Spartina Eradication Program
2016 Progress Report

Washington State Department of Agriculture

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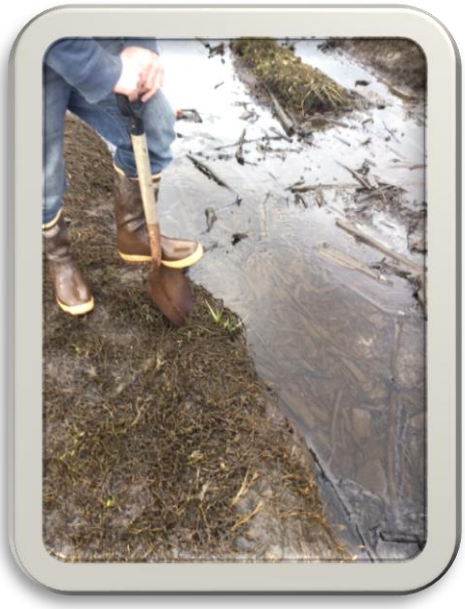

Survey and removal efforts in late fall facilitate location of small plants such as these *Spartina anglica* finds from November, 2016 in Kitsap County. Once native saltmarsh vegetation begins to die back in late fall, detecting small intermixed plants in outlier populations becomes very productive.

Cover photo (Snohomish County)
Other photos provided by (WDFW & WSDA)

Cover: Searching for and documenting *Spartina anglica* finds in Southeast Skagit Bay, summer 2016.

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PROGRESS OF THE 2016 *SPARTINA* ERADICATION PROGRAM

January 2017

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	A record of a *Spartina* find or infested location, each occurrence point typically represents a single *Spartina* plant or a small group of plants.
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.

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 five and a quarter solid acres in 2017. These final 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 coming 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 program support eradication can be achieved. Figure 1 is a projection of *Spartina* reduction within Washington State over the next two years assuming continued funding.

In 2016, as part of an increasingly detailed survey effort, project partners (see appendix C) 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 the cooperators found and recorded over 25,000 *Spartina* occurrence points representing over 44,000 individual plants. This eradication program is an unprecedented success story; however, the last few acres of *Spartina* will by far be the most difficult and time consuming to find and eradicate.

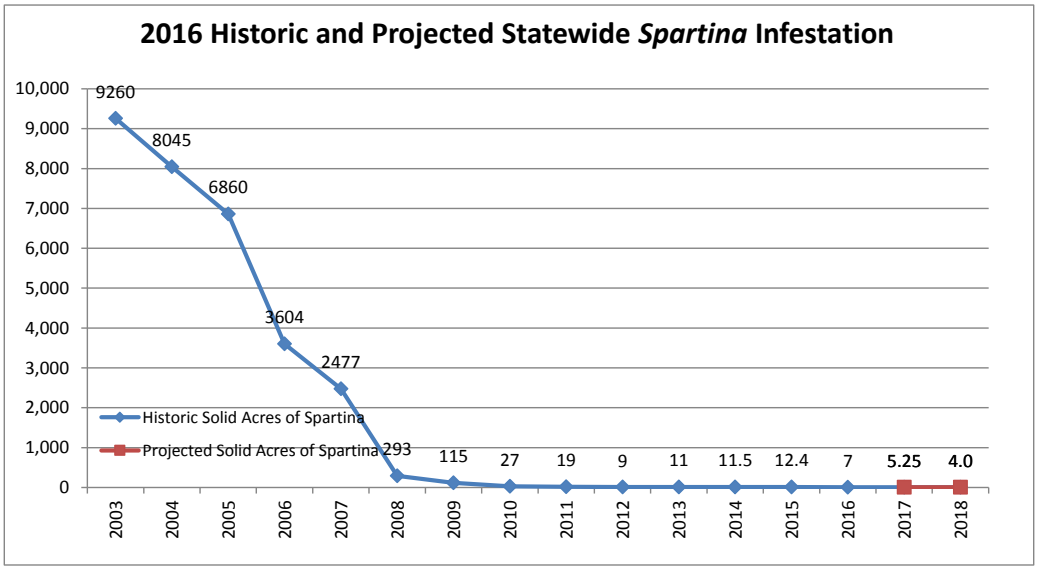

Figure 1: Solid acres of *Spartina* by year statewide based on WSDA estimates. The blue line represents historic *Spartina* infestation since 2003. The red line indicates the projected *Spartina* infestation level through 2018. Projection assumes continued funding.

Pacific County

During the 2016 treatment season, Pacific County cooperators located and treated nearly 0.4 solid acre of *Spartina* (1,338 occurrence points/plants). The treatment program experienced a 66 percent decrease from the 1.13 solid acres treated in Pacific County during the 2015 season. This decrease is encouraging after several years with no significant reduction in the bay-wide totals. With the recent reduction, the cooperators remain confident that the totals will continue to decrease in the upcoming years. WSDA estimates that 0.3 solid acre of *Spartina* will remain in Pacific County during the 2017 treatment season.

Grays Harbor County

In 2016, the Grays Harbor cooperators found and treated 0.028 solid acre of *Spartina.* Of the 0.028 solid acre treated, 0.027 solid acre were *S. alterniflora* (27 points) and 0.001 solid acre were *S. densiflora* (36 points). This is an increase from the approximate 0.0032 solid acre of *Spartina* treated during the 2015 season. After the large increase in total acreage of *Spartina* observed during the 2016 treatment season, WSDA projects that the infestation in Grays Harbor County will be reduced to 0.015 solid acre of *Spartina* during the 2017 treatment season.

Puget Sound Counties

In 2016, approximately 6.6 solid acres of *Spartina* representing over 23,000 occurrence points and over 42,000 individual plants, was treated in the Puget Sound. This effort resulted in a forty-two percent decrease from the 11.3 solid acres treated in 2015. Increased staff and funding to the Puget Sound effort contributed to the recent reductions in *Spartina*. A key component of this increase has been the valuable assistance of Puget SoundCorps (PSC) crews (see appendix A). WSDA estimates that five solid acres of *Spartina* will remain in Puget Sound in 2017.

2016 Trends

The coastal infestation continues to come under control. Beginning in 2013 the success of the coastal effort has allowed staff, funding and resources to transition to the most heavily infested areas of Puget Sound.

In 2016, WSDA once again increased staff field time, cooperator support and equipment resources to the Puget Sound effort. WSDA continued to provide funding to WDFW to survey and treat the most heavily infested areas of Snohomish and Island counties. For the fourth year, DNR funded PSC crews were made available in Skagit, Snohomish and Island counties. With the additional staff and funding, the Puget Sound cooperators expanded their survey and eradication efforts. This resulted in one of the most thorough survey and eradication efforts to date.

The result of the last four years of increased Puget Sound effort can be seen in Table 1, where increased *Spartina* finds in 2013 thru 2015 are the result of detailed surveys locating previously undetected plants. The reward for these efforts came in 2016 when the programs most detailed survey to date documented a 44% statewide reduction from 2015 levels.

Table 1: Annual Statewide *Spartina* Eradication Program Reductions. The blue text describes historic *Spartina* reductions. The red text describes targeted reductions.

Treatment Year	Solid Acres of Spartina	Reduction From Previous Year	Data Source	Year
2003	9260		Historic	1
2004	8045	13%	Historic	2
2005	6860	15%	Historic	3
2006	3604	47%	Historic	4
2007	2477	31%	Historic	5
2008	293	88%	Historic	6
2009	115	61%	Historic	7
2010	27	77%	Historic	8
2011	19	30%	Historic	9
2012	9	53%	Historic	10
2013*	11	-22%	Historic	11
2014*	11.5	-5%	Historic	12
2015*	12.4	-8%	Historic	13
2016*	7	44%	Historic	14
2017	*5.25*	*25%*	*Target*	*15*
2018	*4.0*	*25%*	*Target*	*16*
Average annual reduction, 33%, includes aerial and large scale treatments of *Spartina* meadows				
Average reduction 2011-present, 15%, transition to survey for small clones and individual plants				
A Statewide reduction of 44% was achieved by the cooperators in 2016				
* Increased emphasis on Puget Sound survey starting in 2013				

Another encouraging development in 2016 are the six additional *Spartina* infestations declared eradicated (Fig. 2). This brings the total number of previously infested sites declared eradicated as of 2016 to 49, or 28% of the 174 *Spartina* sites currently tracked by the program.

With continued program support, the cooperators will continue to eradicate sites in the coming years. WSDA is confident that with continued support, 90% of Washington State's known *Spartina* sites can be eradicated in the next ten to fifteen years.

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

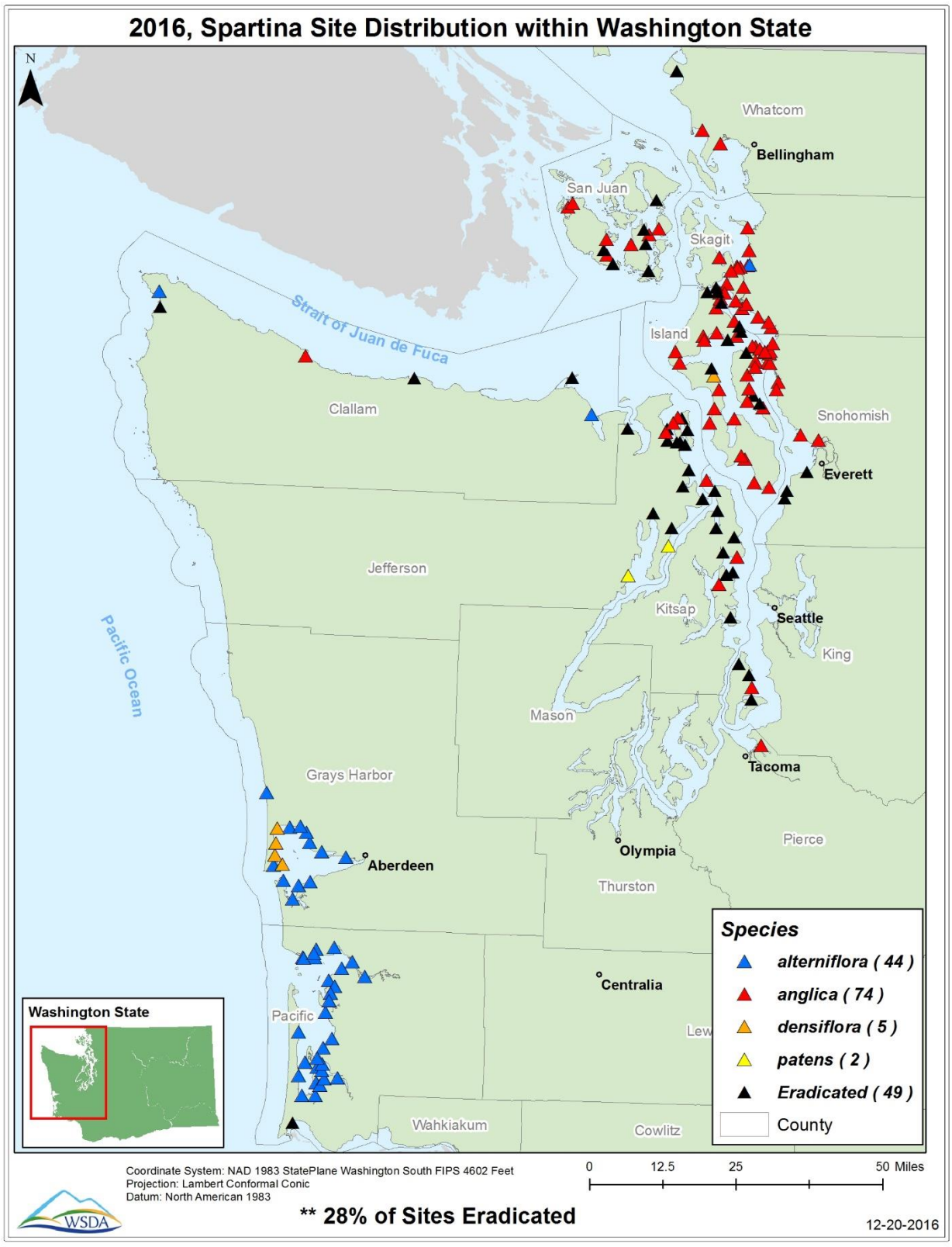

Figure 2: Distribution of invasive *Spartina* sites in Washington State, 2016.

Spartina Eradication Program

WSDA *Spartina* Program

In 2016, 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, 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 meetings. The department also continued to explore more efficient and cost-effective ways to eradicate *Spartina* with partner agencies.

In 2016, WSDA continued to allocate funding for resources and *Spartina* work crews in counties with the majority of the infestations. In Willapa Bay, $140,000 was designated for Pacific County to continue their survey, treatment and weed board involvement. In the Puget Sound, WSDA provided resources totaling $247,500 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 restoration of once-infested tidelands to functional habitat.

An opportunity was provided to the Puget Sound partners during the 2016 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 assisted 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 2016 Puget Sound effort took pressure off the county and state crews which allowed for extremely detailed *Spartina* surveys in 2016. All of the project partners who worked with the PSC crews appreciated the opportunity and hope that the crews will return during future summer surveys. See appendix A for more information on PSC crew involvement and funding background.

Budget

WSDA allotted $1.87 million of the appropriation from the Aquatic Lands Enhancement Account (ALEA) for statewide *Spartina* activities during the 2015-2017 biennium. Table 2 describes how WSDA allocated funds to conduct *Spartina* survey and eradication activities.

Table 2: WSDA *Spartina* Budget Activity – FY16 and FY17

Activity	Fiscal Year 2016 (July 1, 2015 thru June 30, 2016)	Fiscal Year 2017 (July 1, 2016 thru June 30, 2017)	Biennial Totals (July 1, 2015 thru June 30, 2017)
WSDA Eradication & Coordination Activities	$526,000.00	$545,000.00	$1,071,000.00
Purchased Services			
Pacific County	$140,000.00	$140,000.00	$280,000.00
Skagit County	$25,000.00	$40,000.00	$65,000.00
Island County	$55,000.00	$60,000.00	$115,000.00
Snohomish County	$50,000.00	$55,000.00	$105,000.00
Whatcom County	$2,500.00	$2,500.00	$5,000.00
Swinomish Tribe	$5,000.00	$5,000.00	$10,000.00
WDFW Puget Sound	$65,000.00	$85,000.00	$150,000.00
DNR State Wide	$20,000.00	$20,000.00	$40,000.00
Unobligated	$0.00	$30,000.00	$30,000.00
Totals	**$888,500.00**	**$982,500.00**	**$1,871,000.00**

Notes for Table 2:

1. WSDA Eradication and Coordination Activities: Expenses include WSDA eradication, survey, permitting, salaries and benefits, herbicide, equipment, travel, legal fees, public notification 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 2015-2017 biennium. This funding is provided from ALEA, federal agreements, grants and other sources. Table 3 documents these additional funds, as reported to WSDA.

Table 3: Other Agencies *Spartina* Budget Activity – FY16 and FY

Agency	Fiscal Year 2016 (July 1, 2015 thru June 30, 2016) (USFWS Refuge funding follows Federal fiscal period)	Fiscal Year 2017 (July 1, 2016 thru June 30, 2017) (USFWS Refuge funding follows Federal fiscal period)	Biennial Totals (July 1, 2015 thru June 30, 2017)
WDFW Spartina Activities	$245,000.00	$245,000.00	$490,000.00
DNR Spartina Activities	$290,000.00	$290,000.00	$580,000.00
Puget Sound Corps, est.	$50,000.00	$70,000.00	$120,000.00
USFWS Nisqually Refuge	$128,000.00	$0.00	$128,000.00
USFWS Willapa Refuge	$80,000.00	$72,000.00	$152,000.00
Totals	**$793,000.00**	**$677,000.00**	**$1,470,000.00**

Statewide 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*.

With continued reductions in *Spartina* occurring statewide, an encouraging development for 2016 can be seen in Figure 2 page 4, where the 49 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 2016 control season was successful; below are some highlights of the 2016 treatment season.

- In 2016, six additional *Spartina* sites were declared eradicated.
- The cooperative effort resulted in over 25,000 *Spartina* occurrence sites identified.
- The Puget Sound infestation received the most detailed eradication effort to date.
- DNR provided PSC crews; increasing the programs coverage and level of detail in the most heavily infested Puget Sound counties. See Appendix A.
- Approximately 7 solid acres of *Spartina* were located and treated in Washington State during 2016. This represents a 44% decrease from the 12.4 solid acres treated in 2015.
- Several large clones were treated in Grays Harbor attributing to the largest *Spartina* treatments in the county since 2011. All of the plants were found during late summer through early winter surveys.
- Willapa Bay experienced a 66% decrease in total acres of *Spartina* treated and a 27% decrease in the number of occurrence points located throughout the bay.
- Cloud based data collection was implemented greatly increasing the efficiency of data transfer between the partner agencies. 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.

S. alterniflora (Smooth Cordgrass or Saltmarsh Cordgrass) has been 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. Through dedicated funding and aggressive eradication efforts by local, state, and federal agencies, less than 0.41 solid acre of *S. alterniflora* remained in all affected counties during 2016, 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, Pierce and Kitsap. Of these four species of *Spartina*, *S. anglica* is currently the most abundant and accounts for 90 percent of Washington State's infestation. In 2016, approximately 6.6 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. Winter and spring surveys conducted north of Bills Spit to the mouth of the Humptulips River have contributed to the decline of *S. densiflora* solid acreages in Grays Harbor. During extensive winter surveys conducted in 2016, approximately 0.001 solid acre (44 ft^2) of *S. densiflora* was manually removed.

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. *S. patens*, like *S. densiflora*, exhibits physical characteristics that blend in well with the native saltmarsh flora making survey and treatment difficult. Historically, Dosewallips has contained the only known infestation of *S. patens* in Washington State. During the 2013 season, the WSDA survey crew discovered a second infestation of *S. patens* on Hood Canal across from Naval Base Kitsap-Bangor in Jefferson County on the Toandos Peninsula.

Spartina Eradication Effort by County

Pacific County

In 2016, the Pacific County cooperators collectively located 1,338 *Spartina alterniflora* occurrence points and treated 0.38 solid acre. This is a 27% decrease from the 1,825 occurrence points and a 66% decrease from the 1.13 solid acre treated during the 2015 season. These decreases may be explained by several preceding years of elevated treatments and amplified surveys within the most heavily infested areas of Willapa Bay. Figures 4 and 5 identify where eradication efforts occurred.

The Willapa Bay Treatment Program requires the cooperation of many different organizations. WSDA provides resources, equipment, and herbicide to Pacific County. DNR, WDFW, USFWS, Pacific County, TNC and the Shoalwater Bay Tribe all provide crews that are responsible for treatment of their areas of responsibility. The cooperators meet throughout the treatment season in order to maintain communication regarding the progress of eradication efforts.

The recent reductions in *Spartina* occurrence points and total acreage treated in Pacific County has provided evidence that continued pressure in the upper salt-marsh habitat has reduced seed production in the most challenging areas. The likelihood of locating the remaining plants in the bay will increase as they grow, becoming more visible among native vegetation. This has been witnessed in Grays Harbor where nearly all the plants located were mature clones with no indication of viable seed in the area. As the smaller, more isolated populations throughout the bay are extinguished, cooperators will focus resources where the last *Spartina* holdouts exist.

After the 2016 treatment season it has become apparent that permission to treat infestations on private land in Willapa Bay will have increasing impacts on bay-wide reductions. Of the 0.38 solid acre of *Spartina* in Pacific County during the season, 0.15 acre existed on private land where permission was not granted for the treatment of the plants, amounting to roughly half of the total predicted in 2017. In the future, as the infestation continues to be reduced in surrounding areas of the bay, untreated populations left on private lands will represent a larger portion of the total. The eradication of *S. alterniflora* in Pacific County is dependent upon the treatment of the infestations remaining on private land. WSDA and Pacific County will continue to pursue permission to control *Spartina* on these private lands.

WSDA anticipates the cost of conducting *Spartina* eradication in Pacific County in 2017 and beyond will decrease. As the Pacific County infestation approaches eradication, survey effort at individual sites can be reduced. Once a site has been declared eradicated, survey effort will drop to a single detailed, annual survey/monitoring lap. With this plan in effect, funding and resources can gradually transition to the most heavily infested Puget Sound counties while maintaining adequate resources in Pacific County to complete *Spartina* eradication. Figure 3 is a projection of *Spartina* reduction within Pacific County over the next two years with continued funding.

With the successful eradication of over 8,000 solid acres of *Spartina* in Pacific County, it is critical that program continuity is maintained.

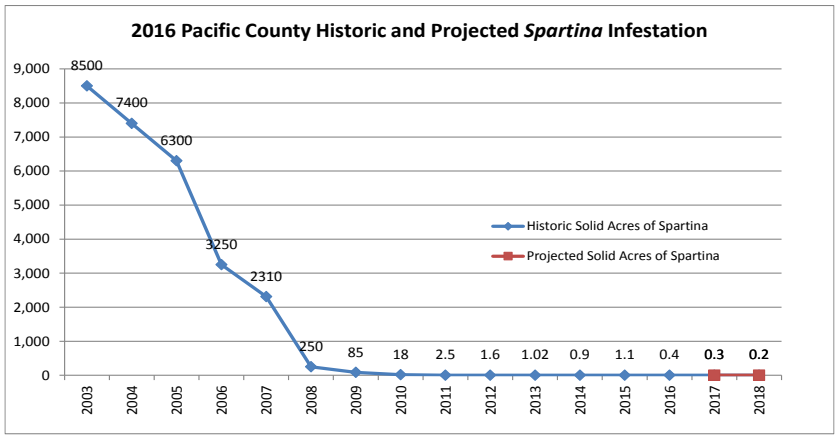

Figure 3: Solid acres of *Spartina* in Pacific County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2018. Projection assumes continued funding.

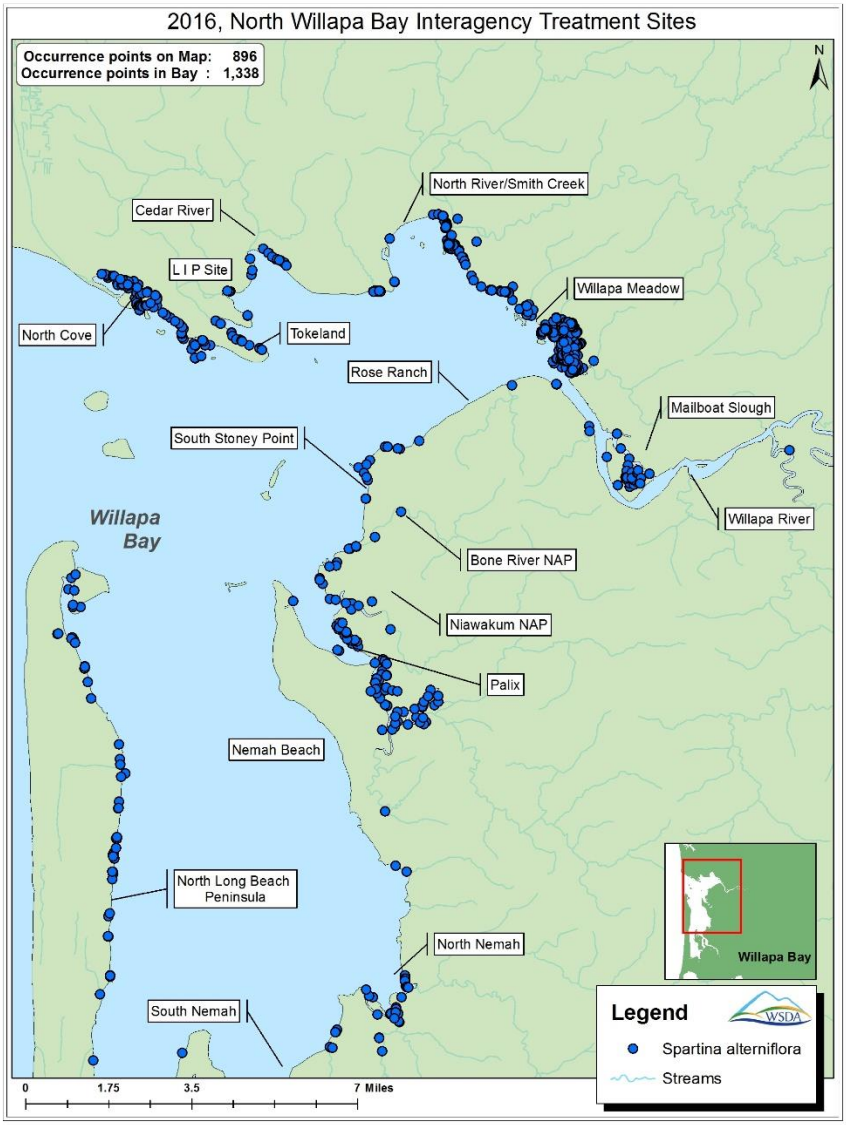

Figure 4: 2016 North Willapa Bay *Spartina* treatment sites.

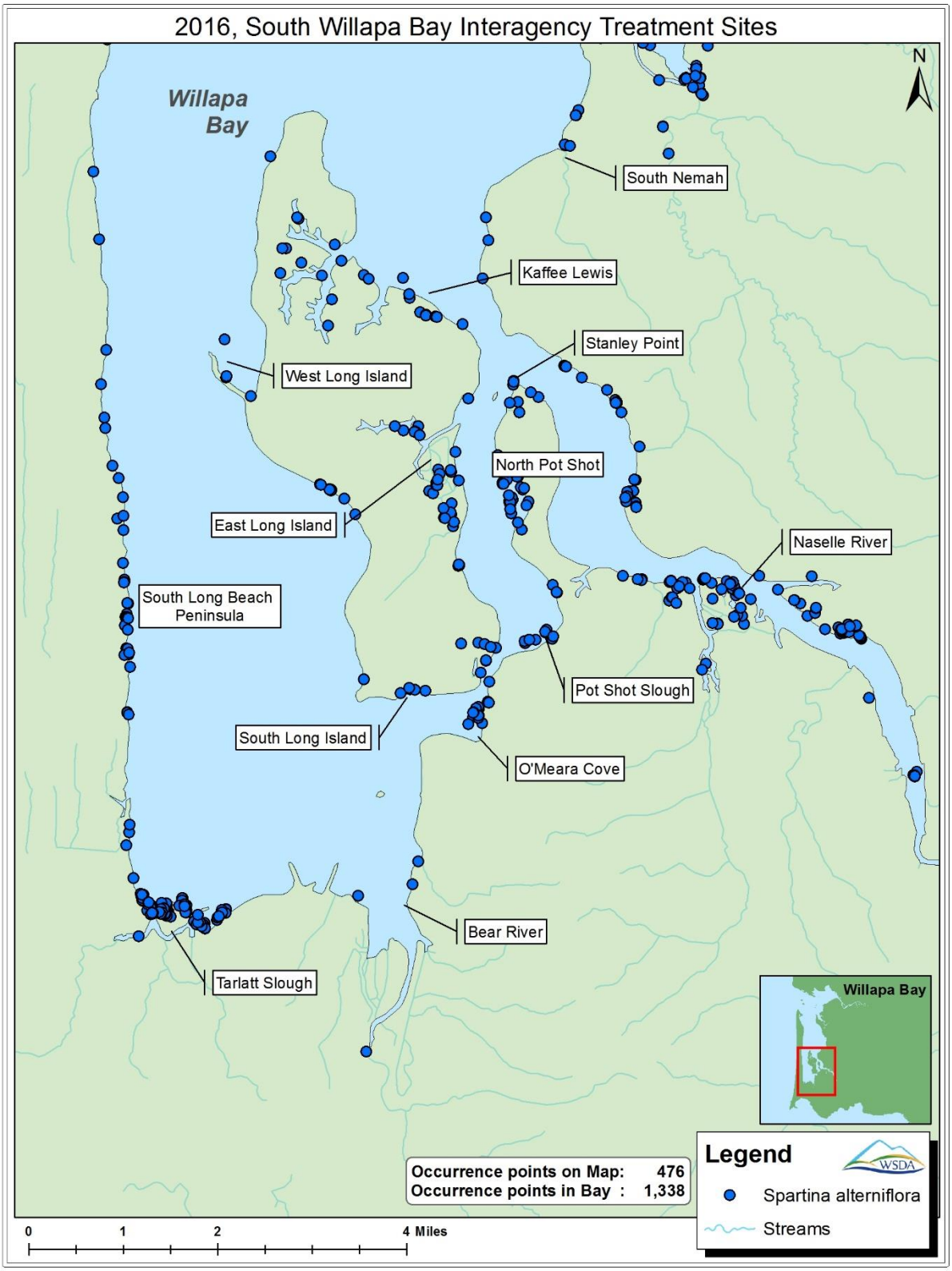

Figure 5: 2016 South Willapa Bay *Spartina* treatment sites.

Grays Harbor County

In 2016, crews from DNR, WDFW, and WSDA completed two survey laps of Grays Harbor. The crews found and treated approximately 1236 ft^2 (0.028 solid acre) of *Spartina* within Grays Harbor County (Fig. 7). Of this total, 1192 ft^2 (0.027 solid acre) were *S. alterniflora* and 44 ft^2 (0.001 solid acre) were *S. densiflora.* This is an increase from the 177 ft^2 (0.0041 solid acre) of *Spartina* treated in 2015. Figure 7 shows the survey sites within Grays Harbor County.

There was a substantial increase in the amount of *S. alterniflora* treated in Grays Harbor during the 2016 treatment season. The increase was a product of several late fall surveys performed in high priority areas after native plants had senesced. There were 27 *S. alterniflora* plants treated in Grays Harbor, most of them being mature clones over 50 ft^2. The treatment of these clones should lead to significant reductions in the future. After extensive winter, late summer, and fall surveys in Grays Harbor no *Spartina* was found outside of known infested areas. The overall infestation of *S. alterniflora* has been reduced to 0.027 solid acre from a high of over ten solid acres in 2005 and the infestation of *S. densiflora* has been reduced to 0.001 solid acre from a high of 0.28 solid acre in 2009. This is a reduction of over 99 percent for each species.

WSDA projects that less than 0.015 solid acre of *Spartina* will be present in Grays Harbor County during the 2017 treatment season (Fig. 6). Two mature *S. alterniflora* clones were found on late fall surveys and will be treated during the 2017 season. In order to be most efficient, two surveys of Grays Harbor shoreline will be completed at strategic times throughout the year. One survey will be completed during the winter into early spring within the areas traditionally infested by *S. densiflora* while native vegetation lies dormant. The 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 marsh as the surrounding plant life begins to senesce. This tactical approach will maximize survey efforts in Grays Harbor during the 2017 treatment season.

With the successes of the past twelve years and the large reductions of *Spartina* in Grays Harbor County, continued support and funding are more important than ever.

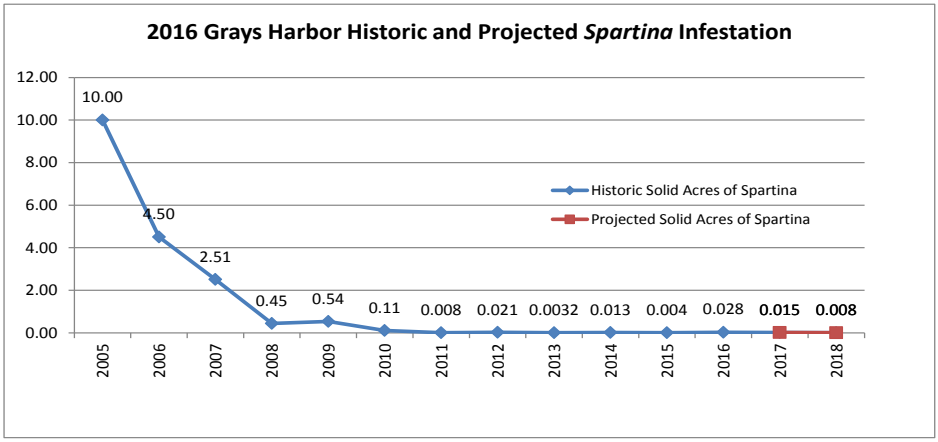

Figure 6: Solid acres of *Spartina* in Grays Harbor County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2005. The red line represents the projected *Spartina* area through 2018. Projection assumes continued funding.

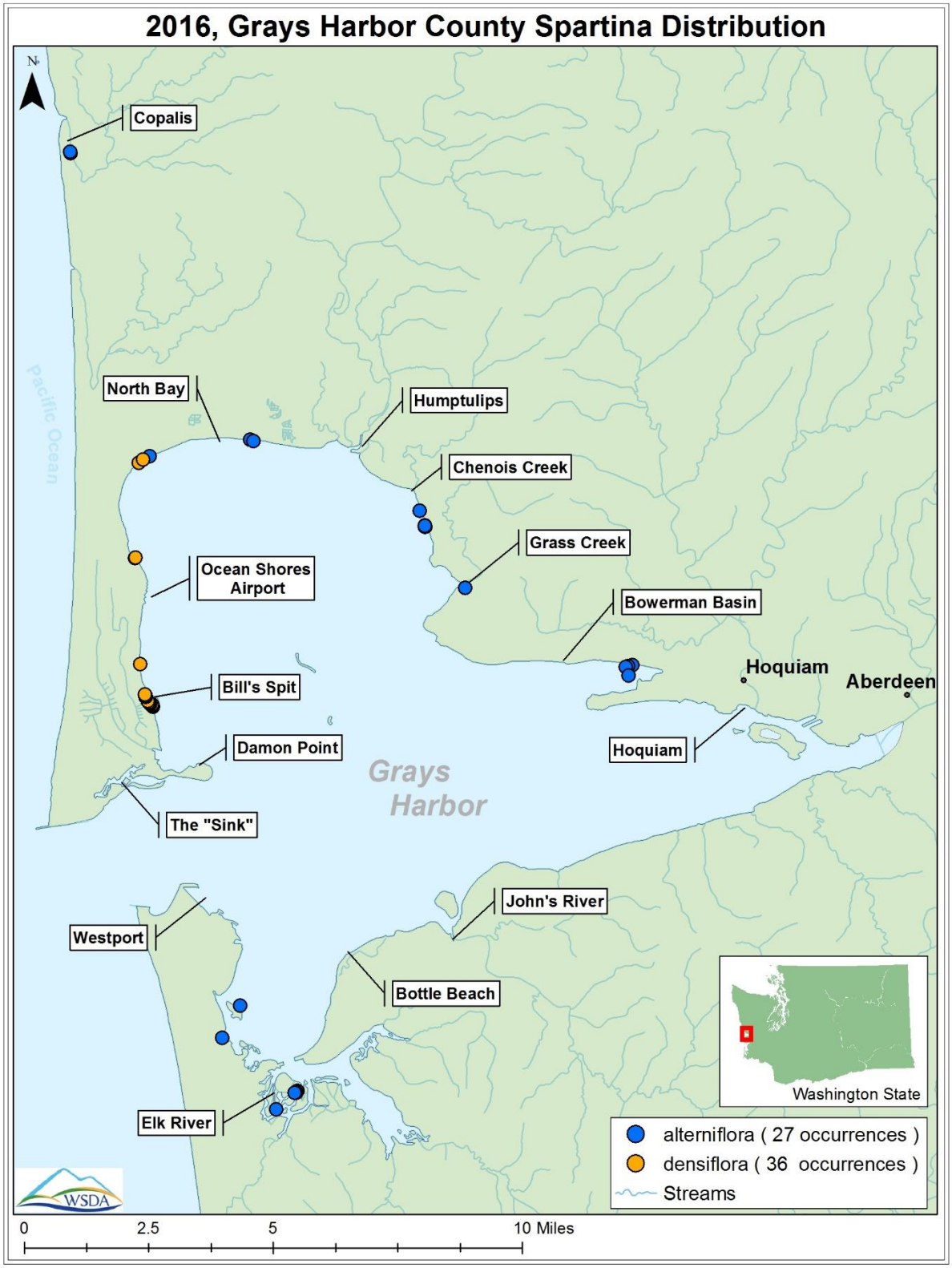

Figure 7. *Spartina* distribution *S. alterniflora* (blue) and *S. densiflora* (yellow), Grays Harbor County, 2016.

Snohomish County

In 2016, the largest *Spartina* infestation in Washington State was located in Snohomish County. The Snohomish County Noxious Weed Control Board (SCNWCB), WDFW, WSDA, DNR, TNC, Skagit County and the Tulalip Tribal Nation found and treated 4.2 solid acres (14,991 occurrence points and 27,798 individual plants) of *Spartina anglica* in 2016 (Fig. 9). This is a thirty seven percent decrease from the 6.7 solid acres treated in 2015. WSDA provided Snohomish County $55,000 for *Spartina* eradication activities in 2016.

The high levels of *Spartina* found from 2013 to 2015 are linked to increased staff and funding provided to the Puget Sound effort. The reward for these increases came in 2016 when the programs most detailed survey to date documented a 37% reduction from 2015 levels. In 2016 WSDA provided additional funding to the WDFW Puget Sound crew and DNR provided Puget SoundCorps (PSC) crews, equipment, and DNR staff.

WSDA continued to facilitate and participate in numerous cooperative treatment days in 2016. Cooperative treatments have become the norm in Snohomish County, on any given day two to three agencies will work the same area combining their resources, crews and equipment to accomplish program goals. PSC crews participated in cooperative efforts throughout the summer. All of the project partners who worked 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 *Spartina* infestation in Snohomish County was treated by WDFW (2.8 solid acres) and SCNWCB/WSDA (1.3 solid acres). The majority of this *Spartina* was contained within the South Skagit Bay area. SCNWCB and WSDA also worked closely with the Tulalip Tribal Nation to treat *Spartina* infesting Tulalip Bay, Big Flats and other culturally significant areas. Continued cooperation from the Tulalip Tribe will be essential to eradicating *Spartina* from Snohomish County. In addition, TNC treated 0.13 solid acre of *S. anglica* within their 4,100 acre saltmarsh located in the Port Susan Bay Preserve (PSBP) just south of Stanwood.

For the 2017 treatment season, WSDA will assist the Snohomish County partners in the survey of problematic areas and areas accessible only by watercraft. WSDA will continue to facilitate and participate in cooperative efforts with the partnering agencies in the most heavily infested areas. Continuing participation from DNR staff and PSC crews will be a great assistance to the Snohomish County effort. This multi-agency cooperative effort will provide the necessary coverage and detail needed to eradicate *Spartina* from Snohomish County.

Figure 8 is a projection of *Spartina* reduction within Snohomish County over the next two years with continued funding.

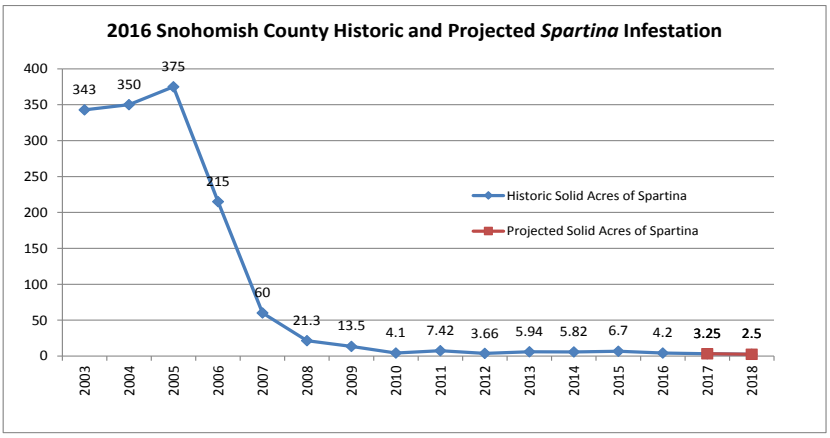

Figure 8: Solid acres of *Spartina* in Snohomish County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2018. Projection assumes continued funding.

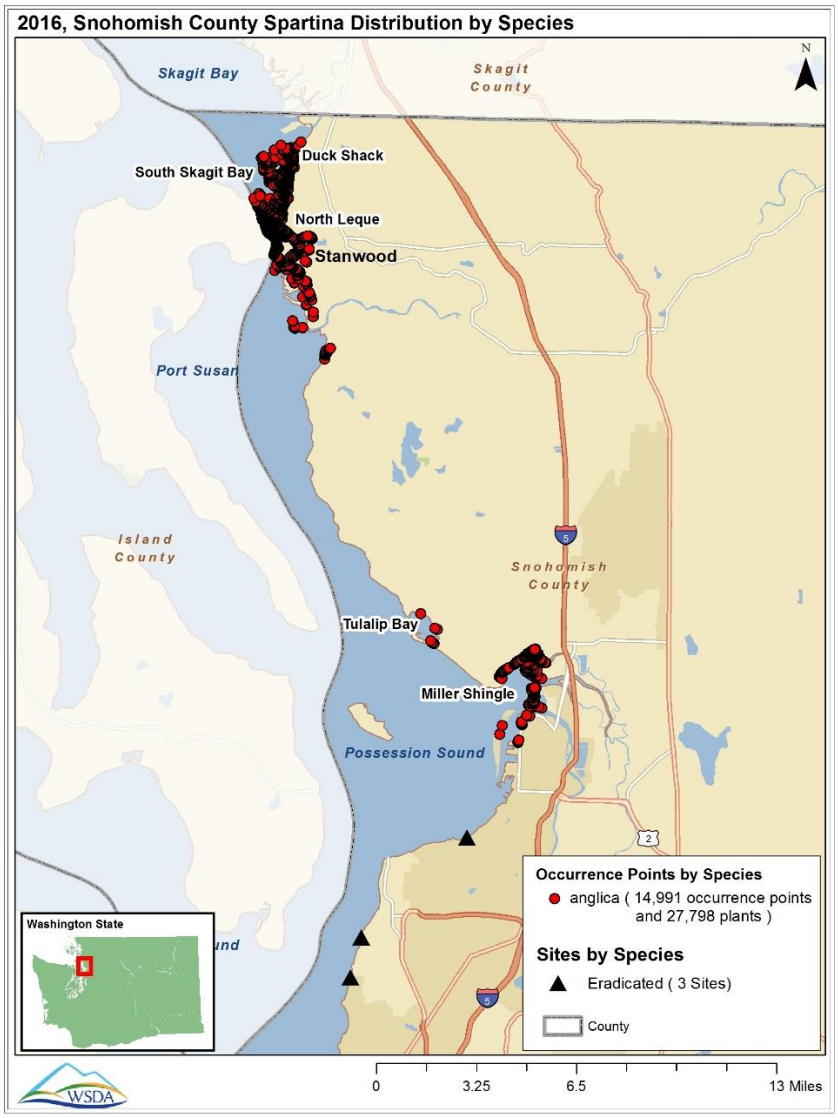

Figure 9: 2016 Snohomish County *Spartina* distribution by species.

Island County

In 2016, Island County contained Washington State's second largest *Spartina* infestation. Snohomish County, Island County, PSC crews, WDFW, and WSDA participated in the Island County effort. Island County Noxious Weed Control Board (ICNWCB) and WDFW treated the majority of the *Spartina* controlled in Island County. A total of 2 solid acres of *Spartina anglica* representing 8,157 occurrence points and 13,679 individual plants was found and treated in 2016 (Fig. 10). This represents a 50% decrease from the 4 solid acres treated in 2015. The large reduction seen in 2016 is the reward for the effective and detailed surveys conducted in recent years. WSDA provided Island County $60,000 for *Spartina* eradication activities in 2016.

Throughout 2016, the Puget Sound cooperators planned and executed effective multi-agency treatments. DNR provided funding for PSC crews to assist with control efforts. 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. All of the project partners who worked with the PSC crews appreciate 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 2016. 0.36 solid acre of *Spartina* were treated by Wildlands Management throughout Island County in 2016. This represents a 10 percent decrease from the 0.4 solid acre treated in 2015.

WDFW treated a total of 1.7 solid acres in Island County in 2016. This represents a 52% decrease from the 3.6 solid acres treated in 2015. The majority of the 2016 Island County *Spartina* infestation occurred in and around Emericks and Prices Islands (Fig. 11). For 2017, these areas will require significant support and resources in order to meet eradication objectives.

In addition, Island County contains Puget Sound's only known infestation of *Spartina densiflora* in Race Lagoon located on Whidbey Island. One small (approximately 1 $ft^{2)}$ plant was located and manually removed at this site in 2016.

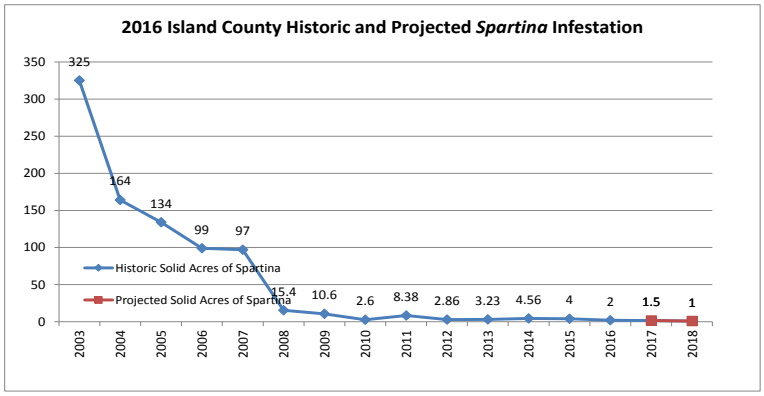

Figure 10: Solid acres of *Spartina* in Island County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2018. Projection assumes continued funding.

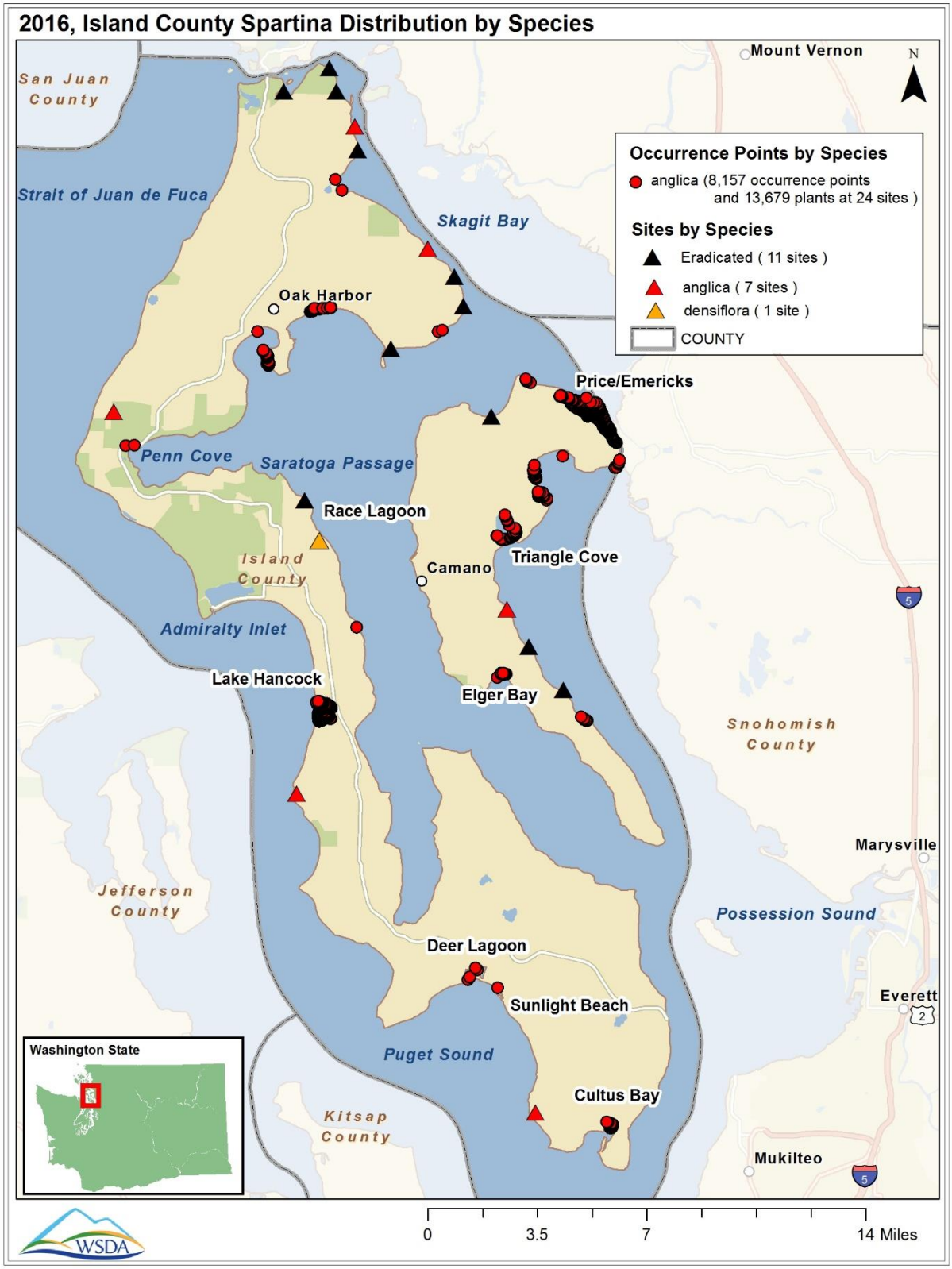

Figure 11: 2016 Island County *Spartina* distribution by species.

Skagit County

In 2016, Skagit County contained the third largest infestation of *Spartina* in Puget Sound. Approximately 0.33 solid acre (14,375 ft²) of *Spartina anglica* representing 545 occurrence points and 1,056 individual plants was found and treated in 2016 by the Skagit County Noxious Weed Control Board (SCNWCB), DOE, WDFW, WSDA, and the Swinomish Tribal Nation (Fig. 12). This represents a 34 percent decrease from the 0.5 solid acre treated in 2015. WSDA provided $40,000 to SCNWCB and $5,000 to the Swinomish Tribal Nation for *Spartina* eradication activities in 2016.

Most of the survey and treatment efforts by SCNWCB occurred in the areas near Fir Island and Fidalgo Bay (Fig. 13). WSDA provided airboat, Marsh-Master and crew assistance to SCNWCB in 2016 to survey and treat difficult to reach areas of the county. For 2017, WSDA will continue to provide equipment and crews to assist the SCNWCB in eradication efforts.

The Swinomish Tribal Nation engaged in *Spartina* control on their lands in 2016. Two thorough rounds of survey and treatment were completed. The 2016 season saw an increase in total *Spartina anglica* found and treated, from 0.0189 solid acre (823 ft², and 244 occurrence points) in 2015 to 0.08 solid acre (3615 ft² and 470 occurrence points) in 2016. This increase is due to crews identifying and treating an incipient infestation at the north end of the reservation located on sand spit islands along the reservation boundary. In 2017 this infestation will be a focus for control efforts. 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*. During the 2016 treatment season, DOE found and dug approximately twelve small *S. anglica* plants and one (10 ft²) *S. alterniflora* clone, which was removed from Dike Island.

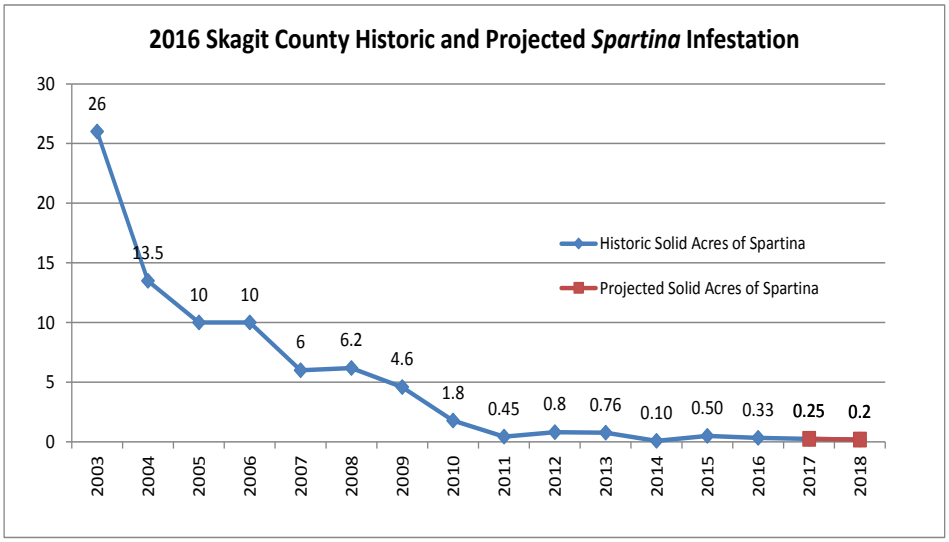

Figure 12: Solid acres of *Spartina* in Skagit County by year, based on WSDA estimates. The blue line represents the historic area of *Spartina* since 2003. The red line represents the projected *Spartina* area through 2018. Projection assumes continued funding.

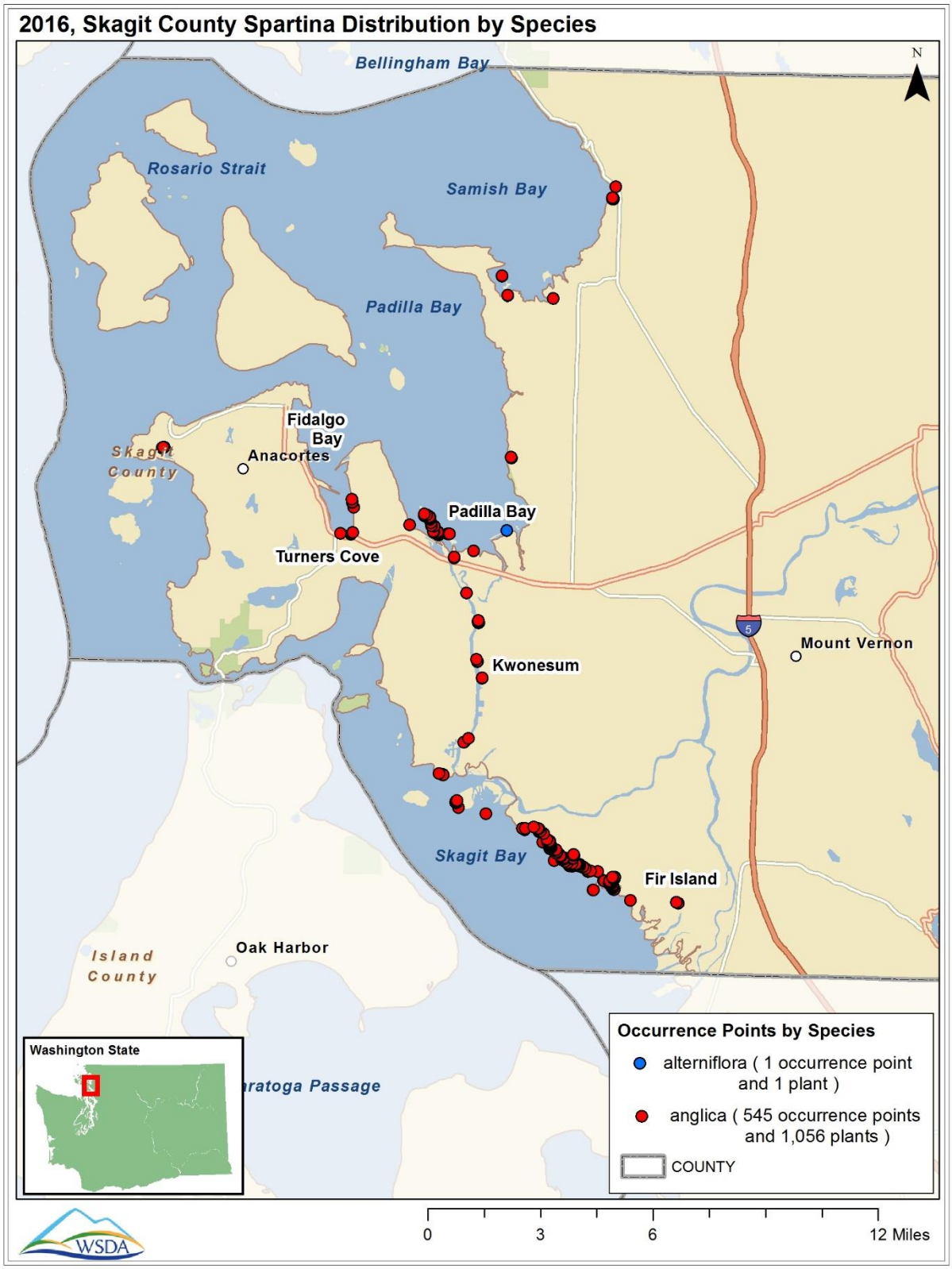

Figure 13: 2016 Skagit County *Spartina* distribution by species.

Whatcom County

In Whatcom County, *Spartina anglica* clones were discovered within the Lummi Reservation in 2010. In 2011, a cooperative effort was initiated with the Lummi Nation, the Whatcom County Noxious Weed Control Board (WCNWCB), People for Puget Sound, and WSDA. With the continued cooperation of the Lummi Nation, survey and removal efforts were conducted 2012 thru 2016.

In 2015 crews were able to find and remove 48 plants or 278 ft^2 from Lummi Flats. Walking surveys in 2015 totaled 13 miles and included Sandy Point to Neptune Beach and all of Point Roberts. No additional *Spartina* was found outside of the Lummi Flats area during the walking surveys.

The 2016 effort was able to find and remove 49 plants or 216 ft^2 from Lummi Flats. This is a 22% decrease from 2015 levels. Walking surveys in 2016 totaled 15 miles and included Lummi Bay, Nooksack Delta, Gulf Road Beach, Semiahmoo/Drayton Harbor and Birch Bay. No additional *Spartina* was found outside of the Lummi Flats area during these walking surveys.

WSDA and the WCNWCB will continue to assist the Lummi Nation in the survey and treatment of *Spartina* located within their estuaries. In 2016 WSDA provided $2,500 to the WCNWCB to survey potential *Spartina* habitat located within the County. Figure 14 depicts the 2016 distribution of *Spartina* in Whatcom County including site names.

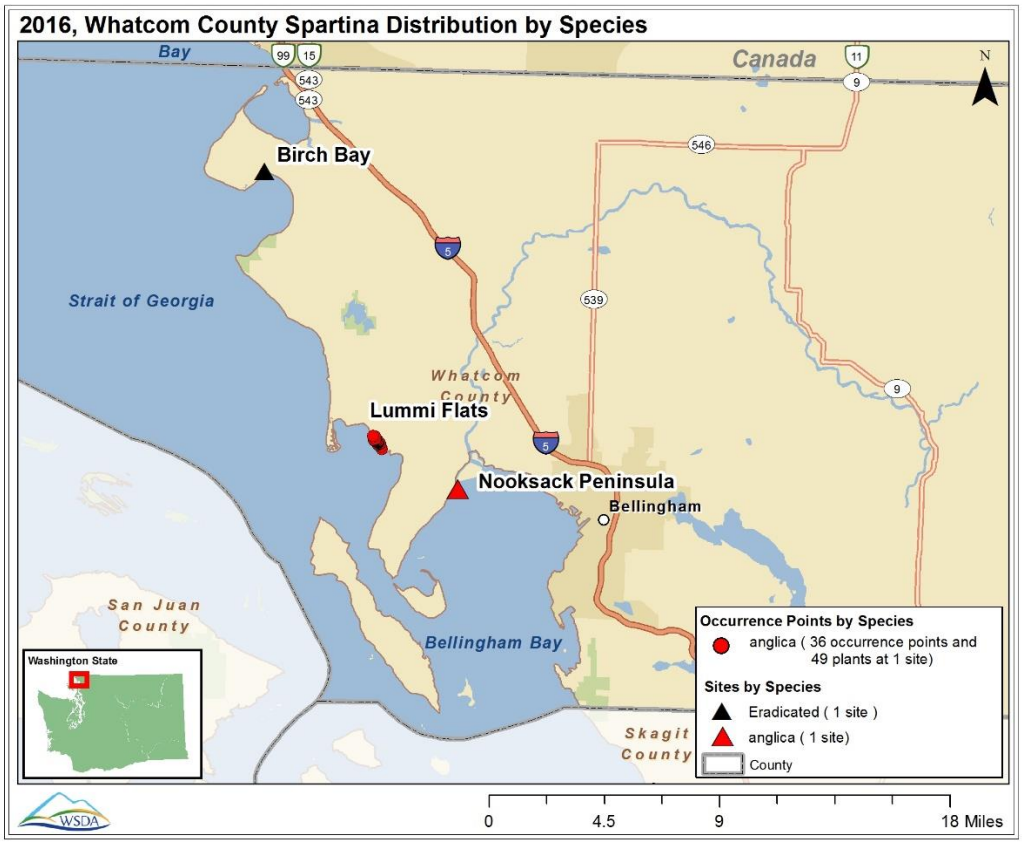

Figure 14: 2016 Whatcom County *Spartina* distribution by species.

San Juan County

Approximately 0.001 solid acre or 41 ft^2 of *Spartina anglica* was treated in San Juan County in 2016. All of this *Spartina* was located within Argyle Lagoon on San Juan Island. This represents a significant decrease from the 1093 ft^2 treated in 2015 where the majority of the *Spartina* treated was in Argyle Lagoon. In 2016, no *Spartina* was found at the other historically infested areas such as Fisherman's Bay, Spencer's Spit, Sculpture Park and White Point. 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 15 depicts the 2016 distribution of *Spartina* in San Juan County including site names.

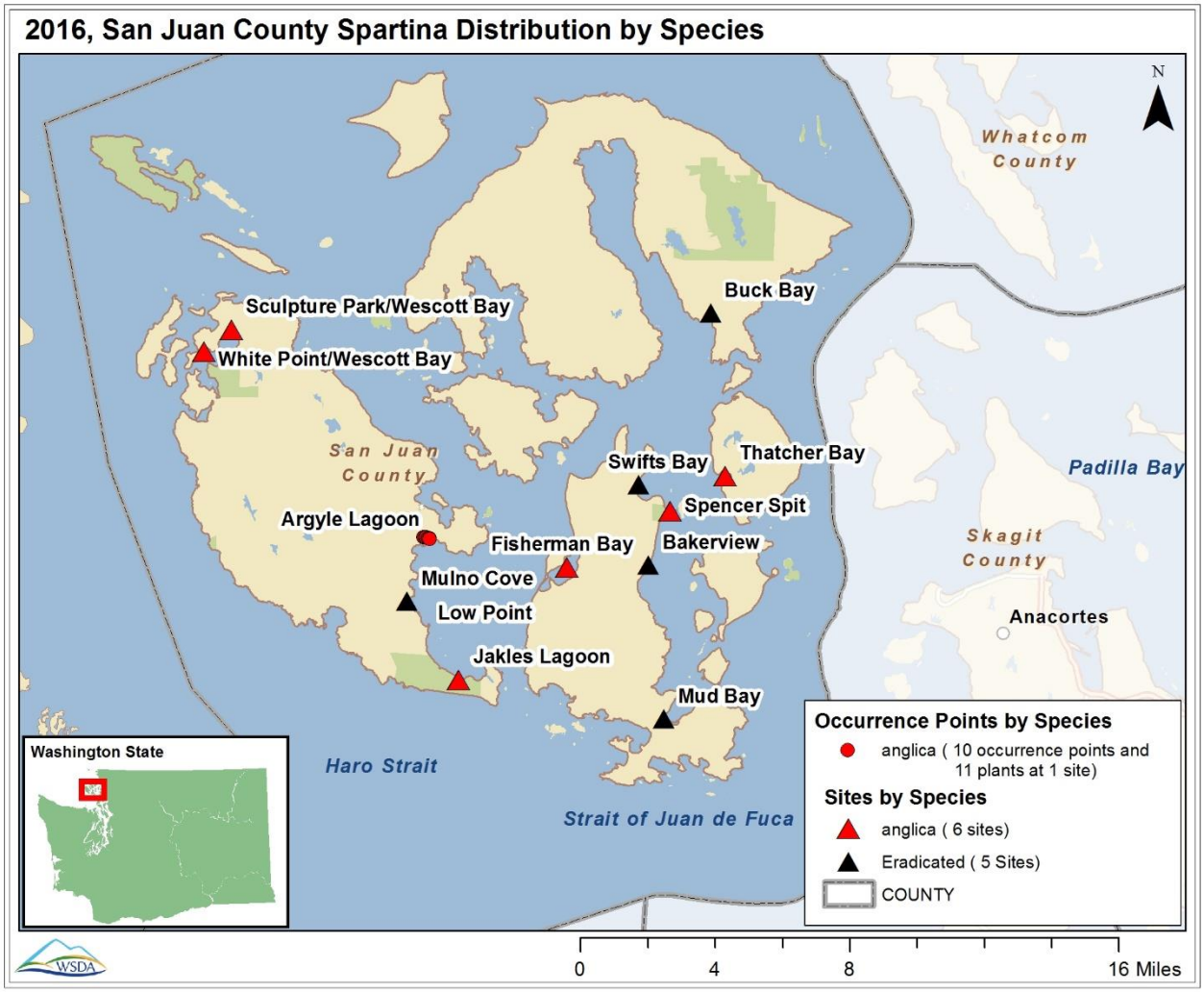

Figure 15: 2016 San Juan County *Spartina* distribution by species.

Clallam County

In 2016, 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 during the treatment season.

Clallam County infestations were located in 2007 during aerial and shoreline surveys. Two species of *Spartina* totaling approximately one acre were discovered. *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.

During the 2016 survey season, the WSDA crew found 5 plants and removed 13 sq. ft. of *Spartina* in Clallam County. There were 4 plants and 11 sq. ft. removed from the Waatch River and 1 plant removed from the Pysht River. Figure 16 depicts the distribution of *Spartina* in Clallam County including site names.

Along with a minimum of two visits to all known sites in 2017, thorough ground and kayak surveys of all vulnerable *Spartina* habitat in Clallam County is recommended. With continued control efforts during the upcoming years, WSDA looks forward to a county wide *Spartina* eradication.

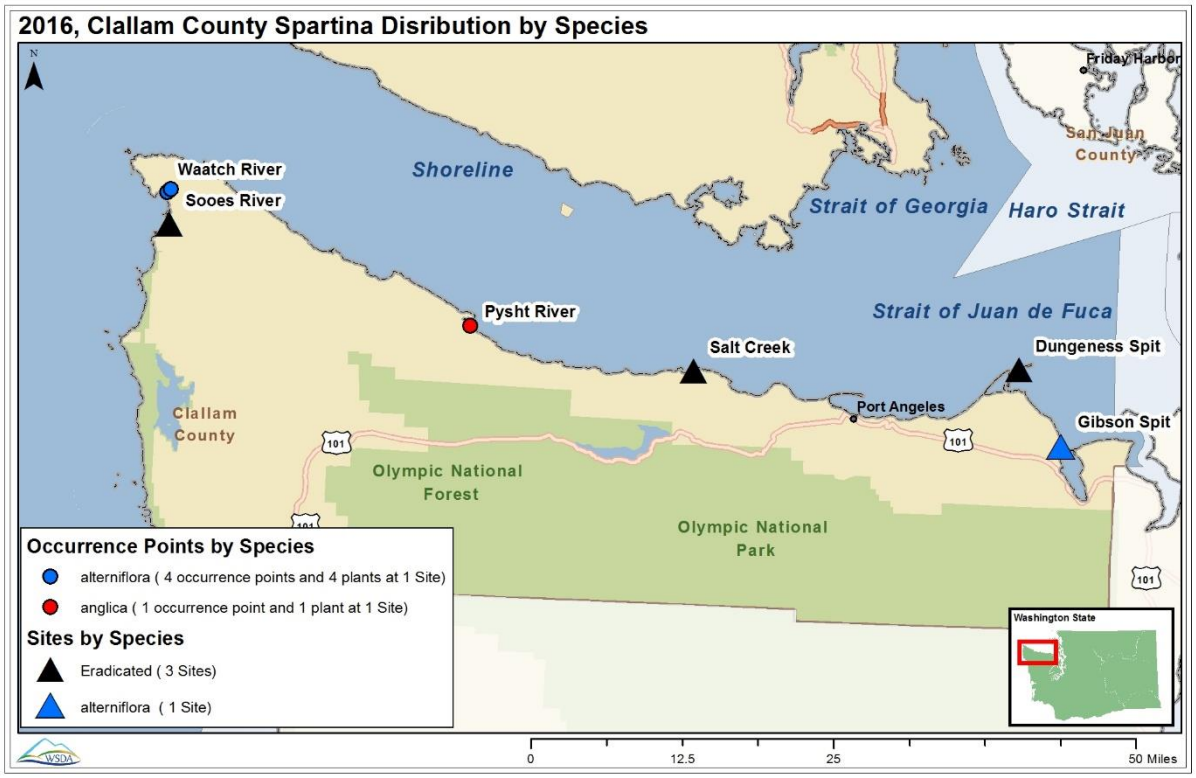

Figure 16: 2016 Clallam County *Spartina* distribution by species.

Kitsap County

In Kitsap County, approximately 0.002 of a solid acre (84 ft^2) of *Spartina anglica* (52 occurrence points) was manually removed in 2016. WSDA and the Suquamish Tribe work together to treat the largest known infestation in the central Puget Sound located at Doe-Kag-Wats, where new fall survey protocols have contributed to recent finds (See Page ii). This site has significant challenges with continually shifting driftwood that litters the cove and makes survey difficult. With continued dedication to the effort, eradication appears attainable (Fig. 17). Without these efforts the infestation would likely have expanded to infest the roughly 14 acres of suitable habitat within this estuary. Additionally, two detailed surveys of Foulweather Bluff revealed three plants (9 ft^2 of *S. anglica*) and the Coon Bay site met Eradication Criteria (Fig. 18).

For 2017, WSDA crews will continue to survey the estuarine habitat of Kitsap County to ensure that no new outlying infestations exist.

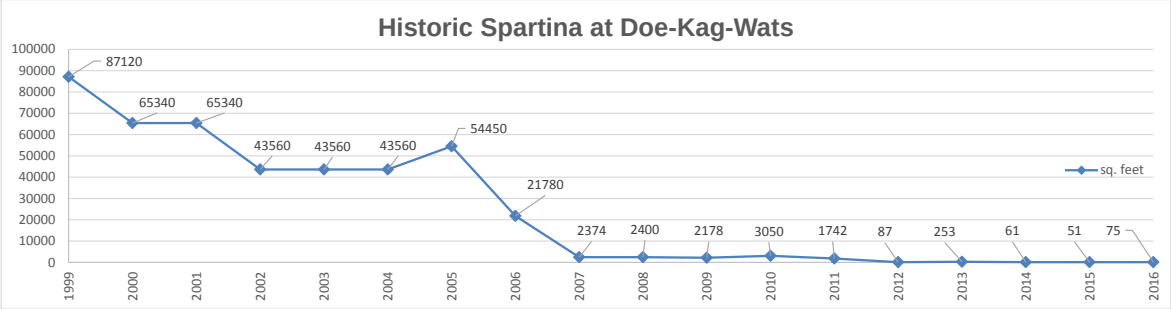

Figure 17: Doe-Kag-Wats infestation history.

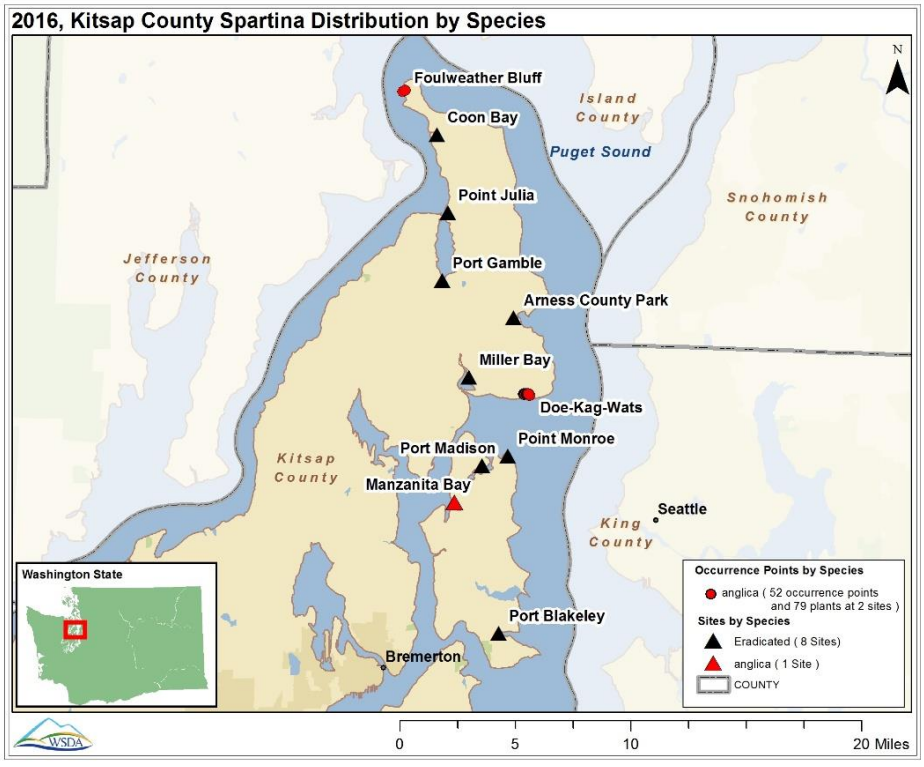

Figure 18: 2016 Kitsap County *Spartina* distribution by species.

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.

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 2016, extensive ground and kayak surveys yielded 12 *Spartina* occurrence points totaling approximately 2178 ft^2 (0.05 acre) treated within Jefferson County. Of this total, WSDA crews treated approximately 1742 ft² of *S. patens* on both public and private land just north of Dosewallips State Park. An additional 436 ft² of *S. anglica* was treated by WSDA crews in the mouth of Chimicum Creek south of Port Townsend (Fig. 19).

In 2017, continued shoreline surveys in Jefferson County are recommended. 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 eradicate *S. patens* from Washington State.

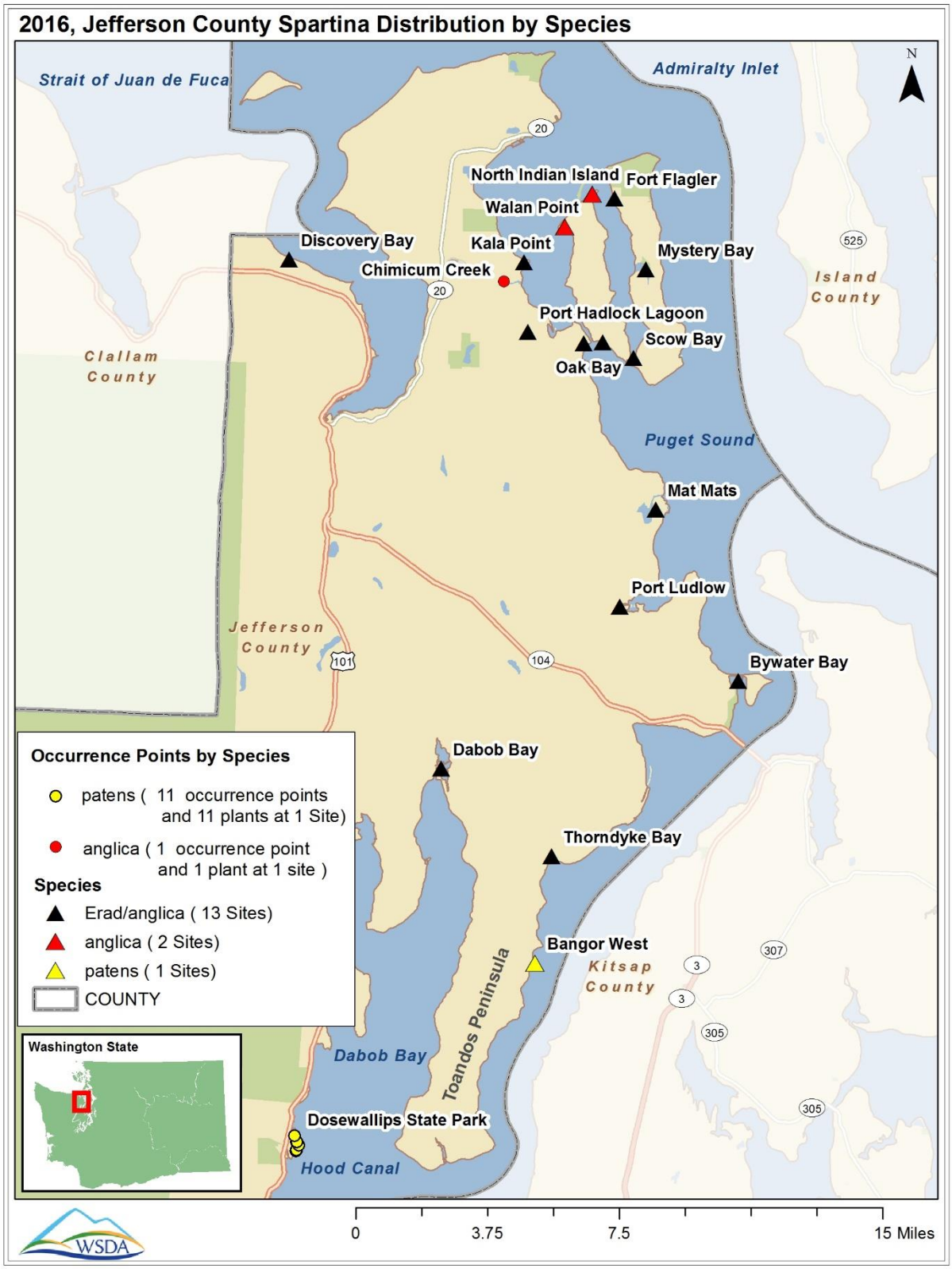

Figure 19: 2016 Jefferson County *Spartina* distribution by species.

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 time, 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. In 2013 and 2014, two rounds of survey were conducted where 2 ft^2 of *anglica* was removed. After multiple trips to the site in 2015 and 2016, no *Spartina* has been found. In 2016 extensive surveys of surrounding habitat were conducted and no *Spartina* was found. With these results Pierce County appears to be approaching eradication. 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.

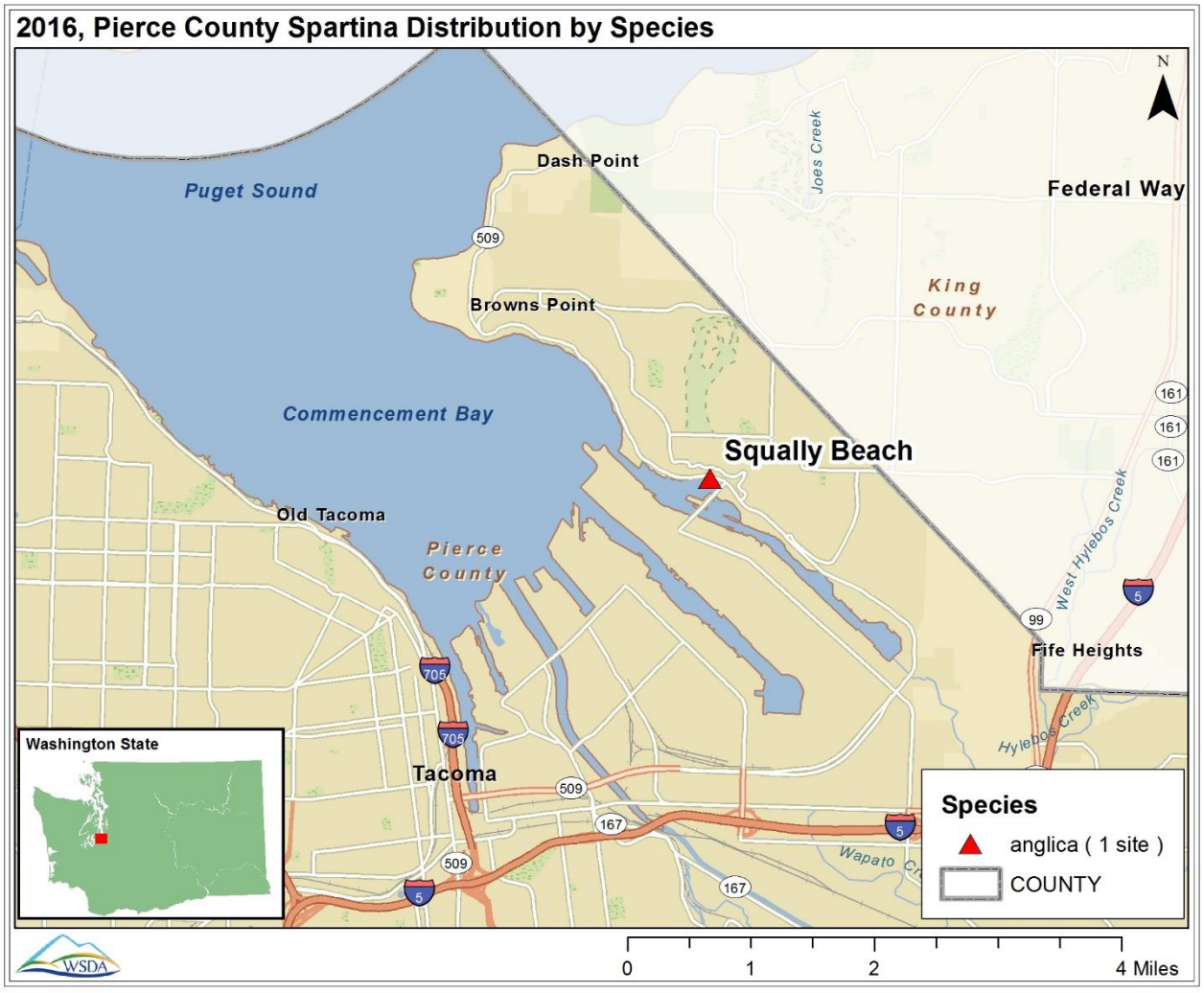

Figure 20: 2016 Pierce County *Spartina* distribution by species.

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*. The 2015 and 2016 surveys did not find any *Spartina* in King County. With these results Pierce County appears to be approaching eradication. 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 2016 distribution of *Spartina* in King County including site names.

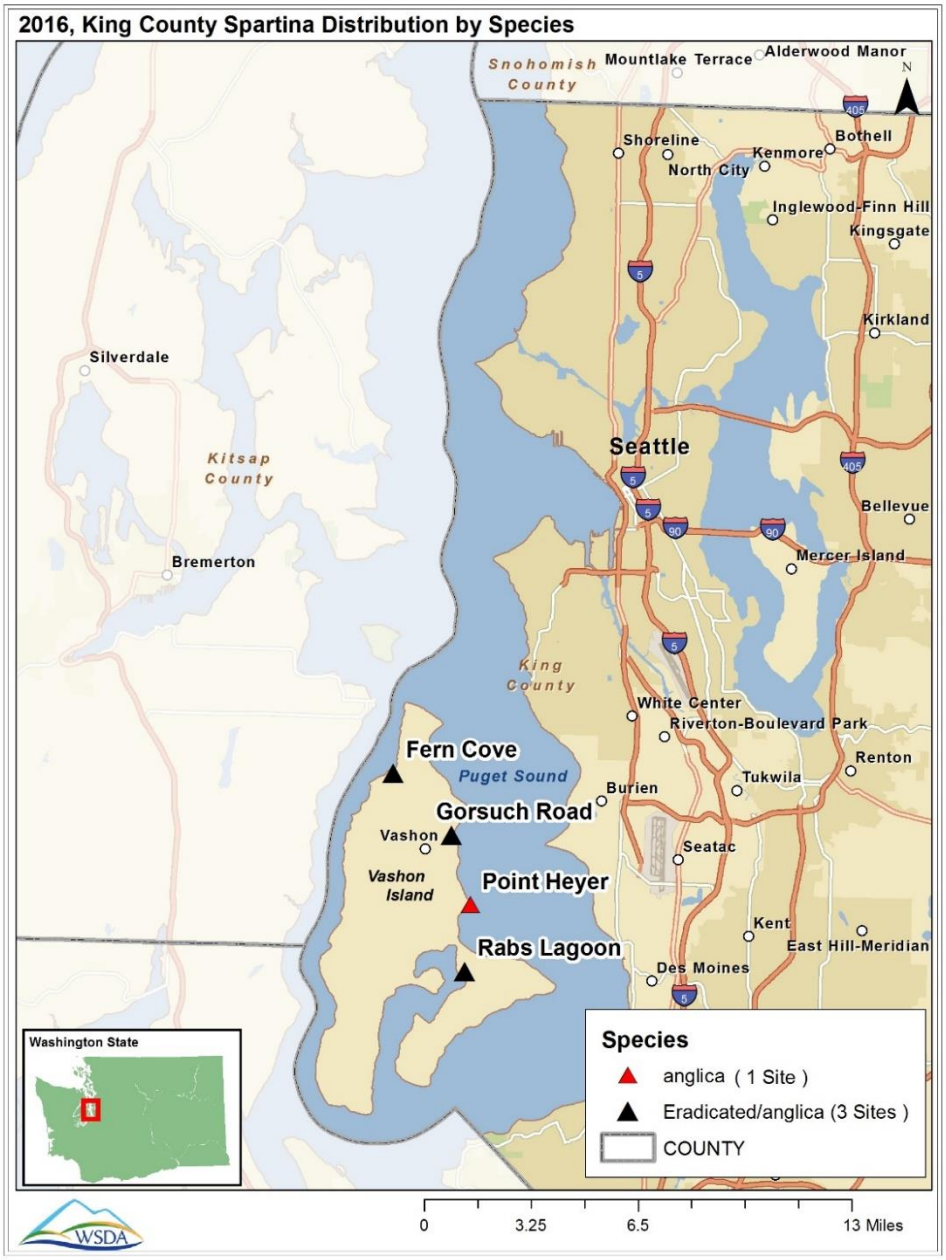

Figure 21: 2016 King County *Spartina* distribution by species.

Appendix A

DNR Aquatic Invasive Species Program Control Work Using Puget SoundCorps Crews
Submitted by Todd Palzer, Micki McNaughton & 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 the 2011-13 biennium. These funds were used to control aquatic noxious weeds as part of a larger jobs fund package. This funding was continued in 2013-15 using $641,000 of re-appropriated funds and an additional new appropriation of $375,000 ALEA funding.

In 2013 and 2014 DNR, along with the Washington State Department of Ecology (Ecology), established Puget SoundCorps crews to perform noxious weed and invasive plant control for select watersheds flowing into the greater Puget Sound and its marine shorelines. DNR's Aquatic Invasive Species Program partnered with county noxious weed control boards and conservation districts with established partnerships with state and federal agencies, tribal governments, conservancy organizations, and private landowners. The combination of these partnerships, a pre-existing infrastructure, and local experience maximized overall productivity and on-the-ground accomplishments.

The capital budget request for Puget SoundCorps partnership funding was approved by the legislature for the 2015-17 biennium. DNR's Aquatic Resources Invasive Species Program was allotted $50,000 of re-appropriated ALEA funding and a final amount of $210,000 of Puget SoundCorps bill funding utilized; and $45,000 of DNR's operating RMCA-A funds were also prioritized to sustain these effective crews for on the ground invasive species survey and treatments

In 2015, Puget SoundCorps crews were once again instrumental during the *Spartina* eradication season continuing work in Skagit, Island, and Snohomish counties which covered the expanded treatment areas of *Spartina* in 2013 and 2014. A total of 35 crew days, at a cost of $1,185 per crew per day plus PPE and supplies, equaled a total of $54,000 spent on invasive species control by Puget SoundCorps crews in 2015.

The bulk of the 2015-17 funding ($251,000) was spent during the 2016 field season allowing crew time to be adequately planned for within DNR, Ecology, EarthCorps and our local, tribal and federal partners. This funding and field work pattern is likely to continue into the future due to logistic issues of putting crews in the field immediately following the biennial budget sessions with the budget cycle year having a reduced focused effort on critical treatments and a more robust effort the second field season of the biennium.

For the 2016 field season, crews were available to perform these activities for a total of 202 crew days (12,120 man hours) at a cost of $251,000 including PPE and supplies. Crews worked closely with numerous partner organizations and were deployed as follows for the 2016 survey and treatment season:

- Clallam County – 12 crew days
- Grays Harbor County – 5 crew days
- King County – 67 crew days
- Kitsap County – 8 crew days
- Island County – 2 days
- Jefferson County – 13 days
- Mason County – 13 days
- Skagit County – 40 days
- Snohomish County – 42 days

A crew is composed of one crew lead and five crew members provided by Ecology's Washington Conservation Corp (WCC) or EarthCorps. DNR used existing invasive species operating funds to cover its project management costs (approximately 0.25 FTE) and did not charge any of its staff time against the Jobs Act Now funding for these projects.

DNR oversight was provided by Kirk Thomas, Field Operation Coordinator for the agency's Asset and Property Management Division; Micki McNaughton, Special Project Coordinator, Todd Brownlee, Invasive Species Operations Coordinator; and Todd Palzer Shellfish Resources and Invasive Species Manager within the Aquatic Resources Division.

For more information about the 2016 Puget SoundCorps crews or the DNR Aquatic Invasive Species Program, please contact Todd Palzer at (360) 280-9153.

Appendix B

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

During the 2016 *Spartina* field survey season, WSDA completed its full implementation of its cutting edge mobile data collection system comprised of two key pieces of software, iForm and ArcGIS Online, which are run on iPhones and iPads. The software is designed to work complimentary to one another to aid in both real-time and offline data collection as well as adding real-time mapping capabilities.

In recent years, the majority of cooperators operated with simple recreational grade GPS equipment only capable of collecting location and date information. This lead to miscommunication in reporting back to WSDA which led to unreliable data. Under the WSDA system, we are able to collect not only location and date but species, size of the infestation, data collector, unique identification per plant, along with a high resolution images. 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 answers 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 reference 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.

This season WSDA, along with multiple cooperators, built upon the success of last year with the use of real-time creation and sharing of trackline data which shows the path of the surveyor throughout the day to represent exact areas that have been surveyed. This allows WSDA and cooperators to show not only positive data but also aided in assuring there are no gaps in coverage and surveyed areas. WSDA also implemented the access to shared mapping information through ArcGIS Online allowing cooperators to access real-time information on plant occurrences and surveyed areas done by all cooperators in their area. This helped greatly to reduce program inefficiencies and improve the cooperative eradication effort.

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 had always been deemed impossible. Yet over the past three years, WSDA has successfully implemented a system that features standardized field data collection forms, universal hardware to aid in training and support along with real-time tracking and collaboration tools. The result has been 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.
For more information about the cloud based data collection process, please contact the WSDA Pest Program at (360) 902-2070.

Appendix C

Government Agencies, Tribes and NGO's Contributing to the Spartina Eradication Effort

Cooperator	Field Crew	Task
Washington State Department of Agriculture (Lead agency RCW 17.26.015)	5	Coordination/Funding/Control
USFW - Various Wildlife Refuges	4	Funding/Control
US Department of the Navy	0	Support/Access
Washington State Department of Fish and Wildlife	10	Funding/Control
Washington State Department of Natural Resources	6	Funding/Control
Washington State Department of Ecology	0	Permitting
Washington State Recreation and Conservation Office	0	Education and Outreach
Washington State Parks	0	Support/Access
Washington State Noxious Weed Control Board	0	Education and Outreach
Puget SoundCorps Crews	15	Control
Washington Conservation Corps	5	Control
The Nature Conservancy/Earth Corps	5	Funding/Control
Clallam County	0	Landowner assistance
Jefferson County	0	Landowner assistance
Grays Harbor County	0	Landowner assistance
Pacific County	4	Control
Whatcom County	2	Control
San Juan County	1	Control
Island County	3	Control
Skagit County	3	Control
Snohomish County	4	Control
King County	0	Landowner assistance
Pierce County	0	Landowner assistance
Thurston County	0	Landowner assistance
Mason County	0	Landowner assistance
Kitsap County	0	Landowner assistance
Swinomish Tribe	3	Control
Tulalip Tribal Nation	0	Support/Access
Lummi Nation	0	Support/Access
Shoalwater Bay Tribe	1	Control
Makah Tribal Nation	0	Support/Access
Suquamish Tribe	0	Support/Access
Puyallup Tribe	0	Support/Access
UW/Olympic Natural Resource Center	0	Mapping/Advice
WSU/Extension	0	Research/Advice
Approximate Number of Crew Members Involved in Summer Field Season	**71**	
Many additional groups such as Friends of Grays Harbor, Pacific Coast Shellfish Growers		
Association and Audubon Society contribute to and advise the program.		