Spartina Eradication Program 2014 Progress Report

Washington State Department of Agriculture

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Cover photo provided by Chad Edwards (WSDA)
Other photos provided by Dave Heimer, Les Holcomb (WDFW)

Cover Photo: Clone of *Spartina anglica* with seed heads in foreground with a Marsh Master II amphibious vehicle in the background, S.E. Skagit Bay, Snohomish County, Washington.

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Extreme care was used during the compilation of the maps in this report to ensure accuracy. However, due to changes in data and the need to rely on outside sources of information, the Department of Agriculture cannot accept responsibility for errors or omissions, and therefore, there are no warranties which accompany this material.

PROGRESS OF THE 2014 *SPARTINA* ERADICATION PROGRAM

January 2015

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

The 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 eight solid acres in 2015. These final, eight solid acres are a collection of individual plants and small clones 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 eradication can be achieved. Figure 1 is a projection of *Spartina* reduction within Washington State over the next two years assuming continued funding. The increases in 2013 and 2014 are the result of transitioning funding and resources to the Puget Sound counties as the coastal infestation levels have declined. This transition along with an exceptionally warm growing season contributed to the increases.

In 2014, as part of an increasingly detailed survey effort, project partners inspected over 80,000 acres of saltwater estuaries and more than 750 miles of shoreline in 12 counties for evidence of *Spartina*. As part of this effort in 2014 the cooperators found and recorded 19,675 *Spartina* occurrence points or discrete finds. 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.

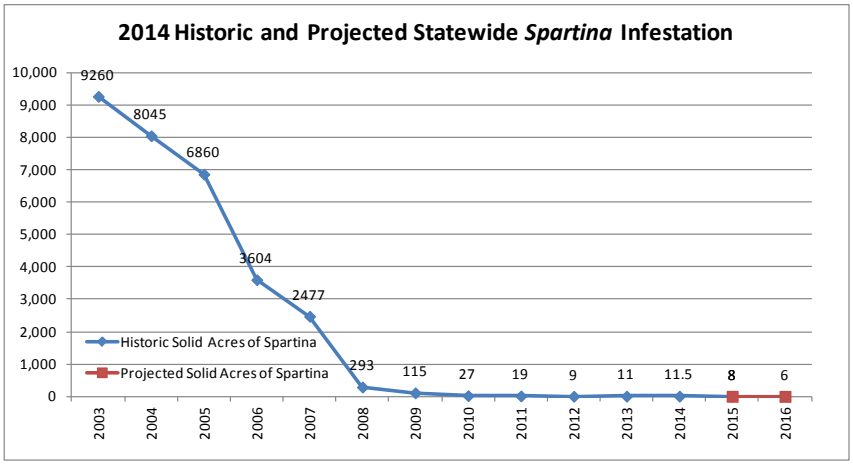

Figure 1: Solid acres of *Spartina* by year statewide based on WSDA estimates. The blue line represents historic *Spartina* infestation since 2003. The red line indicates the projected *Spartina* infestation level through 2016. Projection assumes continued funding.

Pacific County

The 2014 Pacific County treatment program was a success with all known infestations treated. The cooperators' combined 2014 Pacific County effort located and treated 0.9 solid acre of *Spartina* (1,788 occurrence points), which is a 12 percent reduction from the 1.02 solid acres treated in Pacific County during the 2013 season. In 2014, the program continued to eradicate the scattered infestations and individual plants remaining throughout the bay. WSDA estimates that 0.6 solid acre of *Spartina* or less than 10 percent of the Washington State infestation will remain in Pacific County during the 2015 treatment season.

Grays Harbor County

In 2014, WSDA, Washington State Department of Fish and Wildlife (WDFW), Washington State Department of Natural Resources (DNR), and United States Fish and Wildlife Service (USFWS) cooperatively treated all known infestations, with the exception of three *S. alterniflora* plants found post treatment season. During the 2014 season, a total of 0.013 solid acre of *Spartina* was found and treated. Of the 0.013 solid acre treated, 0.011 solid acre were *S. alterniflora* (30 points) and 0.0023 solid acre were *S. densiflora* (90 points). This is an increase from the approximate 0.0032 solid acre of *Spartina* treated during the 2013 season. WSDA estimates that 0.008 solid acre of *Spartina* will remain in Grays Harbor during the 2015 treatment season.

Puget Sound Counties

In 2014, approximately 10.5 solid acres of *Spartina*, representing 17,719 occurrence points, was treated in the Puget Sound. This represents a five percent increase from the ten solid acres treated in 2013. A number of factors contributed to this increase, including: the most detailed survey to date, a very long and warm growing season, increased funding for staff and the use of Puget SoundCorps (PSC) crews (see appendix A). WSDA estimates that fewer than eight solid acres of *Spartina* will remain in Puget Sound in 2015.

2014 Trends

Recognizing that 90 percent of the state's remaining *Spartina* infestation was contained within Puget Sound the cooperators increased efforts in 2014. Both funding and resources have transitioned to the Puget Sound as the coastal infestation level has been reduced. For the second year DNR funded PSC crews were made available in Skagit, Snohomish and Island counties. Increased funding was provided to WDFW 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 expanded their survey and eradication efforts. This resulted in an increase in both the number of detections and the acreage treated compared to 2013. Also contributing to the increase in *Spartina* during 2014 was the long, warm growing season and improved data management (see appendix B).

An encouraging development is depicted in Figure 2 where 15 new black triangles represent previous *Spartina* infestations declared eradicated in 2014. One site in King County previously declared eradicated was found to contain a small population in 2014. This brings the total number of previously infested sites declared eradicated to 35.

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*.

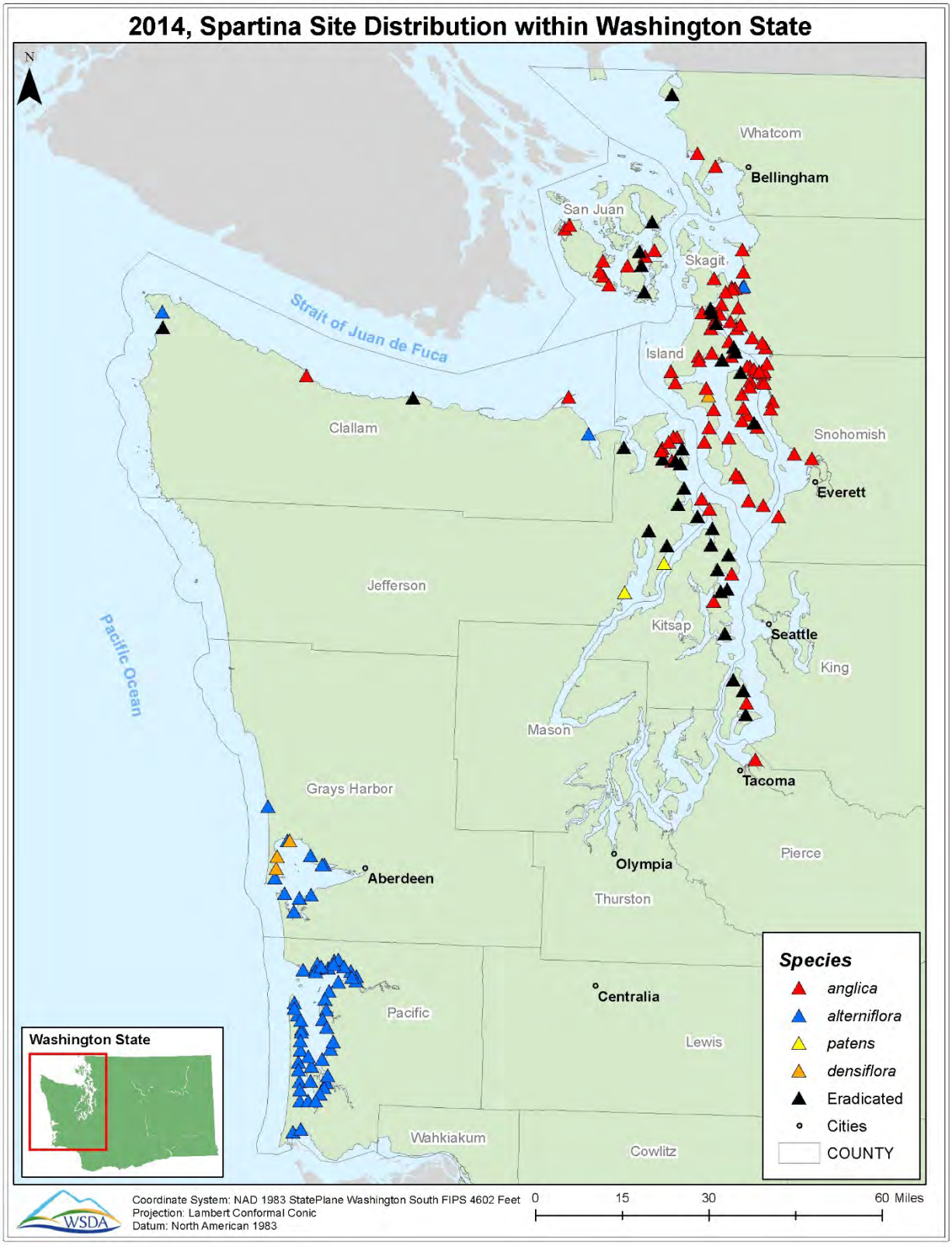

Figure 2: Distribution of invasive *Spartina* sites in Washington State, 2014.

Spartina Eradication Program

WSDA *Spartina* Program

In 2014, 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, cost-share agreements, and contracts with state and local government agencies. WSDA organized and facilitated the exchange of *Spartina* eradication information through regional planning and informational meetings. The department also continued to explore more efficient and cost-effective ways to eradicate *Spartina* with partner agencies.

In 2014, 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 2014, 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 2014 season occurred when 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 a second year of 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*.

WSDA also implemented a significant process improvement during the 2014 *Spartina* season. A cloudbased data collection system was introduced greatly limiting the mishandling of data between the partner agencies. This is one factor contributing to the increase in occurrence points reported for 2014. See appendix B for more information about this cloud based data collection system.

Additionally, an opportunity was provided to the Puget Sound partners during the 2014 summer *Spartina* survey season for the return of Puget SoundCorps (PSC) crews. The Washington State Department of Natural Resources was able to fund PSC crews who were available to assist with a variety of projects including riparian weed control and *Spartina* survey and eradication. Whether they worked directly in the field with *Spartina* crews or along rivers on the Knotweed project, their contribution to the 2014 Puget Sound effort took pressure off the county and state crews which allowed for extremely detailed surveys in 2014. The addition of PSC crews resulted in an expansion of the *Spartina* eradication effort into new areas. The increase in the amount of *Spartina* found and treated in 2014 was a direct result of the increased survey effort and expansion of the areas surveyed. All of the project partners who had the opportunity to work with the PSC crews appreciated the opportunity and hope that the crews will return during future summer 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	$487,000.00	$525,000.00	$1,012,000.00
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
Totals	**$870,500.00**	**$968,500.00**	**$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* (Figure 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 2005 which revealed another 10-15 solid acres. Through dedicated funding and aggressive eradication efforts by local, state, and federal agencies, only one solid acre of *S. alterniflora* remained in all affected counties during 2014, representing a 99.9 percent 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 percent of Washington State's infestation. As of 2014, the largest infestations of *S. anglica* are found within Snohomish (5.82 solid acres), Island (4.56 solid acres) and Skagit (0.1 solid acre) counties. In 2014, approximately 10.5 solid acres of *S. anglica* remain in the infested counties of Washington State representing a 99 percent 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 percent 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 2014, approximately 0.002 solid acre (100 ft^2) of *S. densiflora* was manually removed by crews from WDFW, DNR, and WSDA in Grays Harbor. Island County crews also located and removed an additional 6 ft^2.

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, Dosewallips 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 the Toandos Peninsula. Due to this find occurring late in the season and the need to notify and collaborate with the Navy to gain access, this site was not treated during 2013. Access to the Bangor infestation was granted in September of 2014 and WSDA chemically treated approximately 1,307 ft^2 of *patens* on the Toandos Peninsula (Figure 19).

S. patens, like *S. densiflora*, also exhibits physical characteristics that blend in well with the native saltmarsh flora making survey and treatment difficult. In 2014, 0.047 solid acre of *S. patens* was treated representing a 15 percent increase from the 0.04 solid acre treated in 2013. Permission to access and survey private lands located near the Dosewallips State Park and Bangor West infestations explains the increase in solid acreage treated in 2014. In the future these sites will require detailed survey and treatment efforts in order to achieve eradication.

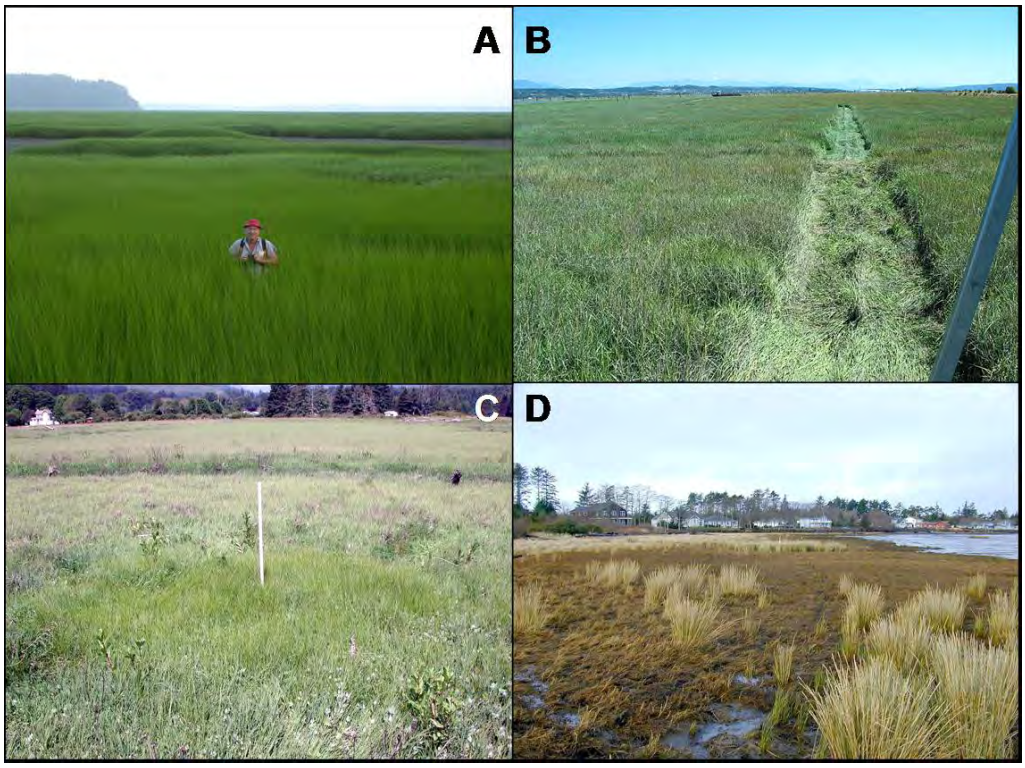

Figure 3: The four species of *Spartina* present in Washington. A) a meadow of *S. alterniflora* in Willapa Bay (2003), B) a meadow of *S. anglica* in Skagit Bay (2003), C) *S. patens* at Dosewallips (2001), and D) clones of *S. densiflora* in Grays Harbor County (2001).

With continued reductions in *Spartina* occurring statewide, an encouraging development for 2014 can be seen in Figure 2 page 3, where the 35 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 2014 control season was successful; below are some highlights of the 2014 treatment season. Following these brief highlights are detailed county by county reports.

- In 2014, fifteen additional *Spartina* sites were declared eradicated.
- One monitor site in King County thought to be eradicated was found to contain a small population.
- The *S. patens* site discovered in 2013 in Jefferson County across from Navy Base Kitsap-Bangor was treated after extensive coordination with the Navy.
- DNR provided PSC crews; increasing both the area covered and the staff available to conduct detailed surveys in Snohomish and Island counties.
- Additional funds were provided to WDFW Puget Sound allowing the crew to increase *Spartina* activities in Snohomish and Island counties.
- Approximately 11.5 solid acres of *Spartina* were located and treated in Washington State during 2014. This represents a five percent increase from the 11 solid acres treated in 2013. The PSC crews and additional funding provided to WDFW were key factors in locating this additional *Spartina*.
- Over 165 miles of shoreline in the San Juan Islands were surveyed by boat. No *Spartina* was discovered outside of known sites.
- Extensive shoreline surveys were continued in Jefferson and Kitsap counties where no new *Spartina* infestations were located.
- Grays Harbor received the most widespread winter time survey to date where *S. densiflora* was the primary target. A majority of the *S. densiflora* found were located on those surveys, along with a few *S. alterniflora* clones.
- Cloud based data collection was introduced which greatly increased the efficiency of data transfer between the partner agencies. This is one factor contributing to the increase in occurrence points reported for 2014. See Appendix B for more information about this cloud based data collection.
- The WSDA *Spartina* program has achieved over a 99 percent 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 majority of *Spartina* in Pacific County lies within Willapa Bay. All of Willapa Bay was surveyed two or more times during the 2014 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 2014 season, approximately 0.9 solid acre 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 2014, the affected acres treated declined to 1,007 representing a 96 percent 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 2014, 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 2014, the cooperator surveys yielded a combined total of 1,788 *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 twelve 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 0.9 solid acre in 2014. This is an overall reduction of 99.9 percent achieved in eleven treatment seasons. If the 2014 treatment season meets expectations and achieves an overall efficacy of 30 percent or greater, WSDA estimates that 0.6 solid acre of *Spartina* will be present in Pacific County during the 2015 treatment season.

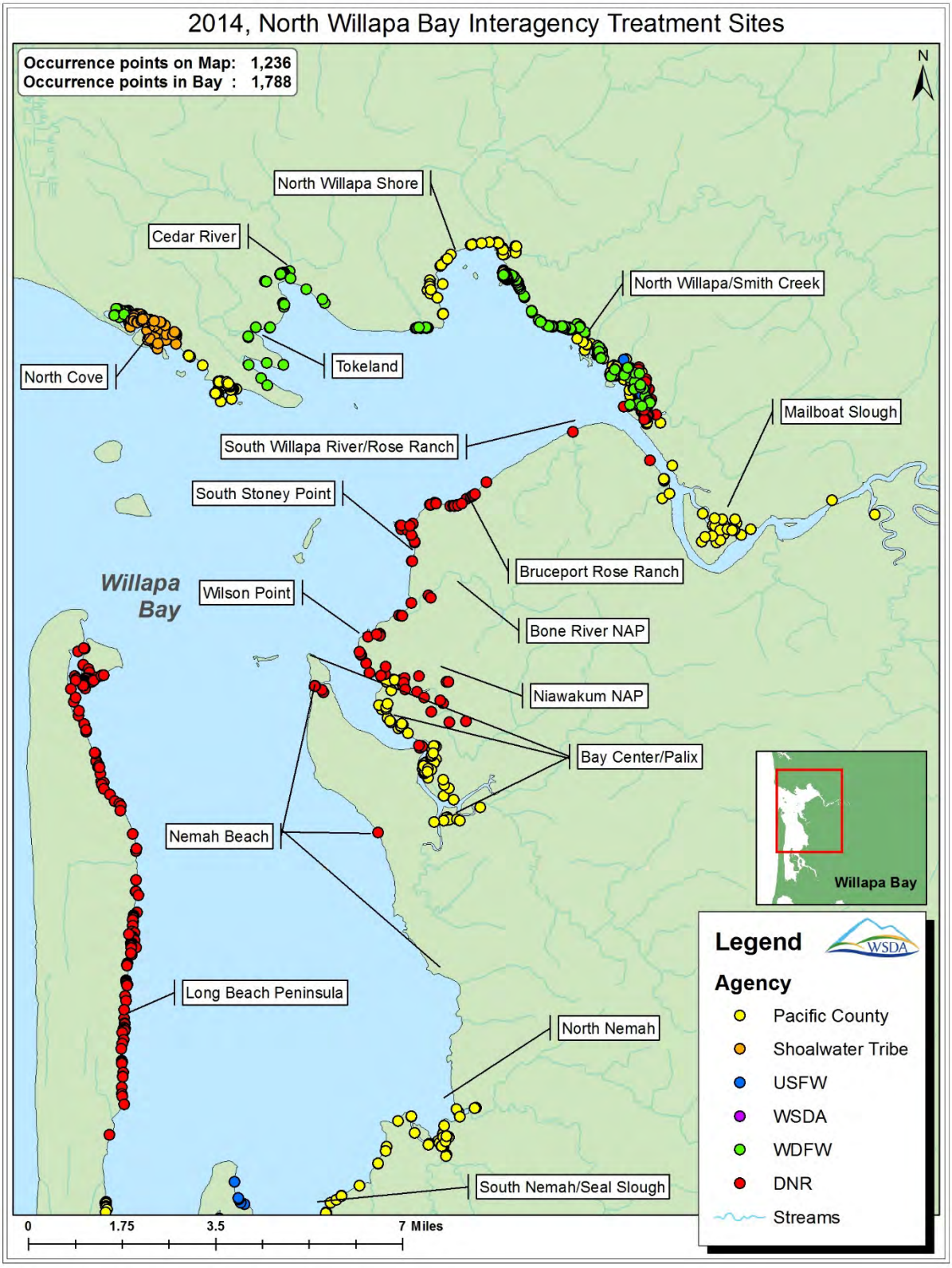

Figure 4: 2014 North Willapa Bay interagency *Spartina* treatment sites.

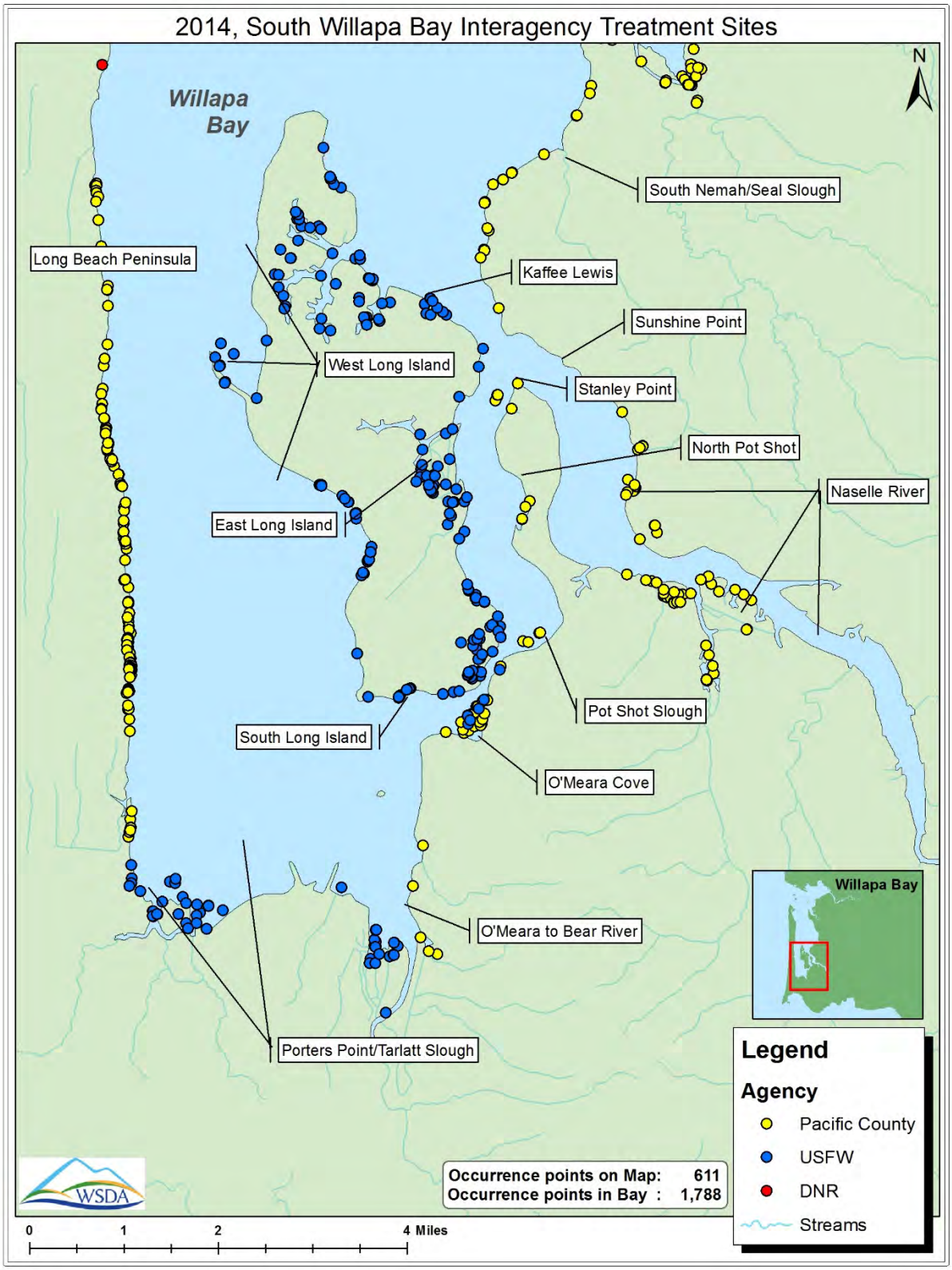

Figure 5: 2014 South Willapa Bay interagency *Spartina* treatment sites.

Roles of Cooperators in Pacific County for 2014

- **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. 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 12 years and the massive reductions of *Spartina* in Pacific County, continued support and funding remain crucial. The transition from the large-scale treatments of meadows has required significant 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. Under this regime, WSDA anticipates the overall cost of re-treating scattered infestations in 2015 will not differ significantly from that of recent years. Furthermore, it is anticipated that with continued programmatic success the cost of conducting *Spartina* eradication in Pacific County in 2016 and beyond will decrease. As the Pacific County infestation decreases, funding and resources can transition to the most heavily infested Puget Sound counties, while maintaining adequate resources in Pacific County to complete two detailed survey and treatment laps each year. With the successful eradication of over 8,000 solid acres of *Spartina* in Pacific County over the past twelve 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.

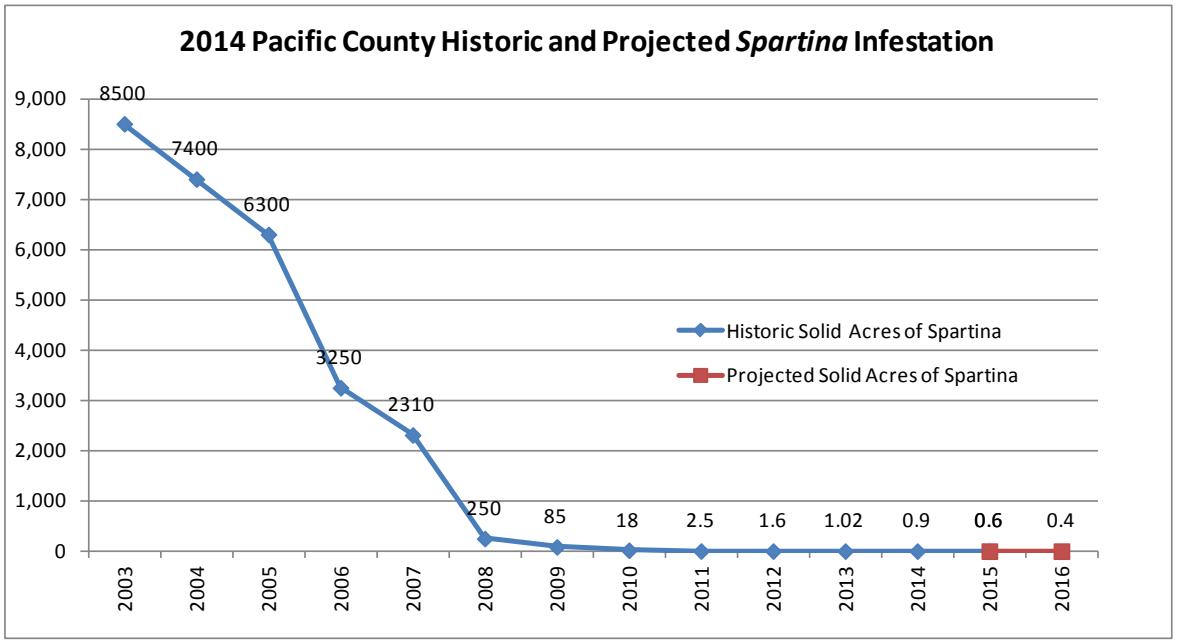

Figure 6: Solid acres of *Spartina* in Pacific County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2016. Projection assumes continued funding.

Grays Harbor County

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 ten 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, 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.

Historically the most prevalent species was *Spartina alterniflora*, discovered in the early 1990s. However, the most prevalent species in recent years has been *Spartina densiflora*, which was discovered in 2001 in Bill's Spit (Figure 7). 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 2014, with the opportunity furnished by continued federal funding from the USFWS Nisqually National Wildlife Complex and other state funding, crews from WSDA, WDFW, and DNR completed two survey laps of Grays Harbor. The crews found and treated approximately 566 ft^2 (0.013 solid acre) of *Spartina* within Grays Harbor County (Figure 7). Of this total, roughly 466 ft^2 (0.0011 solid acre) were *S. alterniflora* and 100 ft^2 (0.0023 solid acre) were *S. densiflora.* This is an increase from the 140 ft^2 (0.0032 solid acre) of *Spartina* treated in 2013. The increase is most notable in the amount of *S. alterniflora* treated.

Over the past eight years, the combined effort in Grays Harbor County has been extremely effective. The overall infestation of *S. alterniflora* has been reduced to less than 0.011 solid acre from a high of approximately ten solid acres in 2005 and reduced the overall infestation of *S. densiflora* to roughly 0.0023 solid acre from a high of 0.28 solid acre in 2009. This is a reduction of over 99 percent 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, if larger infested areas are located during future surveys herbicide treatments remain an option.

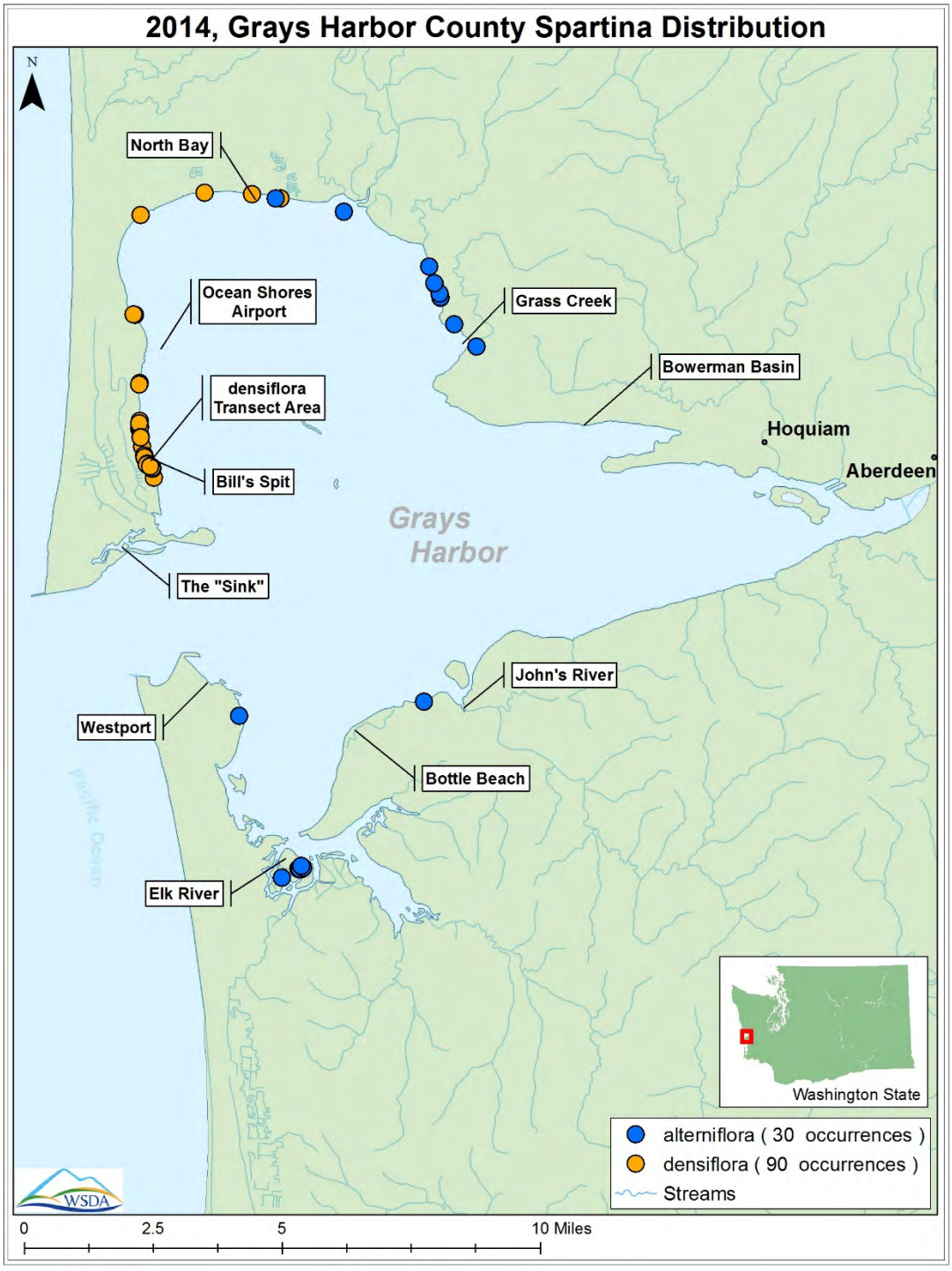

Figure 7. *Spartina* distribution *S. alterniflora* (blue) and *S. densiflora* (yellow), Grays Harbor County, 2014.

Grays Harbor County Recommendations

With the successes of the past ten 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. Winter surveys and manual removal have proven effective and provide for a longer treatment season. This programmatic shift has resulted in lowered herbicide costs and level labor costs. Under this regime, WSDA anticipates the overall cost of finding and controlling the scattered infestations in 2015 and 2016 will not differ significantly from the previous costs of conducting the program.

WSDA projects that less than 0.008 solid acre of *Spartina* will be present in Grays Harbor County during the 2015 treatment season (Figure 8). In order to be most efficient, two surveys of the entire Grays Harbor shoreline will be completed at strategic times throughout the year. One survey will be completed during the winter into early spring, targeting upper salt marsh areas for *S. densiflora* while native vegetation lies dormant. A second survey will be conducted during late summer and early fall. The focus of this survey will be locating *S. alterniflora* in the upper salt marshes as the surrounding plant life begins to recede. This tactical approach will maximize survey efforts in Grays Harbor during the 2015 treatment season.

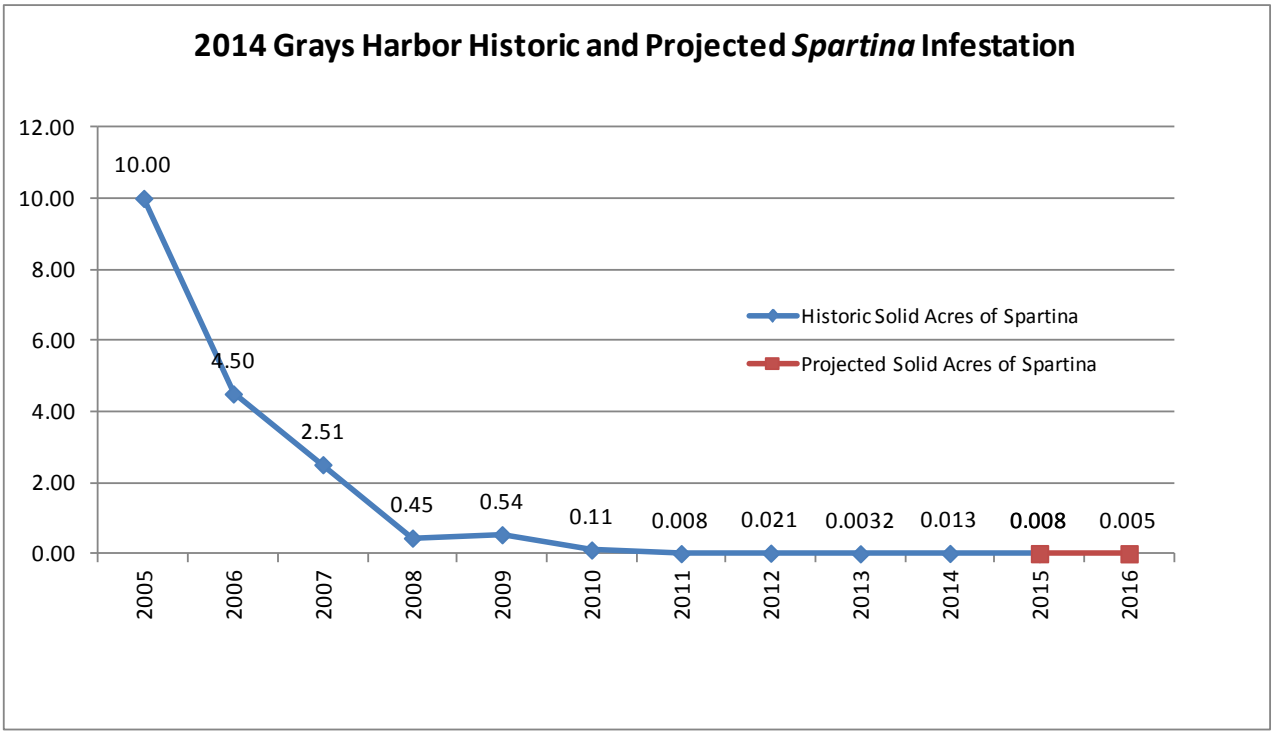

Figure 8: Solid acres of *Spartina* in Grays Harbor County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2005. The red line represents the projected *Spartina* area through 2016. Projection assumes continued funding.

Snohomish County

In 2014, 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 5.82 solid acres (9,504 occurrence points) of *Spartina anglica* in 2014 (Figure 10). This is a two percent decrease from the 5.95 solid acres present in 2013. WSDA provided Snohomish County $50,000 for *Spartina* eradication activities in 2014.

The higher levels of solid acreage found in 2013 and 2014 are linked to additional staff and funding provided to the Puget Sound effort. WSDA provided additional funding to the WDFW Puget Sound crew and DNR provided Puget SoundCorps (PSC) crews. These additions resulted in an expansion of the *Spartina* eradication effort into new areas. The increase in the amount of *Spartina* found and treated in 2014 was a direct result of the increased survey effort and expansion of the areas surveyed. All of the project partners who had the opportunity to work with the PSC crews appreciated the opportunity and hope that the crews will return during future summer surveys. For more information on PSC crew involvement please see Appendix A of this report.

The majority of the infestation in Snohomish County was controlled by the WDFW where 3.91 solid acres of *Spartina* were found and treated. North Leque Island (3.64 solid acres) and the WDFW owned land located in Southeast Skagit Bay (.26 solid acre) produced the largest amounts of solid acreage treated by WDFW within Snohomish County.

SCNWCB controlled 1.73 solid acres in Snohomish County contained mostly within the South Skagit Bay area (0.38 solid acre) and the newly discovered infestation located at the mouth of the Snohomish River on Miller Shingle property (0.71 solid acre). 897 *Spartina* occurrence points were recorded at the Miller Shingle site using SCNWCB, PSC, Washington Conservation Corp (WCC), and EarthCorps crews. SCNWCB also worked closely with the Tulalip Tribal Nation to treat 0.004 solid acre (175 ft^2) of *Spartina* within the Tulalip Bay tribal area in 2014. The 2014 effort in Tulalip Bay represents a 98 percent decrease from the 0.25 solid acre treated in 2011. Continued cooperation from the Tulalip Tribe and the Miller Shingle Company is essential for efforts aimed at eradicating *Spartina* from Snohomish County.

In addition, TNC treated 0.21 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 0.21 solid acre treated in 2014 represents a 92 percent reduction from the 2.56 solid acres treated in 2006. For the 2015 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 2015 treatment season, WSDA will assist WDFW and SCNWCB in the survey of problematic areas and areas accessible only by watercraft. Cooperative efforts among partnering agencies in heavily infested areas will provide the necessary coverage and detail needed 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.

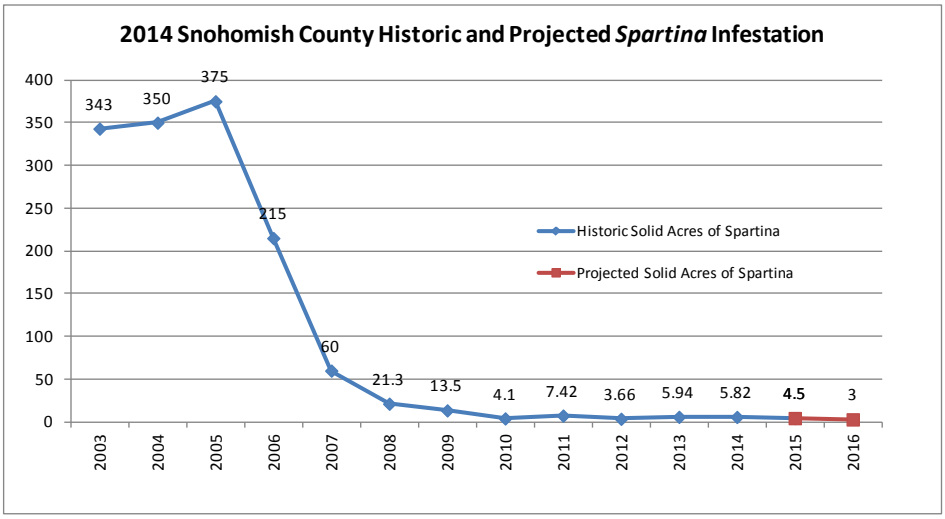

Figure 9: Solid acres of *Spartina* in Snohomish County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2016. Projection assumes continued funding.

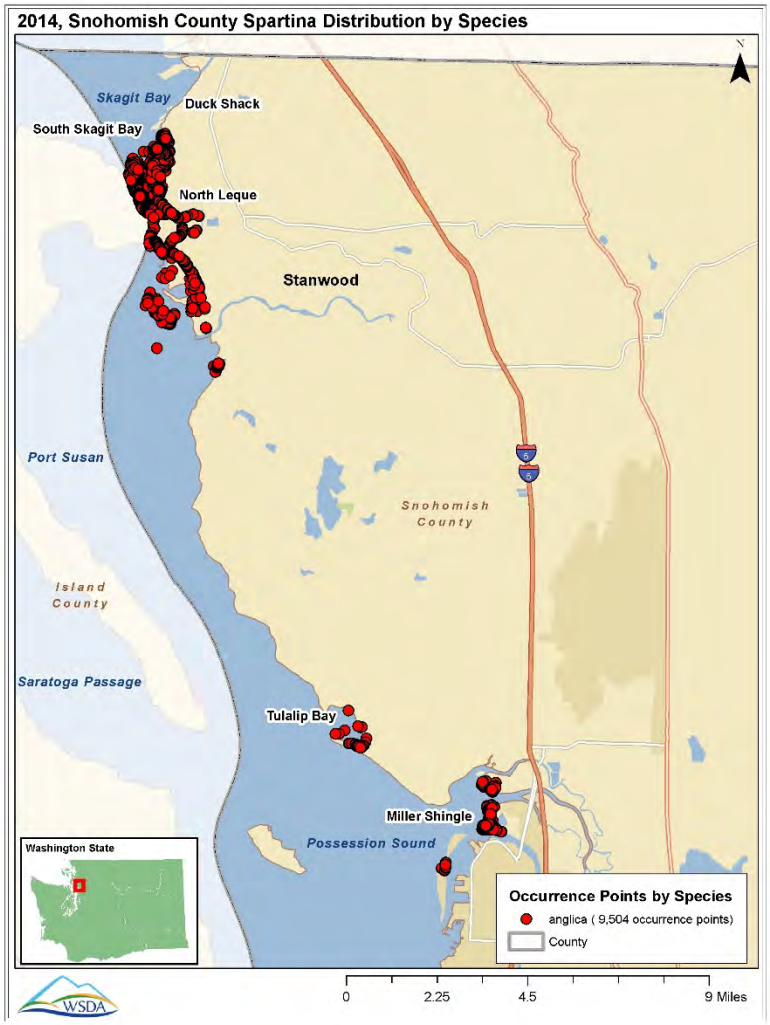

Figure 10: 2014 Snohomish County *Spartina* distribution by species.

Island County

In 2014, 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 4.56 solid acres of *Spartina* (*S. anglica*/*S. densiflora*) representing 7,731 occurrence points were found and treated in 2014 (Figure 12). This represents a 41 percent increase from the 3.23 solid acres treated in 2013. WSDA provided Island County $50,000 for *Spartina* eradication activities in 2014.

For the second consecutive year DNR funded PSC crews were made available in Island County. WSDA provided additional funding to WDFW to survey and treat the most heavily infested areas of the County. With the additional staff and funding, the cooperators expanded their survey and eradication efforts. These additions resulted in an expansion of the *Spartina* eradication effort into new areas. The increase in the amount of *Spartina* found and treated in 2014 was a direct result of the increased survey effort and expansion of the areas surveyed. All of the project partners who had the opportunity to work with the PSC crews appreciated the opportunity and hope that the crews will return during future summer surveys. For more information on PSC crew involvement 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 2014. 0.61 solid acre of *Spartina* were treated by Wildlands Management throughout Island County in 2014. This represents a 25 percent decrease from the 0.81 solid acre treated in 2013. Hancock Lagoon (0.24 solid acre) and Maylors Marsh (0.095 solid acre) contained the majority of *S. anglica* treated in 2014.

In addition, Wildlands Management mechanically removed Puget Sound's only known infestation of *Spartina densiflora* in Race Lagoon located on Whidbey Island. Approximately 6 ft^2 were located and manually removed at this site in 2014. 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 2015 and 2016.

WDFW treated a total of 3.95 solid acres in Island County in 2014. This represents a 63 percent increase from the 2.42 solid acres treated in 2013. The majority of the *Spartina* infestation occurred in Emericks Island (3.06 solid acres) and Prices Island (0.75 solid acre). For 2015, these infested areas will require additional support and resources in order to meet eradication objectives.

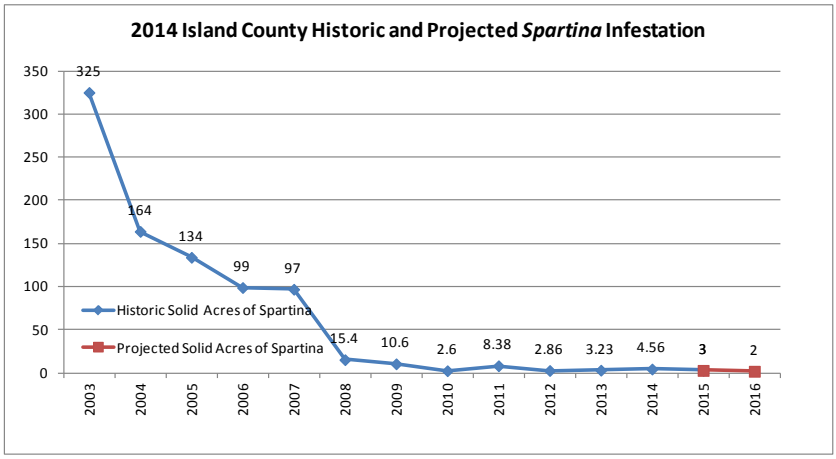

Figure 11: Solid acres of *Spartina* in Island County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2016. Projection assumes continued funding.

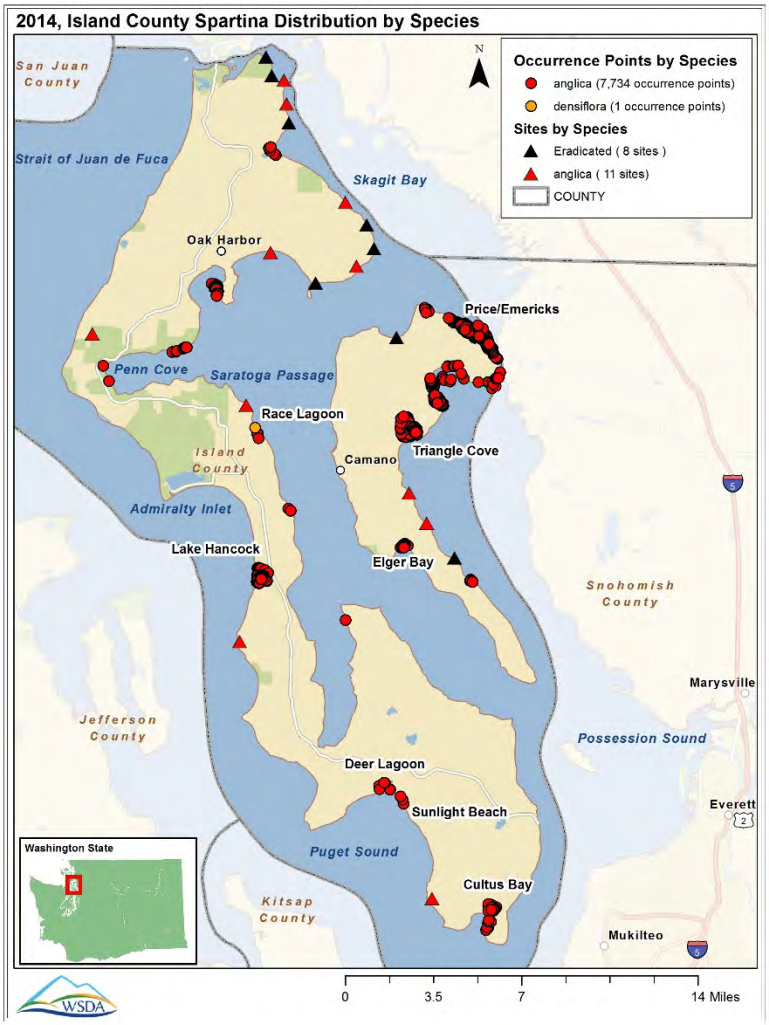

Figure 12: 2014 Island County *Spartina* distribution by species.

Skagit County

In 2014, Skagit County contained the third largest infestation of *Spartina* in Puget Sound. Approximately 0.10 solid acre (4,379 ft²) of *Spartina anglica* representing 398 occurrence points were found and treated in 2014 by the Skagit County Noxious Weed Control Board (SCNWCB), DOE, WDFW, WSDA, and the Swinomish Tribal Nation (Figure 14). This represents an 87 percent decrease from the 0.76 solid acre treated in 2013. WSDA provided $25,000 to SCNWCB and $6,000 to the Swinomish Tribal Nation for *Spartina* eradication activities in 2014.

The SCNWCB treated a total of 0.10 (4,356 ft²) solid acre of *Spartina* in 2014. Most of the survey and treatment efforts by SCNWCB occurred in the areas near Fir Island and Fidalgo Bay. As per recommendations detailed in the 2013 WSDA *Spartina* Report, WSDA provided airboat assistance to SCNWCB in 2014 to survey and treat the areas between Ika Island and Craft Island. For 2015, in addition to the Fir Island and Fidalgo Bay infestations, WSDA will continue to provide airboat assistance to the SCNWCB in the survey and treatment of all outlying islands including Alice Bay near Samish Island, Ika Island, and the tide flats between Craft Island and Ika Island.

The Swinomish Tribal Nation engaged in *Spartina* control on their lands. In 2014, a total of 0.0004 solid acre (17.4 ft²) of *Spartina anglica* was treated. This represents a 99 percent decrease from the 0.054 solid acre (2,352 ft²) treated in 2013 during two survey laps. However, due to staff turnover and logistical issues, one lap of survey was completed in 2014 which may explain the dramatic decrease in *Spartina* found. Turners Cove continues to produce the largest amounts of *Spartina* within the Swinomish Tribal lands. Since 2008, the Swinomish Tribe has reduced the *Spartina* infestation by 99 percent. 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 2014 treatment season, DOE treated/dug 0.0001 solid acre (5.5 ft^2) of *S. anglica* and 0.000004 solid acre (0.2 ft^2) of *S. alterniflora.*

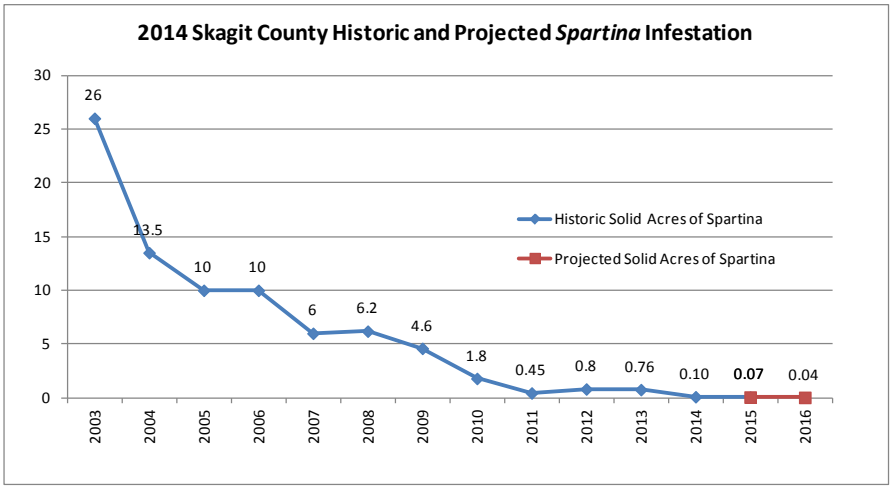

Figure 13: Solid acres of *Spartina* in Skagit County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2016. Projection assumes continued funding.

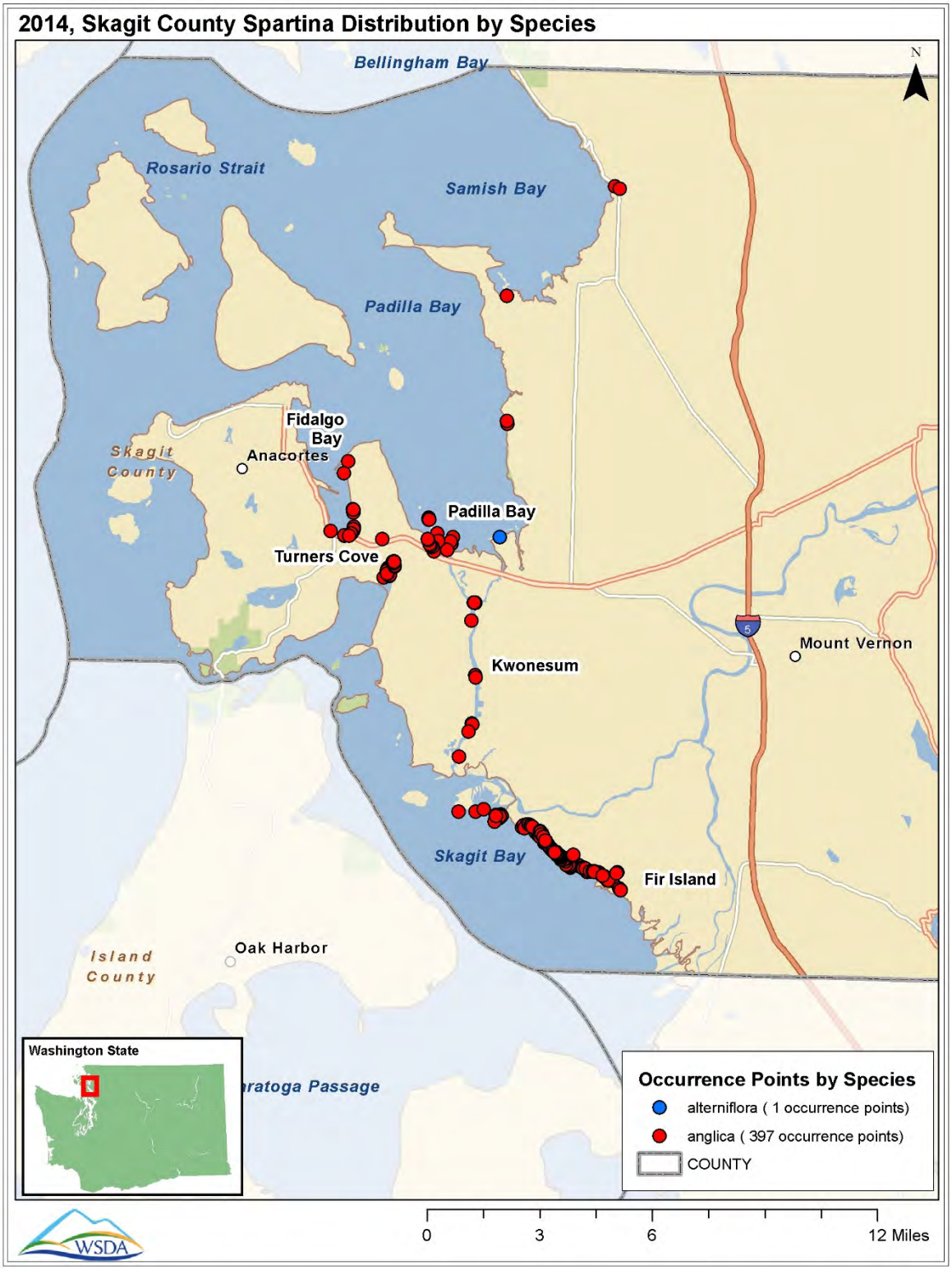

Figure 14: 2014 Skagit County *Spartina* distribution by species.

Whatcom County

In Whatcom County, *Spartina anglica* clones were discovered on the Nooksack Delta within the Lummi Reservation in 2010. 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 and 2013 by staff from the WCNWCB and WSDA where a combined total of 144 ft^2 (0.0033 solid acre) of *S. anglica* were dug and removed in the Red River/Nooksack Delta area. Due to access issues and inclement weather a thorough survey of the affected area was not completed in 2014, however, crews from the WCNWCB and the Lummi Tribe dug 20 ft^2 in one treatment day and estimated an additional 100 ft^2 in the Red River Delta.

For 2015, the Lummi Tribe is seeking additional funding for the establishment of Tribal Corps Crews who will assist in conducting noxious weed surveys throughout their lands. WSDA and the WCNWCB will continue to assist the Lummi Tribe in the survey and treatment of *Spartina* located within their estuaries. Additionally, WSDA has provided $5,000 to the WCNWCB to survey potential *Spartina* habitat located within the County. Figure 15 depicts the 2014 distribution of *Spartina* in Whatcom County including site names.

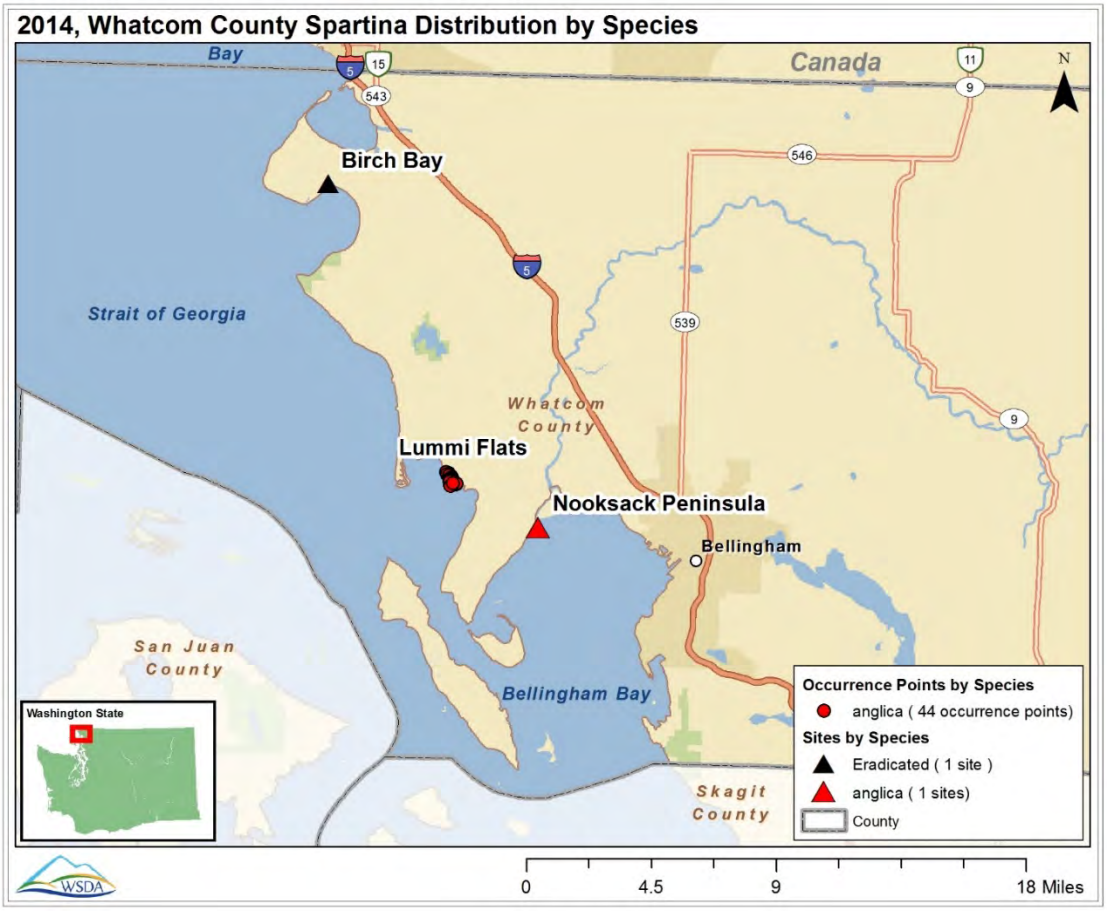

Figure 15: 2014 Whatcom County *Spartina* distribution by species.

San Juan County

Approximately 0.0005 solid acre or 23 $ft^2$of *Spartina anglica* were manually dug in San Juan County in 2014. This represents a reduction of 65 percent from the 66 ft^2 found and treated in 2013. However, a large infestation was located in Argyle Lagoon during a late September survey and was not treated due to landowner consent issues and inclement weather. This infestation will be treated with herbicide in 2015. 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. As per recommendations described in the 2013 WSDA *Spartina* report, extensive shoreline surveys were conducted by WSDA *Spartina* crews of San Juan County in 2014 in an effort to find isolated infestations. Isolated infestations are a major source of seed to all of vulnerable habitat located within San Juan County. Four days of boat surveys conducted in San Juan County revealed no new *Spartina* finds. 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 depicts the 2014 distribution of *Spartina* in San Juan County including site names.

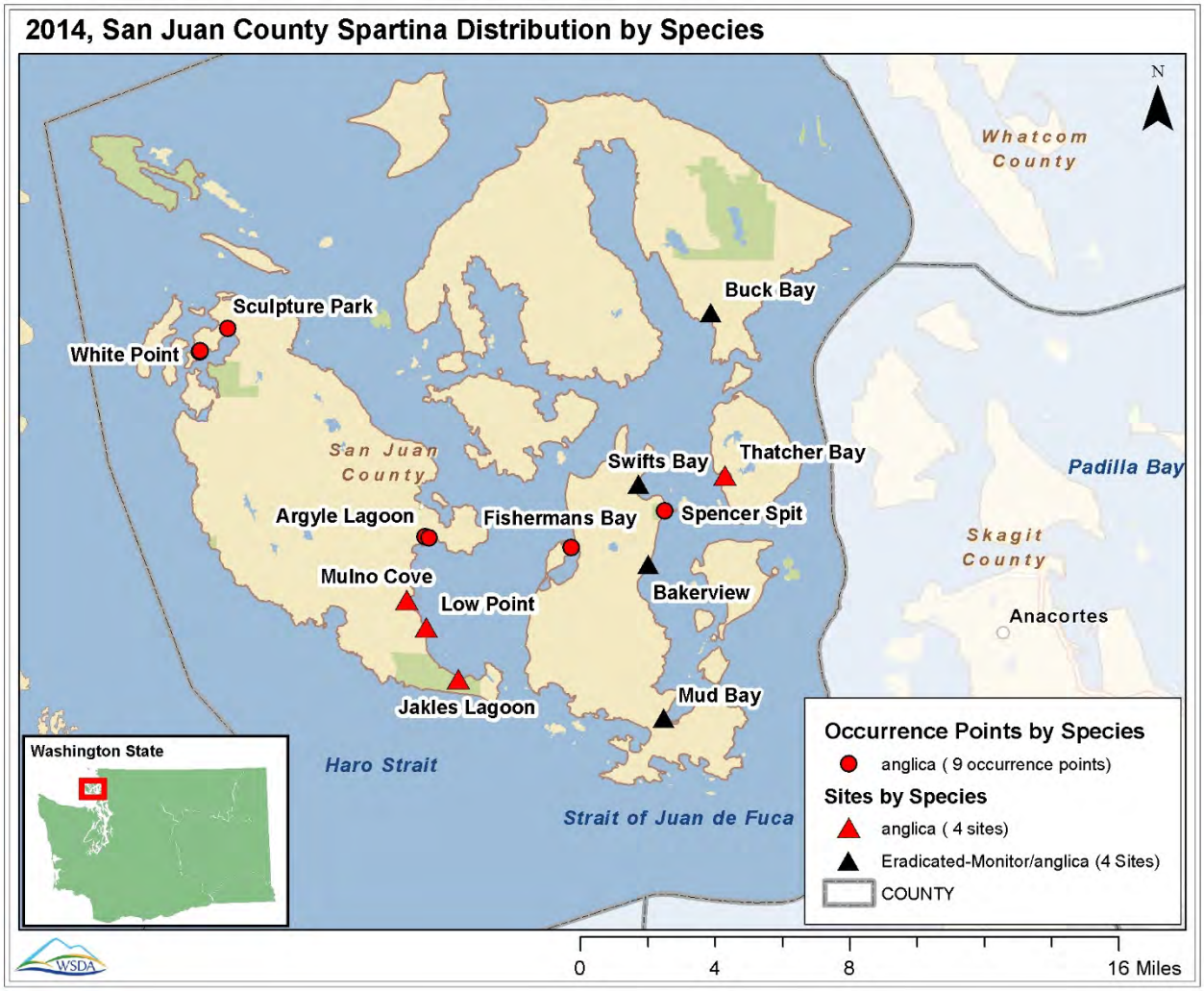

Figure 16: 2014 San Juan County *Spartina* distribution by species.

Clallam County

In 2014, 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 2014 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 2014, detailed ground and kayak surveys yielded one *Spartina* occurrence point totaling approximately 1 ft^2 within the county. This represents a 99.7 percent reduction from the 330 ft^2 found in 2013. With landowner consent, WSDA crews surveyed Gibson Spit where 1 ft^2 of *S. alterniflora* was found and treated. From 2013 to 2014 there has been a 99.7 percent reduction in *S. alterniflora* at this site.

In addition to a minimum of two visits to all known sites in 2015, thorough ground and kayak surveys of all vulnerable *Spartina* habitat in Clallam County is recommended. Figure 17 depicts the 2014 distribution of *Spartina* in Clallam County including site names.

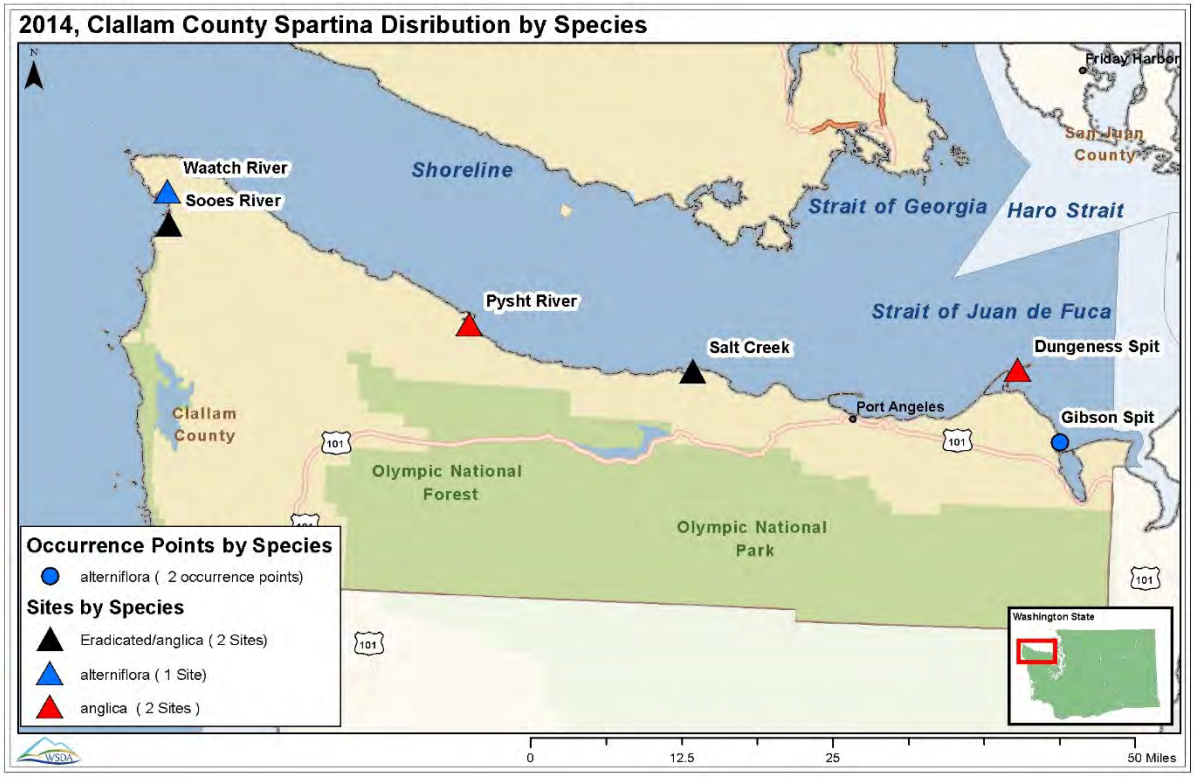

Figure 17: 2014 Clallam County *Spartina* distribution by species.

Kitsap County

In Kitsap County, a total of 0.002 solid acre (85 ft^2) of *Spartina anglica* (61 occurrence points) was manually removed in 2014. This represents a 67 percent decrease from the 253 ft² removed in 2013. WSDA 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 2014, 0.001 solid acre (61 ft^2) of *Spartina* was treated at Doe-Kag-Wats representing a 74 percent decrease from the 0.005 solid acre (234 ft^2) treated in 2013. With the continued cooperation of the Suquamish Tribe, eradication at this site will require repeated visits in the coming years. Additionally, two detailed surveys in Foulweather Bluff revealed 24 ft² of *S. anglica*.

For 2015, WSDA crews will continue to survey the estuarine habitat of Kitsap County to ensure that no new outlying infestations exist. Figure 18 depicts the 2014 distribution of *Spartina* in Kitsap County including site names.

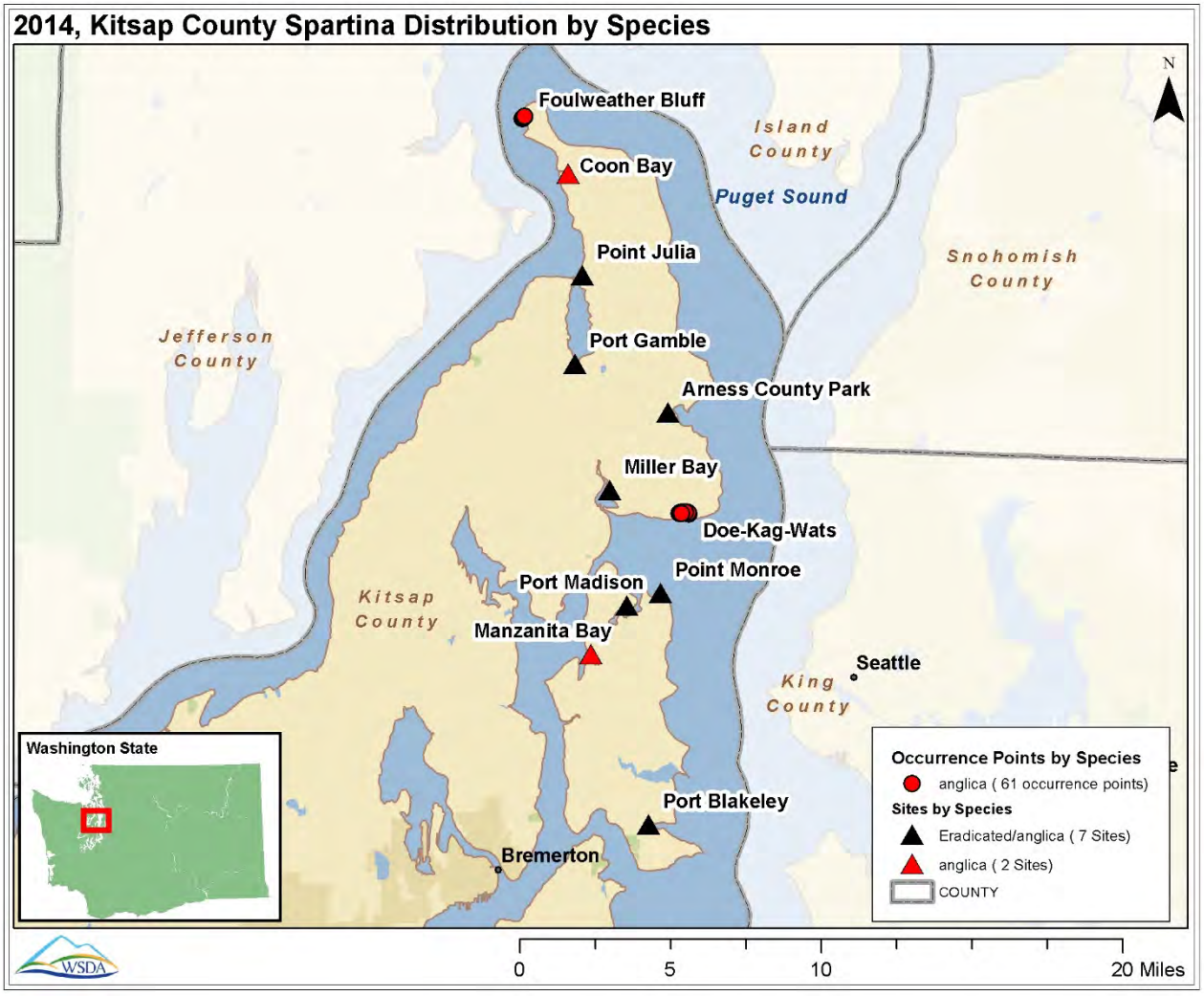

Figure 18: 2014 Kitsap County *Spartina* distribution by species.

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 1990s revealed scattered infestations of *Spartina anglica* at several locations within the county. *Spartina patens* was discovered in the 1990s 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 led to a vast reduction of *Spartina* within the county.

In 2014, extensive ground and kayak surveys yielded 11 *Spartina* occurrence points totaling approximately 2,069 ft^2 (0.05 acre) treated within Jefferson County. Of this total, WSDA crews treated approximately 2,047 ft² of *S. patens* located within the Dosewallips State Park and the Bangor Naval Base. An additional 22 ft² of *S. anglica* was dug by WSDA crews in Walan Point and North Indian Island.

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* in 2014. As a result, approximately 740 ft^2 (0.02 acre) of *S. patens* was treated at this site representing a 52 percent decrease from the 1,550 ft^2 (0.036 acre) treated in 2013. In addition, a new infestation of *S. patens* was discovered by WSDA crews in 2013 on Hood Canal across from the Bangor Naval Base on Toandos Peninsula. This infestation was not treated in 2013 due to its discovery late in the treatment year and the need to acquire access permission from the Naval Base. With permission granted in 2014, WSDA crews chemically treated approximately 1,307 ft² (0.03 solid acre) of *S. patens* on Toandos Peninsula.

In 2015, continued shoreline surveys in Jefferson County are recommended to locate and eradicate *Spartina*. Additionally, continued landowner support to the north and south of Dosewallips State Park and the Bangor Naval Base 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.

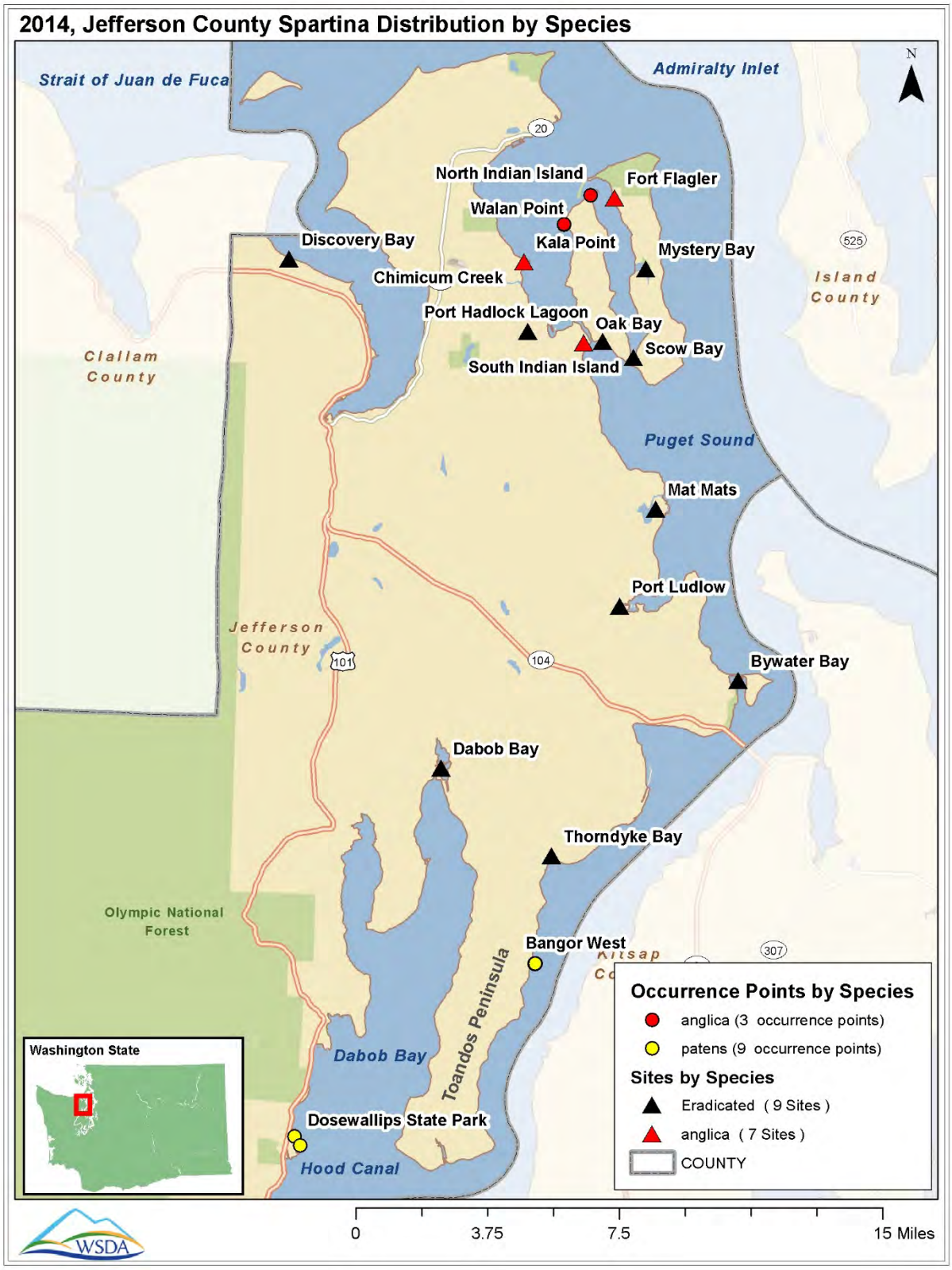

Figure 19: 2014 Jefferson County *Spartina* distribution by species.

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. At this site, approximately 60 ft^2 (0.0014 solid acre) of *Spartina* was manually removed by crews from WSDA and WDFW. In 2011, WSDA crews conducted three rounds of survey 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. From 2013-2014, two rounds of survey were conducted where 2 ft^2 of *anglica* was removed. From 2010-14 there has been a 98 percent 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 depicts the location of the Squally Beach, Pierce County Site.

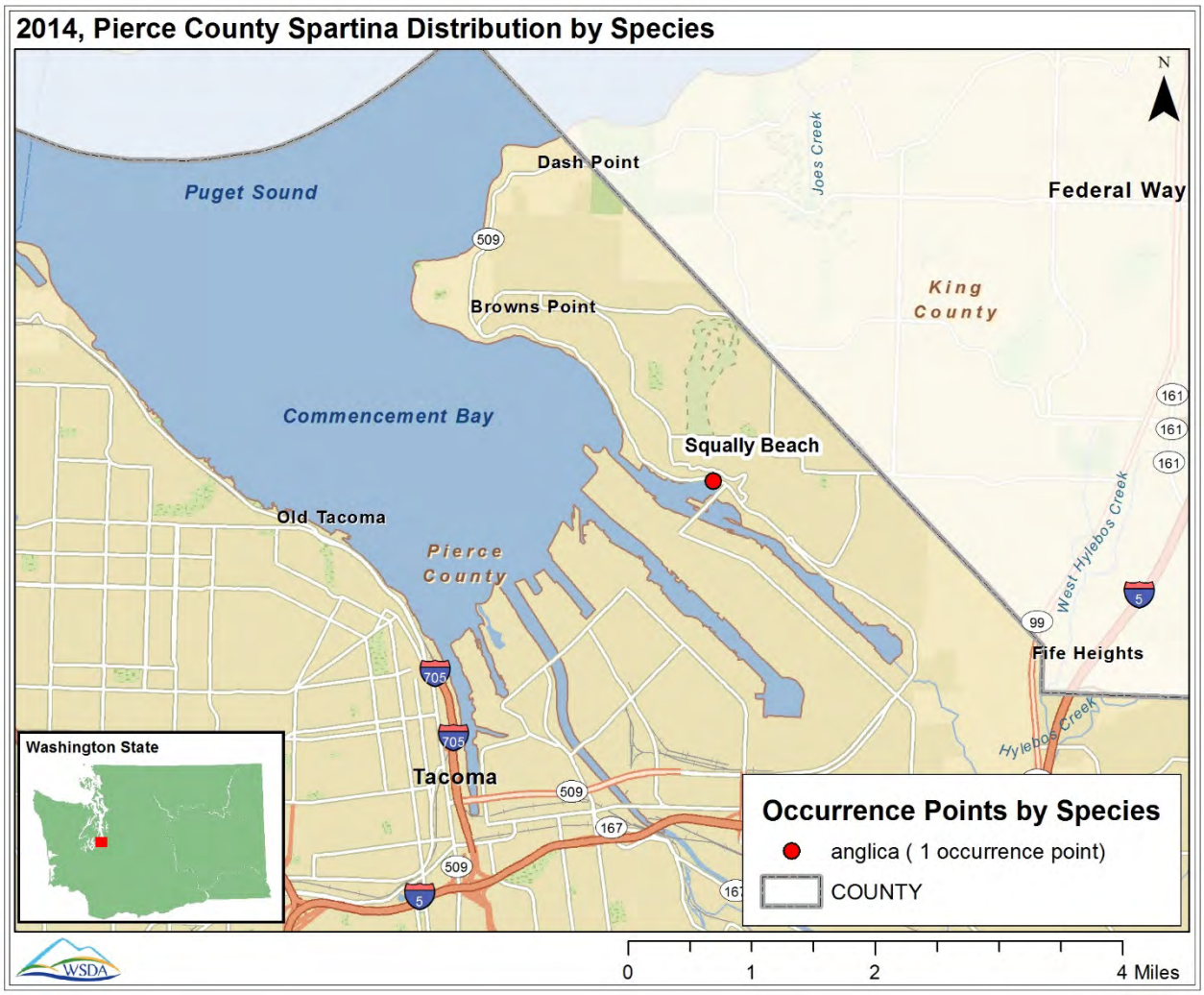

Figure 20: 2014 Pierce County *Spartina* distribution by species.

King County

Historically, small infestations of *S. anglica* were found on Vashon Island near Rabs Lagoon, Point Heyer, Gorsuch Road and Fern Cove and following the 2013 treatment season the county was declared "eradicated." However, in 2014, surveys conducted by WSDA crews in Point Heyer revealed 3 ft² of *Spartina*. WSDA and King County Noxious Weed Control Board will continue to monitor the estuarine habitat of King County to ensure that no new infestations occur. Figure 21 depicts the 2014 distribution of *Spartina* in King County including site names.

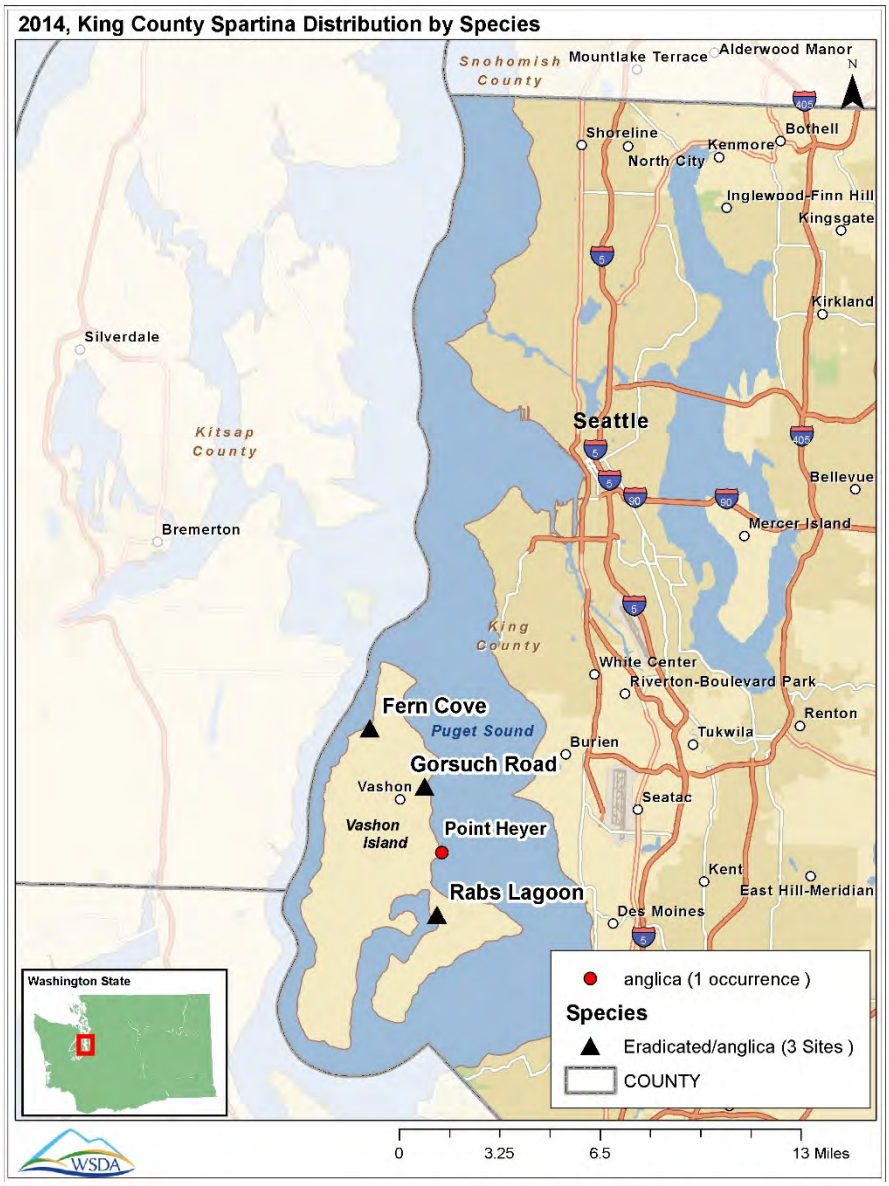

Figure 21: 2014 King County *Spartina* distribution by species.

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.

In 2013 DNR, along with the Washington State Department of Ecology (Ecology), 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.

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. A total of 313 crew days in FY 2014 equaled a total of $388,000 spent on invasive species control by DNR funded WCC and EarthCorp crews. The successes of the 2013 season allowed for some additional unused crew time to be reallocated to the invasive species program. By the end of 2014 the total spent by DNR invasive species equaled $1,225,000.

The success of 2013 was built upon in 2014 with the use of seven Puget SoundCorp crews performing noxious weed and invasive plant control. Puget SoundCorps crews were once again instrumental during the 2014 *Spartina* eradication season. Puget SoundCorp crews working in Skagit, Island, and Snohomish counties covered the expanded areas of 2013 and made it possible to further expand treatments of *Spartina* in 2014.

The Puget SoundCorps crews, EarthCorps crews, and Veterans Corps positions created a total of 110 jobs at a cost of $1,225,000. 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 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 2014 Puget SoundCorps crews, please contact Todd Palzer at (360) 902-1864.

Appendix B

WSDA Pest Program Cloud Based Data Collection Process Improvement
Submitted by Landon Udo, Plant Protection Division

During the 2014 *Spartina* field survey season, WSDA implemented a revolutionary data collection system comprised of two key pieces of software, iForm and ArcGIS Online running on Apple iOS smartphones. The two pieces of software worked complimentary to one another to aid in both real-time and offline data collection as well as adding real-time mapping capabilities, all of which have never been capable or feasible within the *Spartina* program.

In recent years the majority of cooperators operated with simple recreational grade GPS equipment only capable of collecting location and date information leading to miscommunication in reporting back to WSDA which led to unreliable data. Under the new system, we are able to collect not only location and date but species, size of the infestation, data collector, unique identification per plant, and comments along with a high resolution image. Another limitation of the old system was the wait time involved in receiving data from cooperators which ranged from weeks to months making it difficult for field crews to recall questions about specific data verification inquiries. With the new system the process of collecting the data can be done in as little as 30 seconds from starting the record to uploading the record. Once the data has been uploaded, the information is immediately available to all WSDA *Spartina* staff, GIS department, and management from a central website and mapped in real-time. This automated flow of data and ease of accessibility has led to increased communication between cooperators in the field and WSDA staff as well as cut down on reporting lag time from months to minutes. The incorporation of real-time mapping and ArcGIS Online allowed WSDA to monitor and respond to *Spartina* occurrences in less time and included other benefits such as the ability to look at historical data, aerial imagery analysis, access to parcel ownership information, in addition to plant occurrences' relation to other plant occurrences from different cooperators in the area.

With the vast amount of data collectors and cooperators involved, the ability to find a single solution that could satisfy the needs of all users has always been deemed impossible. Yet over the past year, WSDA has successfully implemented a system that featured standardized field data collection forms, universal hardware to aid in training and support as well as data collected and mapped wirelessly in real-time. The result was less time wasted on data management for cooperators, less data lost by cooperators when saving and transmitting data to WSDA, and at the end of the season a more accurate and reliable data collecting and reporting process. WSDA hopes to build on the success of 2014 and will be rolling out the real-time mapping elements of ArcGIS Online to a limited number of cooperators allowing them access to real-time information on plant occurrences and surveyed areas done by all cooperators in their area. This will help reduce inefficiencies in accidental misses, potential overlapping of surveyed areas, and facilitate overall improved cooperator communication.

For more information about the cloud based data collection process, please contact the Pest Program at (360) 902-2070.