most heavily infested area with 0.015 solid acres (653 ft^2) 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 end of the 2012 treatment season, Turners Cove produced 0.014 solid acres 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 2012 treatment season, DOE treated/dug 0.0006 solid acres (26 ft^2) of *S. anglica* and 0.0002 solid acres (10.4 ft^2) of *S. alterniflora*.

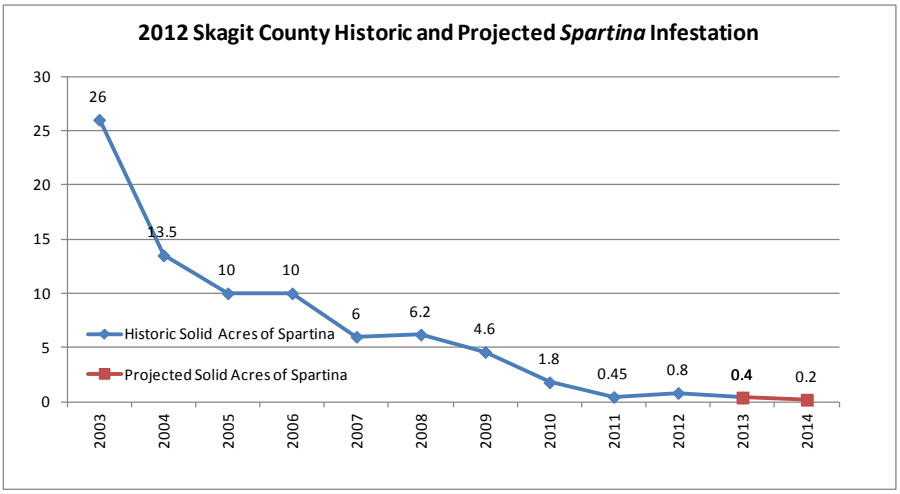

Figure 13: Solid acres of *Spartina* in Snohomish County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2014. Projection assumes continued funding.

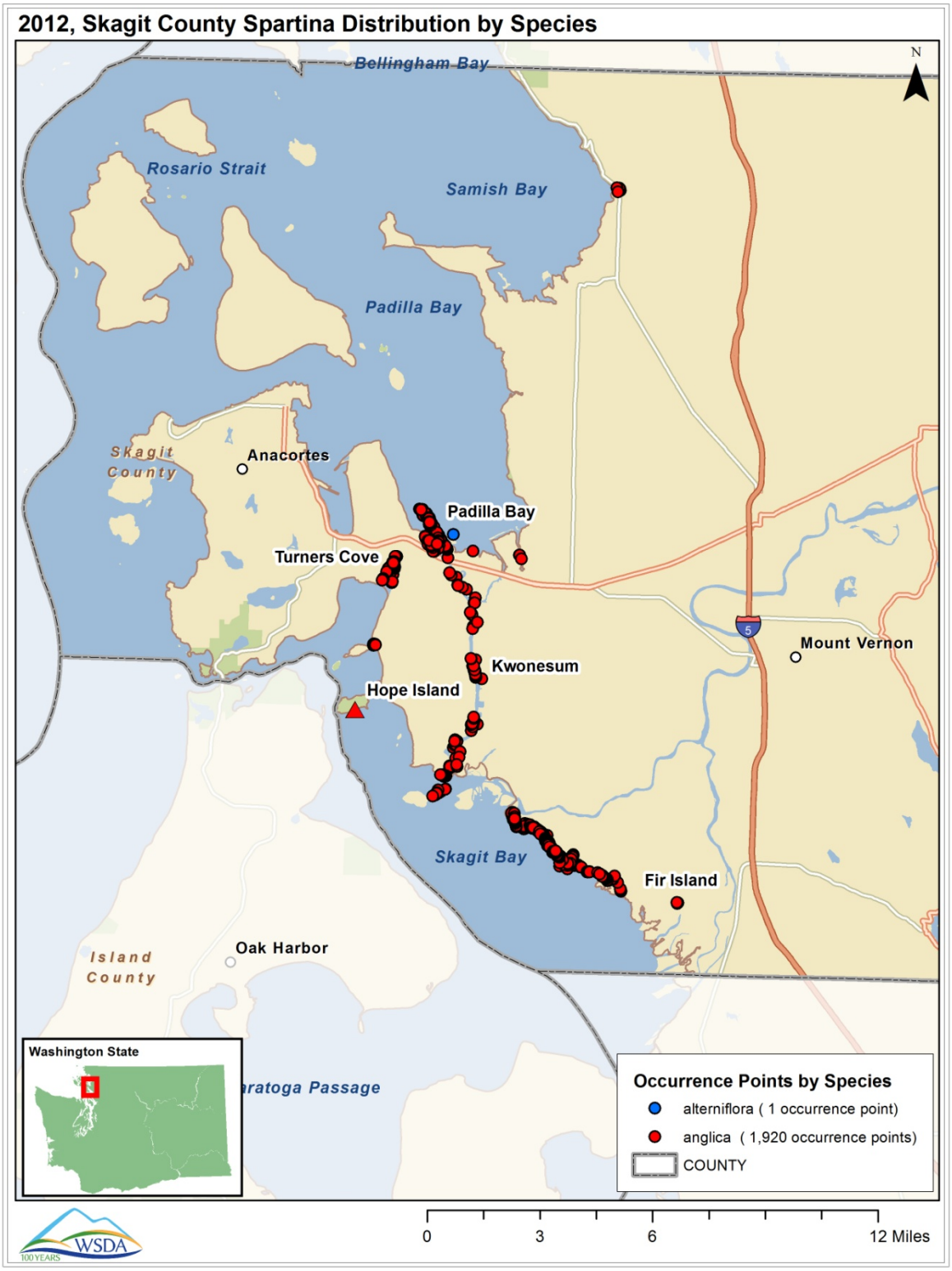

Figure 14: 2012 Skagit County Spartina distribution by species.

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 Weed Board (WCWB), People for Puget Sound and WSDA located and dug approximately 100 ft^2or 0.0023 solid acres 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 acres) of *S. anglica* were dug and removed in the Red River/Nooksack Delta area. This is a 45% decrease from the first treatments conducted in 2011. For the 2013 season, WSDA will continue to assist the Lummi Tribe with the survey and treatment of their lands and have provided $5,000 to the WCWB to survey potential *Spartina* habitats located within the county.

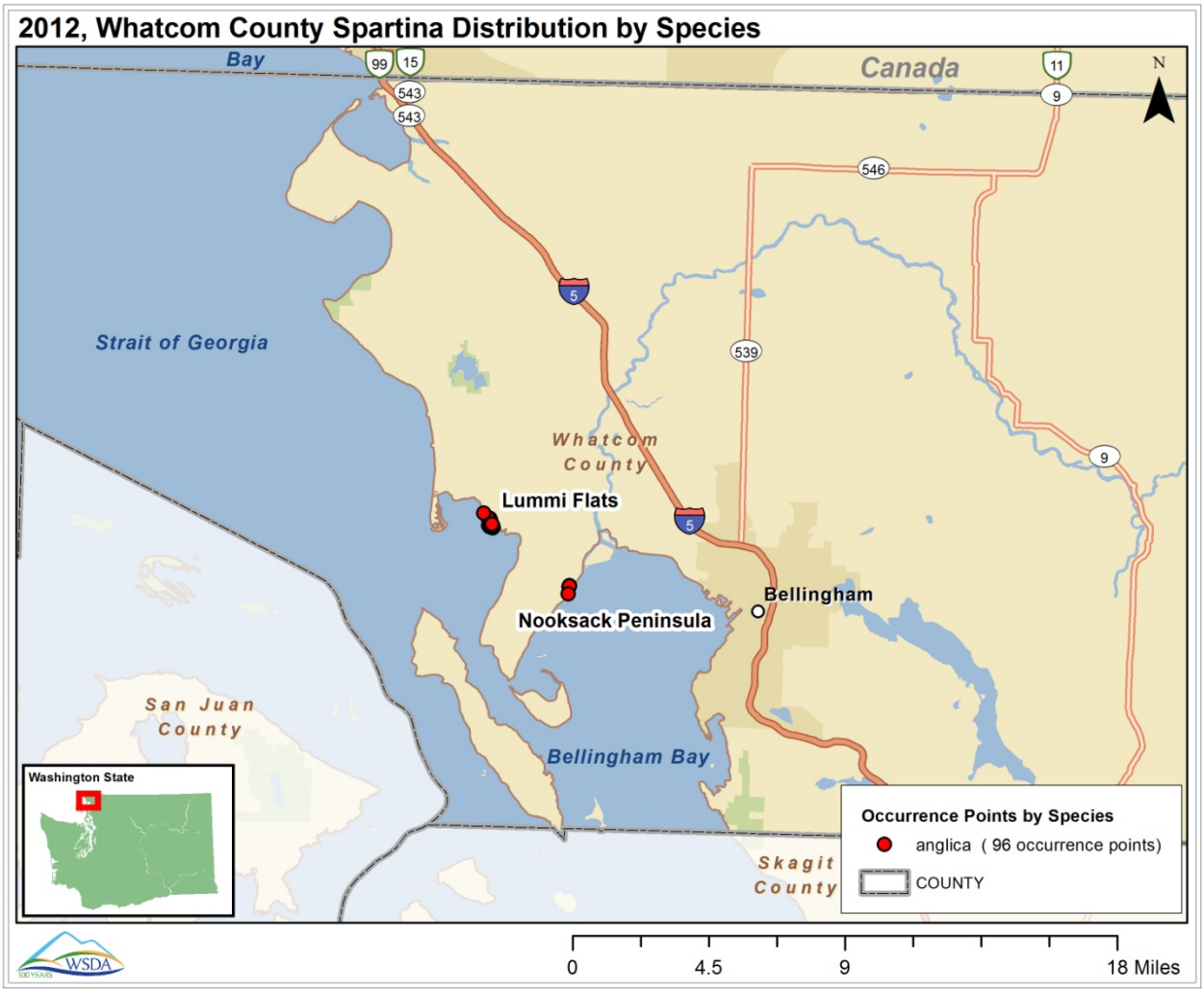

Figure 15: 2012 Whatcom County Spartina distribution by species.

San Juan County

Approximately 0.002 solid acres or 76 $ft^2$of *Spartina anglica* were dug or treated with herbicide in San Juan County in 2012. A large clone (approx. 64 ft^2) was found just north of the Spencer Spit Bay area. This clone was growing on an exposed beach in large cobble substrate and treated using herbicide (See Cover Photo). In addition to Spencer's Spit, the historically infested areas such as Fisherman's Bay, Low Point, Sculpture Park and White Point continue to produce *Spartina* although in small amounts. In San Juan County from 2011 to 2012, a 99% reduction in the amount of *S. anglica* treated was achieved. WSDA will continue to assist the San Juan County Weed Board in the survey and treatment of all vulnerable habitat located within the county.

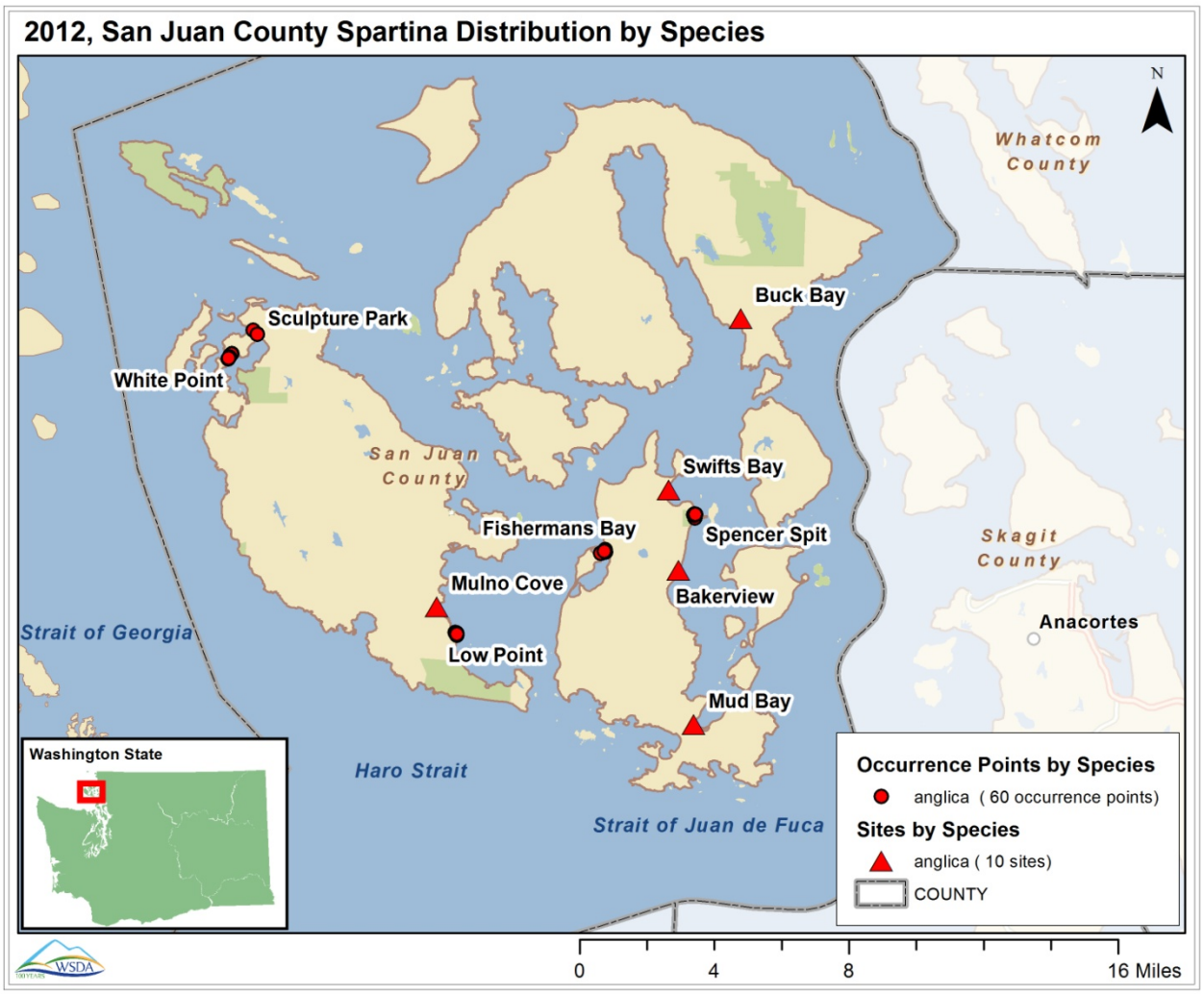

Figure 16: 2012 San Juan County Spartina distribution by species.

Clallam County

In 2012, 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 2012 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 2012, detailed ground and kayak surveys yielded 12 *Spartina* occurrence points totaling approximately 88 ft^2 (0.002 acre) within the county. With help from the Makah Tribal Nation, approximately 84 ft^2 (0.0019 acre) of *S. alterniflora* was treated on the Waatch River. Working in cooperation with the USFWS, WSDA crews dug and removed roughly 4 ft^2 (0.00009 acre) of *S. anglica* at Dungeness Spit. This is a county wide reduction of over 99% since 2007.

In addition to a minimum of two visits to all known sites in 2013, thorough ground and kayak surveys of all vulnerable *Spartina* habitat in Clallam County is recommended. Figure 17 depicts the 2012 distribution of *Spartina* in Clallam County including site names.

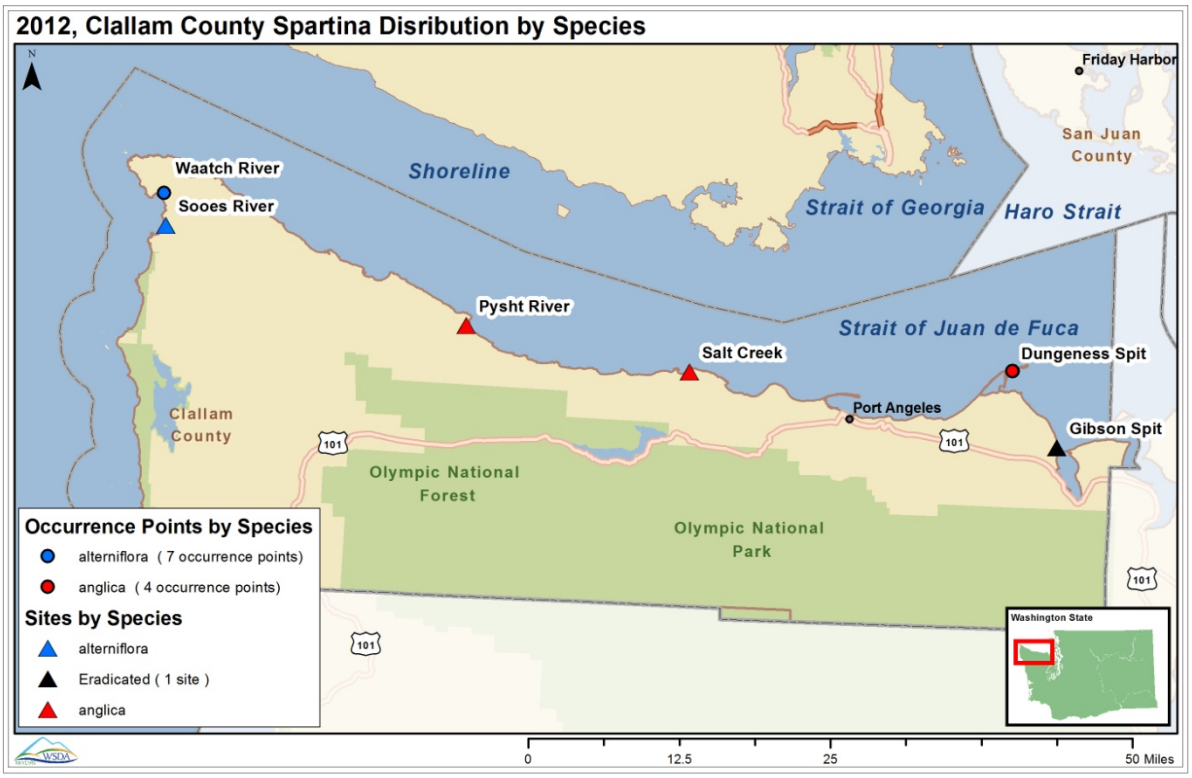

Figure 17: 2012 Clallam County Spartina distribution by species.

Kitsap County

In Kitsap County, a total of 0.002 solid acres of *Spartina* were treated or manually removed in 2012. WSDA and the Suquamish Tribe worked together to treat the largest known infestation in the central Puget Sound at Doe-Kag-Wats. This site has significant challenges with continually shifting driftwood that litters the cove and makes surveying difficult and dangerous. 0.002 solid acres of *Spartina* were treated at Doe-Kag-Wats in 2012 which is over a 95% decrease from the 0.04 solid acres treated in 2011. 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 (4 ft^2) and Foulweather Bluff (5 ft^2). At the conclusion of the 2012 treatment season, 3 sites were declared eradicated and will be closely monitored in the coming years to ensure that no re-infestations occur (Figure 18). For 2013, WSDA crews will continue to survey the estuarine habitat of Kitsap County to ensure that no new outlying infestations exist.

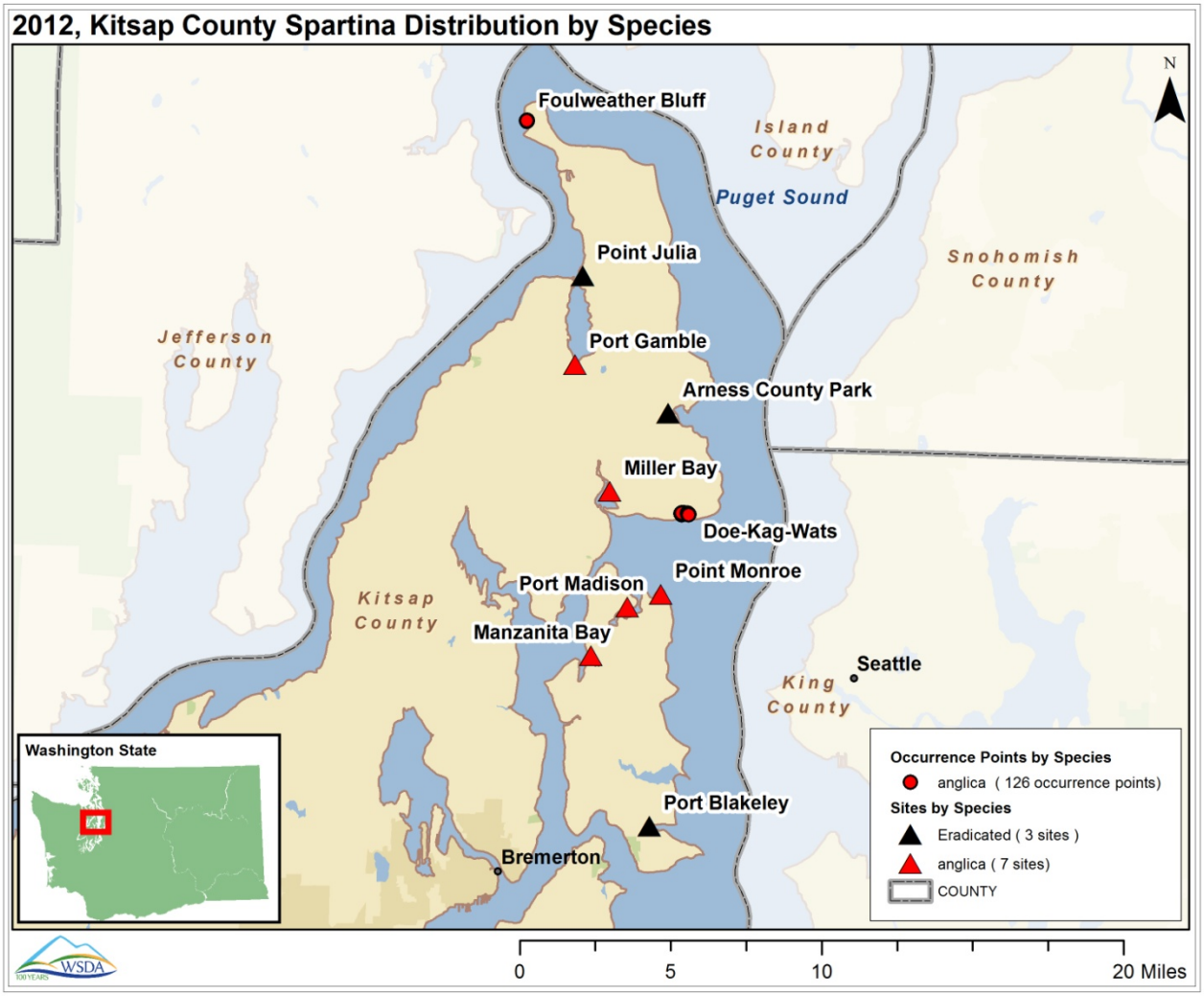

Figure 18: 2012 Kitsap County Spartina distribution by species.

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 2012 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 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 2012, extensive ground and kayak surveys yielded 8 *Spartina* occurrence points totaling approximately 25 ft^2 (0.0005 acre) within Jefferson County. WSDA crews dug and removed roughly 4 $ft^2$of *S. anglica* at Fort Flagler and 1 ft^2 from Kala Point. 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 20 ft^2 (0.0004 acre) of *S. patens* was treated in 2012. This a significant reduction from the 730 ft^2 (0.017 acre) treated in 2011. However, due to the elusive nature of this species WSDA expects that frequent and detailed surveys will be required before it can be successfully eradicated.

In 2013, continued surveys of shoreline 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 2012 distribution of *Spartina* in Jefferson County including site names.

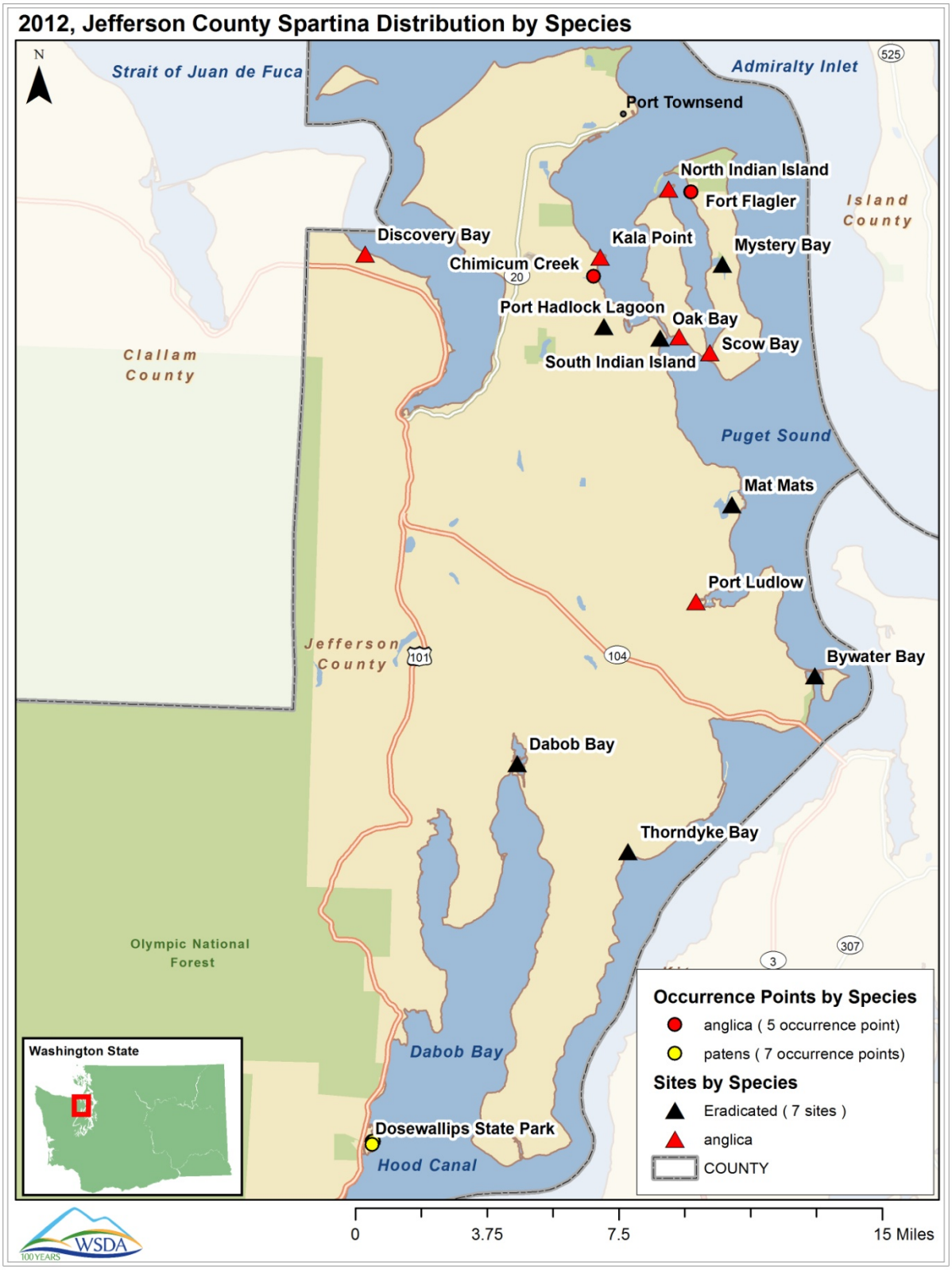

Figure 19: 2012 Jefferson County Spartina distribution by species.

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 acres) 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 acres) of *Spartina*. Two survey/treatment laps were conducted in 2012 where 6 ft^2 (0.00014 solid acres) were manually removed. This represents a 90% decrease from the 60 ft^2 first found and treated in 2010. 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.

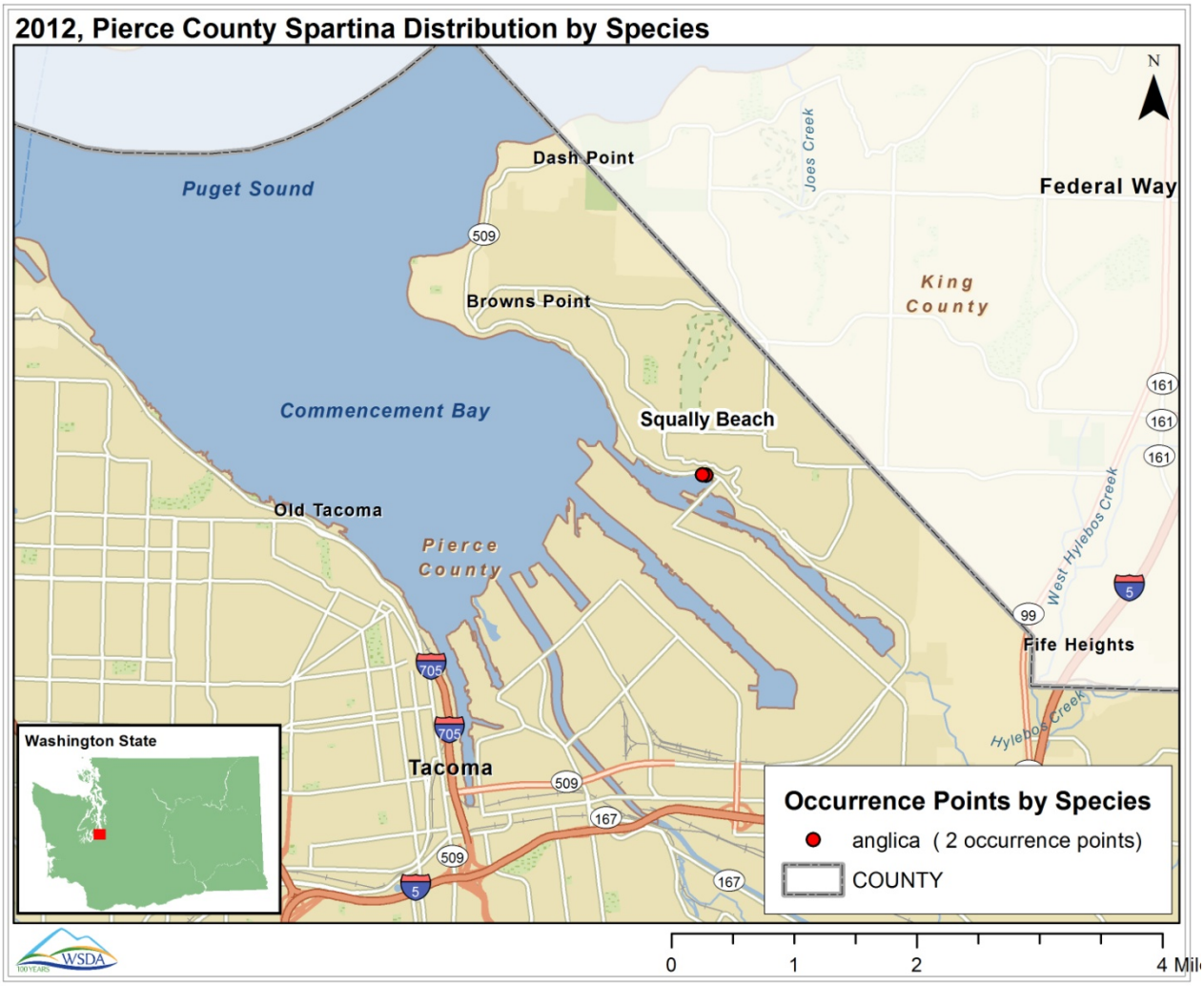

Figure 20: 2012 Pierce County Spartina distribution by species.

King County

Historically, small infestations of *S. anglica* were found on Vashon Island near Rabs Lagoon, Point Heyer, Gorsuch Road and Fern Cove. However, surveys conducted by WSDA and the King County Noxious Weed Control Board (KCNWCB) in 2012 revealed no new Spartina infestations. As per the eradication declaration procedures set forth on page seven of this report, King County could be designated as "eradicated" following negative survey events for the 2013 treatment season. WSDA and KCNWCB will continue to monitor the estuarine habitat of King County to ensure that no new infestations occur.

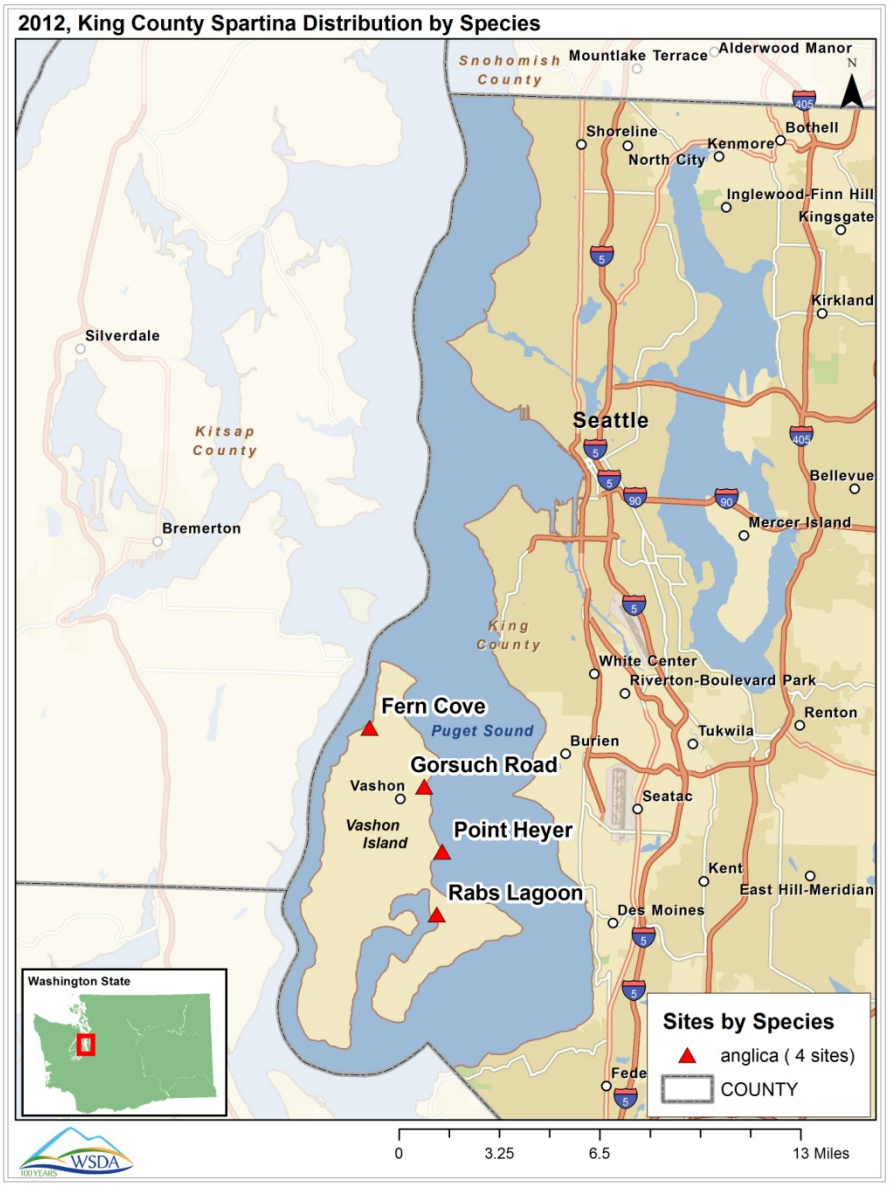

Figure 21: 2012 King County Spartina distribution by species.