

2018

British Columbia Spartina Eradication Program Progress Report

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On Behalf of the BC Spartina Working Group



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DEFINITIONS

Abundance: total number of *Spartina* plants found.

Clone: a patch of *Spartina*. Patch is defined as anything < 30 cm.

Impacted Area: calculation of how much shoreline is impacted by laying a 1-hectare (Ha) grid cells over the entire shoreline and assessing which grid cell has one or more *Spartina spp.*

Leaf Area: calculation of size x the number of plants equaling approximately the number of square meters a dispersed population would occupy if all *Spartina* plants are grouped together.

Size Class Seedling: single plant or seedling.

Size Class A: patch of *Spartina* that is < 30 cm.

Size Class B: patch of *Spartina* that is 30 cm to 1.0 m in diameter.

Size Class C: patch of *Spartina* that is > 1.0 m in diameter.

Size Class D: patch of *Spartina* that is ~ 5.0 m diameter patch with numerous plants.

ACKNOWLEDGMENTS

The work completed in 2018 for the *Spartina* Eradication Program could not have been undertaken without funding from:



Major capital contributions in 2018 were also granted by:



The British Columbia Spartina Working Group (BCSWG) is a collaborative group that formed in 2004 and includes members from both government and non-government organizations. The Spartina Eradication Program is primarily lead by the technical committee however, the success of the programs early detection rapid response efforts is only possible with contributions from the entire working group (Figure 1).



Figure 1. Members of the BCSWG.

In addition, special thanks are extended to the field coordinators and many other individuals and groups who contributed to finding and removing *Spartina spp.* in BC. Many landowners provided access through their property to map and control *Spartina* and we thank them for their support. Those contributions to the BCSWG program are acknowledged in Table 1.

Table 1. List of 2018 participants by organization who helped map and control *Spartina* in BC

Organization	Participants
City of Surrey; SHaRP Program	Elizabeth Goullaud, Noah Bircher, Julia Larsen, Sophie Cummings, Brandon Davies, Sarah Gutzmann, Chris Wang, Alexandra Legere, Alyssa Lait, Amy Chen, Anthony Duong, Athena Li, Selena Li, Christina Nguyen, Ehsan Hafizi, Eshana Baran, Hunter Wheaton, Ishawn Sharda, Ivona Zivkovic, Jason Lee, Logan Kreiser, Manuela Vilio, Meriwether Morris, Miles Burkholder, Oskar Kolanczyk, Ravleen Brar, Tristan Campbell
Corporation of Delta	Kevin Li
British Columbia Conservation Foundation	Katie Calon, Ben Kavanagh, Ken Wu, Richard Topp, Ben Siebert
Ducks Unlimited Canada	Matt Christensen, Megan Winand
Environment Canada – Canadian Wildlife Service	Kathleen Moore
Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Val Miller, Becky Brown, Derek Hogan
Port Metro Vancouver	Kim Keskinen
Tsawwassen First Nation TFN Construction / Matcon Joint Venture	
West Coast Conservation Lands Management Program	Tom Reid, Curtis Rispin, Shawn Lukas
K’omoks First Nation	Cory Frank
Friends of Semiahmoo Bay	Shubhi Singh, Heather
Volunteers in the Fraser Delta	Shannon MacDonald
Volunteers on Vancouver Island (including Gulf Islands)	Alan and Anita, Barb, Barbara, Charmaine, Doug, Jeff, Jenny, Joanne, Judith, Neil, Tim, and Vicki

BACKGROUND

The Fraser Delta has approximately 25,000 ha of tidal mud flat that is internationally recognized as important habitat for fish and migratory birds. In all of Canada, the Fraser Delta has the highest density of wintering waterfowl, shorebirds and raptors. The impacts of *Spartina* include the conversion of mudflats to monoculture stands, loss of habitat for waterfowl and fish, accretion of sediments, and modification of drainage patterns. Intertidal areas in Washington State dominated by *Spartina* have exhibited large declines in the abundance of shorebirds and waterfowl. Significant expenditures have been required to control *Spartina* in Washington State costing approximately one million dollars per year. It is only recently with sustained funding and use of herbicide that the States have significantly reduced *Spartina* infestations. Controlling the spread at the early stages of species expansion is the most cost-effective approach and it is critical to control *Spartina* in BC as early as possible. The loss of important intertidal habitats in BC will be detrimental to a multitude of species and will require considerably greater resources to control in the future. For more information on *Spartina* in BC and the *Spartina* Eradication Program, please visit www.spartina.ca.

EXECUTIVE SUMMARY

In 2018, the British Columbia Spartina Working Group (BCSWG) continued to work toward the eradication of non-native, invasive *Spartina* along the BC Coast. BCSWG recognizes the potential impacts of *Spartina* on local shorelines and wildlife habitat and is striving to support the Pacific Coast Collaborative goal of eradication of all non-native *Spartina* (*S. anglica*, *S. densiflora*, and *S. patens*) along the coasts of British Columbia (B.C.).

BC Spartina Eradication Program applied \$348,996 of in-kind and direct value to deliver program components focused on Monitoring, Removal, Herbicide, Coordination, Outreach and Science/Evaluation. The monitoring program included mapping approximately 250 km of BC's coastline in search of *Spartina* spp. throughout the summer, fall and winter months (Figure 2).

The results of 2018 show success in reducing abundance of *S. anglica* in Boundary Bay and Robert's Bank by 65% since 2016 and a **continuous** reduction in *S. densiflora* since 2015. *S. patens*, has increased by 50% since 2015; this increase is partly the result of increased surveillance efforts as well as extremely limited to no success of non-herbicide treatment control methods. It is predicted that *S. patens* will continue increase if herbicide treatments are not introduced as a primary treatment method for this species. The BC SWG is working towards implementing herbicide as a primary control method for *S. anglica* and *S. patens* for 2019.

Following monitoring and removal of *Spartina*, BC SWG recognizes the importance of restoring marsh ecosystems. Therefore, in 2018, BC SWG worked with the City of Port Moody to plant nursery *Carex lyngbyei*, in areas previously matted with woven Nilex 2002 geotextile fabric. This will serve as the starting point in restoring marshes after the removal of *S. patens*.

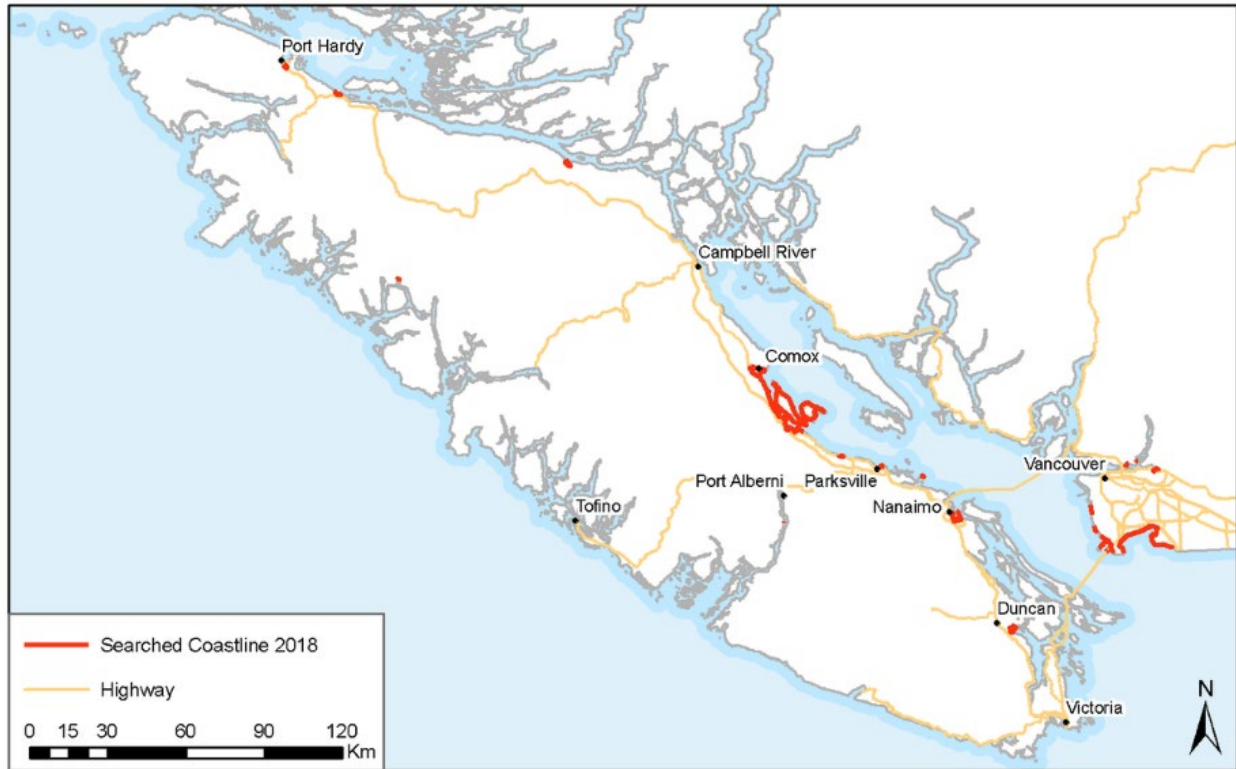


Figure 2. All areas searched in British Columbia in 2018 resulting in approximately 250km of searched shoreline.

DETECTION

Data compilation and storage for *Spartina* sp. data has been a joint effort of Ducks Unlimited Canada (DUC) and the Community Mapping Network (CMN). This data is used for evaluating eradication progress and planning future monitoring and control activities. Ducks Unlimited Canada (DUC) also maintains a geodatabase of the BC SWG spatial data. For more information on mapping methodology and spatial analyses, please visit www.spartina.ca.

Spartina data is also entered into the Invasive Alien Plant Program (IAPP) database (<http://www.for.gov.bc.ca/hra/Plants/application.htm>).

FRASER DELTA, BOUNDARY BAY AND BURRARD INLET

In 2018, four summer technicians spent 332 person-days mapping *S. anglica* in the Lower Mainland and *S. patens* in Burrard Inlet covering approximately 68 km of shoreline (Figure 2).

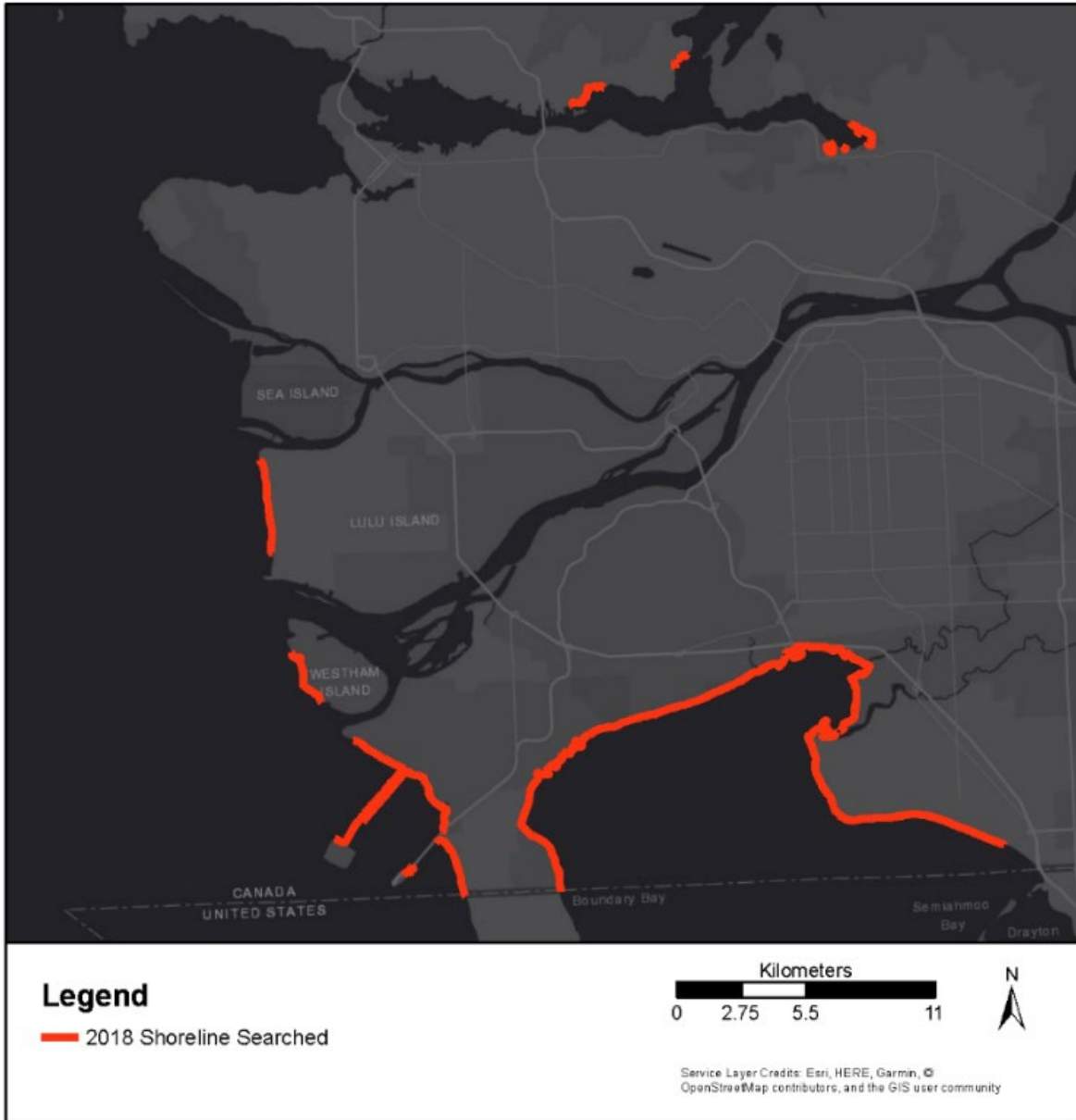


Figure 3. Shoreline searched in 2018 for *Spartina* spp.

EAST COAST OF VANCOUVER ISLAND

The West Coast Conservation Land Management Program (WCCLMP) surveyed approximately 104 km of shoreline from Kye Bay to South Winchelsea Island and various priority conservation lands on Vancouver Island (Figure 4, Figure 5, Figure 6, and Figure 7)

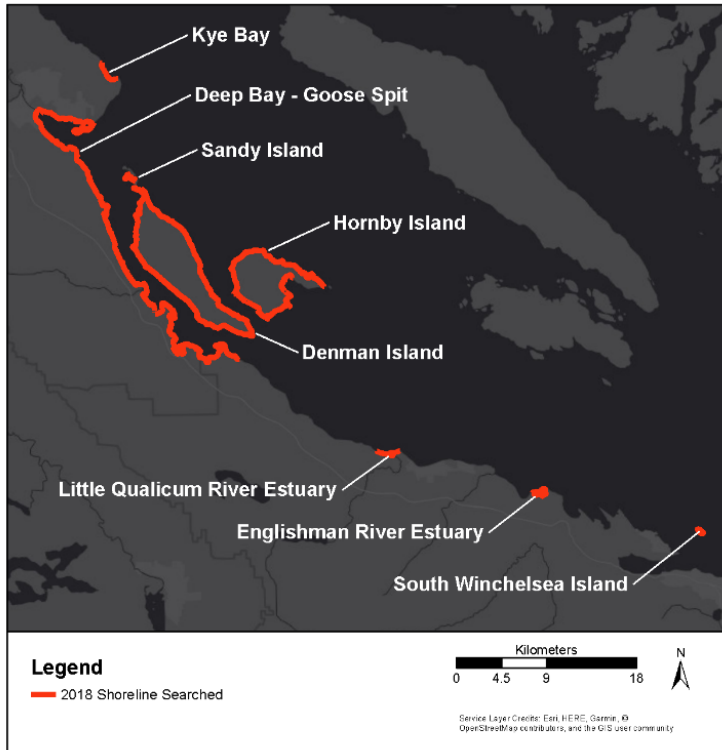


Figure 4. Areas searched on the East Coast of Vancouver Island (Baynes' Sound) including the Gulf Islands for *Spartina spp.* in 2018.

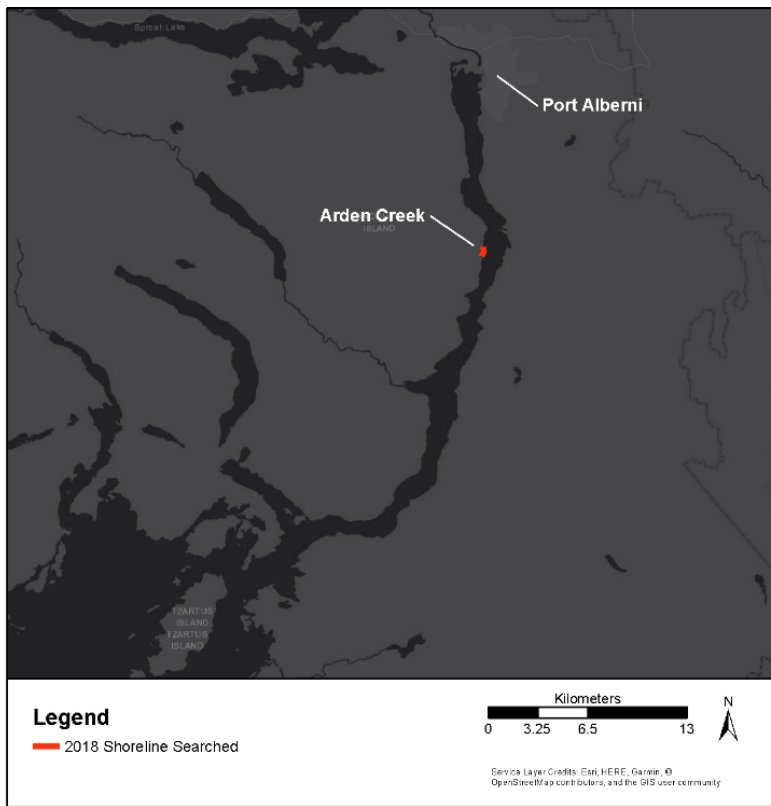


Figure 5. Areas searched for *Spartina spp.* in 2018.

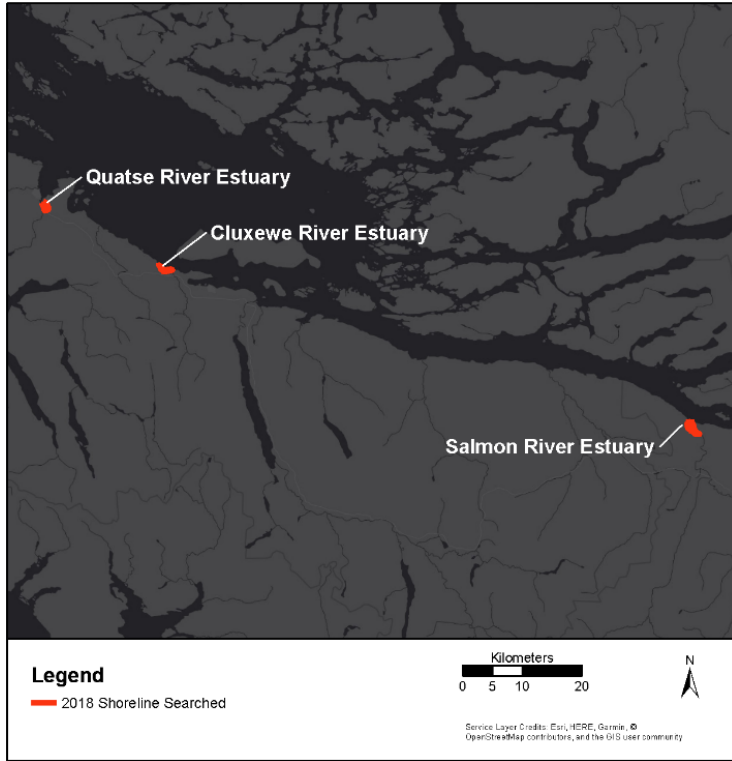


Figure 6. Areas searched for *Spartina spp.* in 2018.

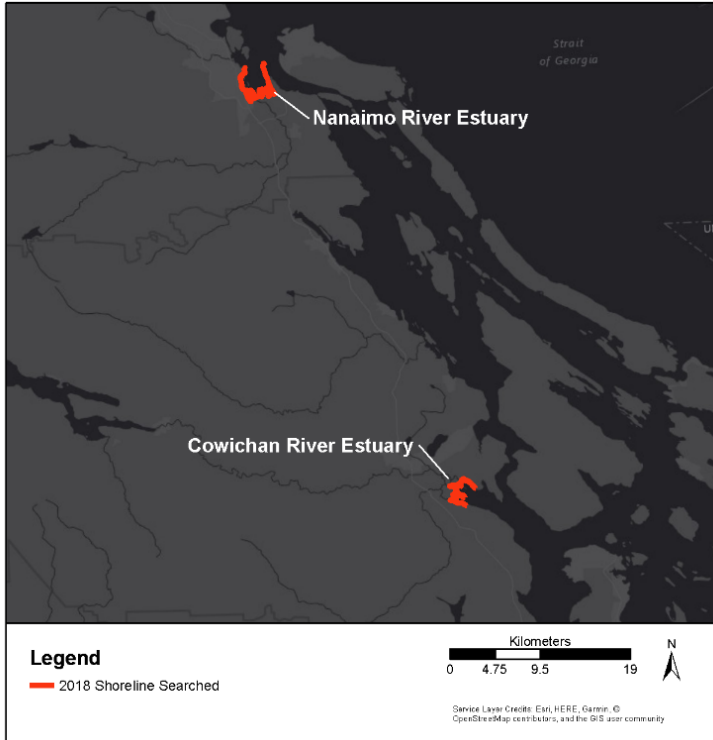


Figure 7. Areas searched for *Spartina spp.* in 2018.

GULF ISLANDS

In 2018, approximately 79 km of shoreline was surveyed between Denman, Hornby and Sandy Island (Figure 4). *S. patens* is found on Hornby and Sandy Island while *S. densiflora* is found on all three islands.

INVENTORY

Mapping in the Lower Mainland took place from Sturgeon Banks, BC to White Rock, BC. The distribution of *S. anglica* is contained within its known areas of Boundary Bay between Blackie Spit and Beach Grove, and Roberts Bank between Brunswick Point and the north side of the Tsawwassen Ferry Terminal (Figure 8 & Figure 9).

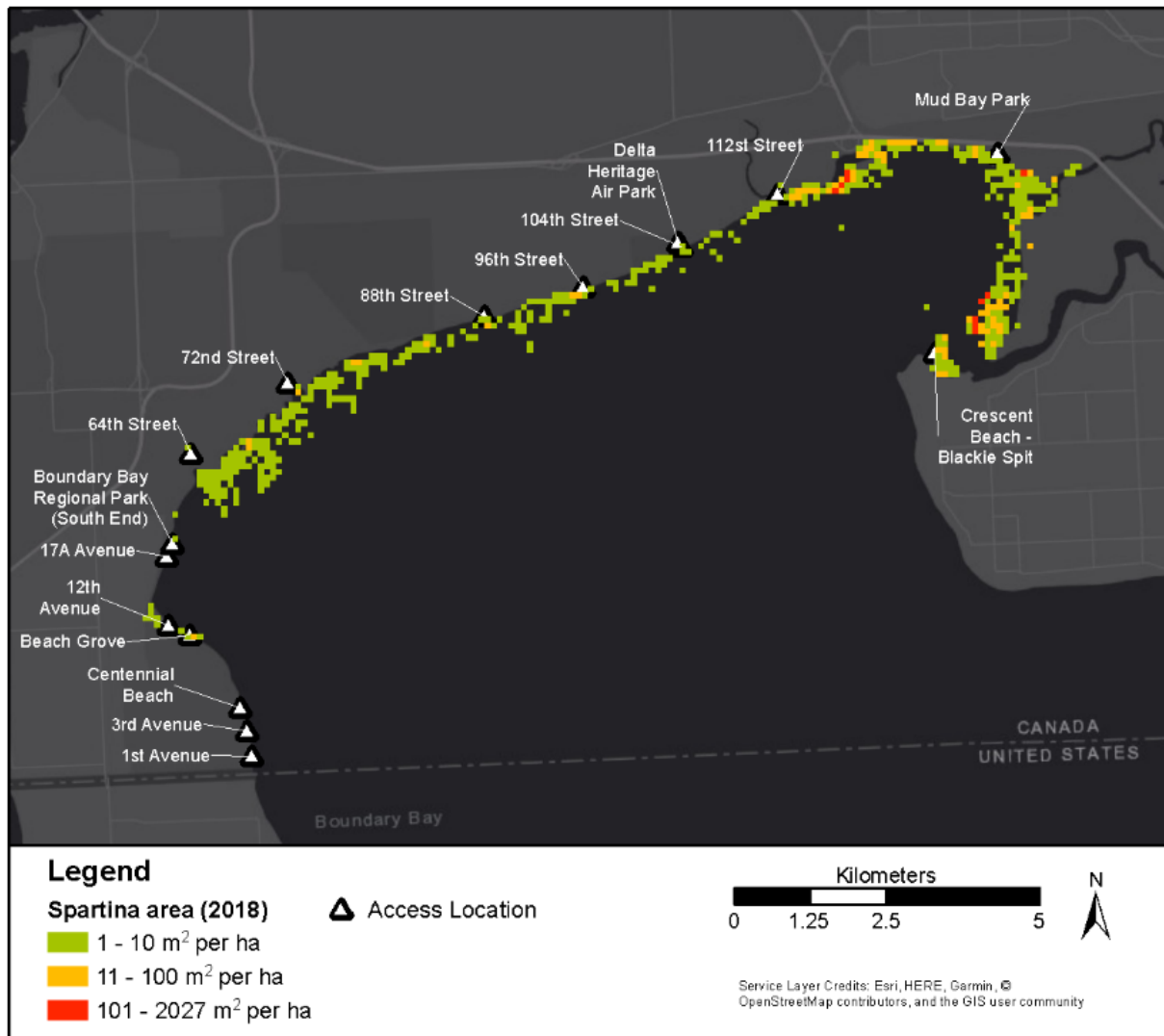


Figure 8. Estimated leaf area of *S. anglica* for Boundary Bay in 2018.

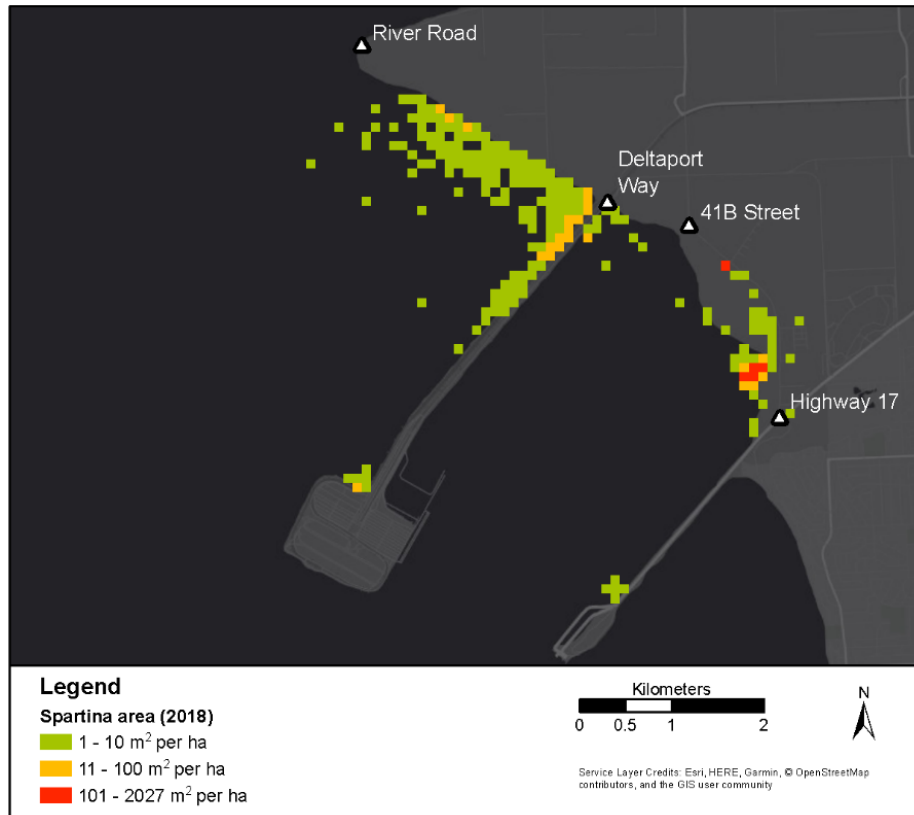


Figure 9. Estimated leaf area of *S. anglica* for Roberts Bank in 2018.

The number of *S. anglica* plants reduced by approximately 65% since 2016. In addition to a decline in abundance, there is a decline in the leaf area indicating fewer plants that are smaller in Boundary Bay and the Fraser Delta.

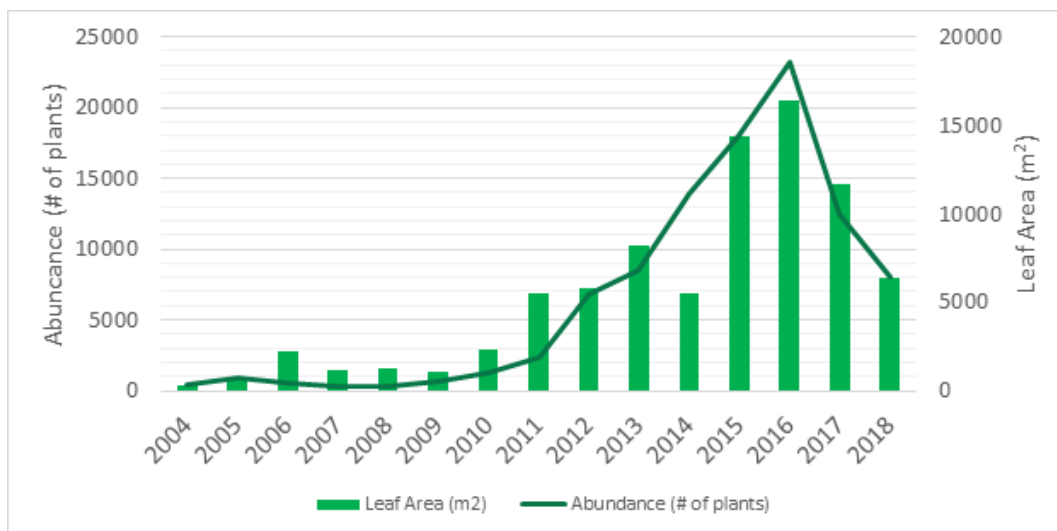


Figure 10. Number of plants and approximate leaf area of *S. anglica* in Boundary Bay and Fraser Delta from 2004 to 2018.

Mapping in Burrard Inlet took place from Maplewood Conservation Area in the District of North Vancouver, Shoreline Park and, Pacific Coast Terminals in Port Moody (Figure 11).

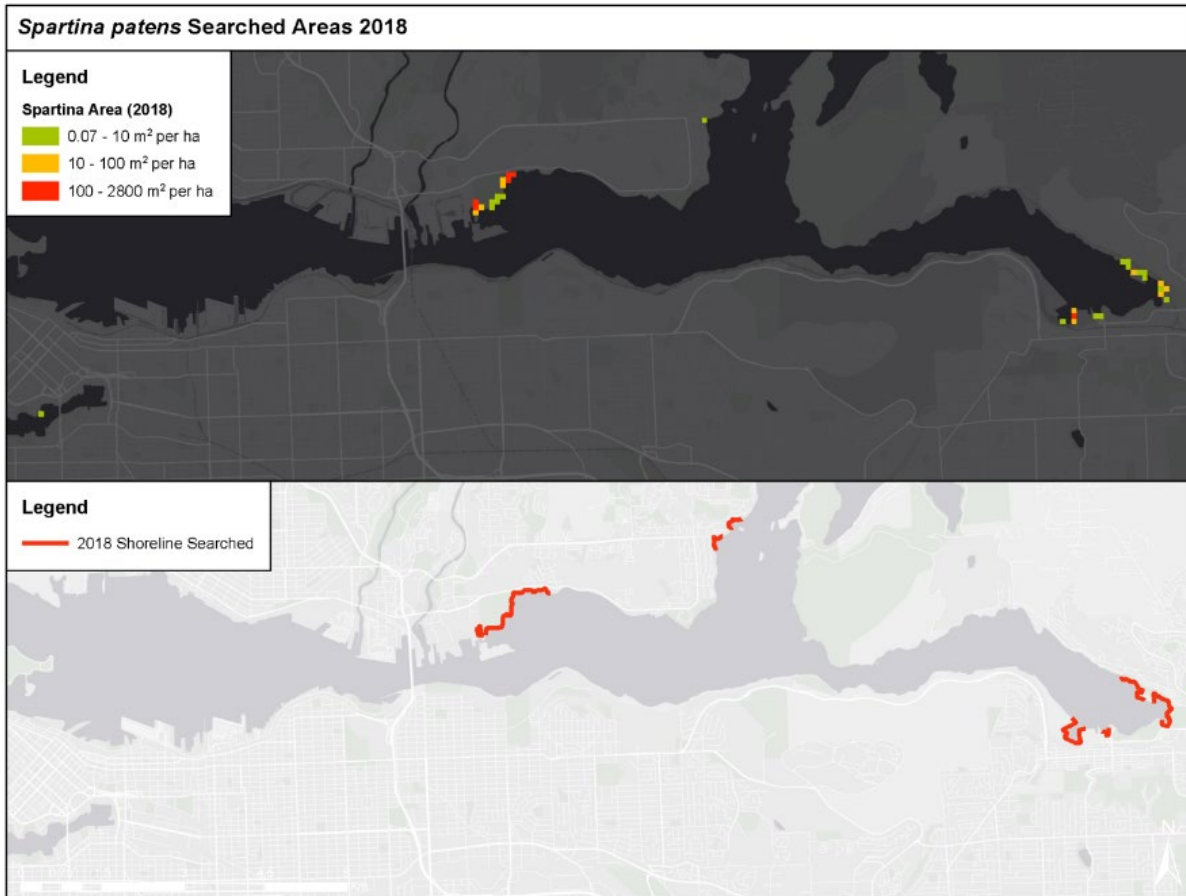


Figure 11. Searched shoreline and estimated leaf area of *S. patens* for Burrard Inlet in 2018.

Despite the general geographic areas *S. patens* has been detected remaining largely the same, the number of plants has continued to increase by 50% and the area impacted by *S. patens* has increased by 35%. This increase in *S. patens* has occurred despite numerous non-herbicide control efforts, including removing approximately 66,000 lbs of *S. patens* by hand in 2017. *S. densiflora* has continued to decrease with results showing plant sizes are primarily less than 30 cm and/or seedlings.

GULF ISLANDS

S. densiflora removal efforts have been coordinated by Jenny Balke on Denman Island and her reports show a reduction in density with an overall decrease in seedlings along the foreshore. Mapping of Hornby Island coordinated by Leanne Letson showed an increase in *S. patens* abundance by approximately 70% since 2015 and a decrease in *S. densiflora* plants by approximately 75%. Denman, Hornby and Sandy Island spartina mapping will be completed by Ducks Unlimited Canada in 2019 to verify the reductions being reported and check in with Gulf Island contractors.

CONTROL & REMOVAL

MANUAL REMOVAL

S. ANGLICA

As in previous years, participants dug up individual plants and smaller clones using hand shovels before loading them into re-usable shopping bags or sleds for transport.

Manual control follows the integrated control plan by using manual removal (i.e. pulling and digging) for single plants and small clones with a focus on herbicide for clones < 30 cm. In 2018, 84 size 'S' (single plants or seedlings) and 14 size 'A' (< 30 cm in diameter) clones were manually removed. There has been a significant reduction in the total number of spartina plants removed by hand as a result of less small plants that are easily and effectively able to be removed as a result of years of hand removals and herbicide treatments.

S. PATENS

The BC SWG has had very limited success with reducing *S. patens* using non-herbicide control methods. *S. patens* does not grow in tufts but grows in a dense mat that eventually forms a meadow making removal difficult and destructive to the habitat it occurs in. Shading out or covering *S. patens* to prevent photosynthesis and encourage senescence has had very limited success due to extensive root energy reserves as well as wind and wave exposure damaging shade material, especially during winter storm events. To effectively control and *S. patens*, herbicide treatments are required. A timeline of various control methods attempted have been documented in Figure 12.

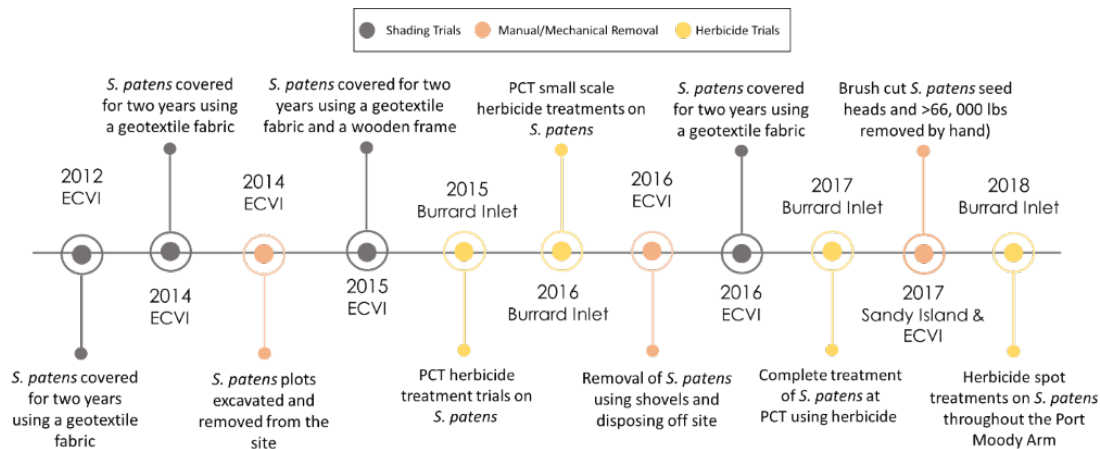


Figure 12. A timeline of *S. patens* control methods

S. DENSIFLORA

Manual removal has been consistently effective in the management of *S. densiflora*. Technicians on Vancouver Island and adjacent Gulf Islands remove the entire plant with its roots using a handpick as shown in Figure 11. Dug up plants are removed off site to an isolated compost site or landfill.



HERBICIDE

For more than a decade *Spartina* control work in BC on *S. anglica* using only mechanical/manual was not able to achieve containment. Therefore, since 2010, a small sub-group of the BC *Spartina* Working Group has worked with staff from provincial and federal Canadian agencies to determine the requirements and process to use herbicide as a control activity on *Spartina*. For more information related to BCSWG herbicide permits and background information please visit the “Reports > Other Reports” on www.spartina.ca.

S. ANGLICA

Approximately 131 people-days were spent on herbicide application in 2018. Herbicide treatment for 6300 clones *S. anglica* was completed over two passes in Roberts Bank and Boundary Bay (Figure 14 & Figure 15). Approximately 2.22 ha of *S. anglica* spread over more than 709 ha of intertidal habitat was treated with 1109L of herbicide mix.

Figure 13. Hand pick used by technicians to remove *S. densiflora* seen here in the background. (Photo Credit: Leanne Letson)

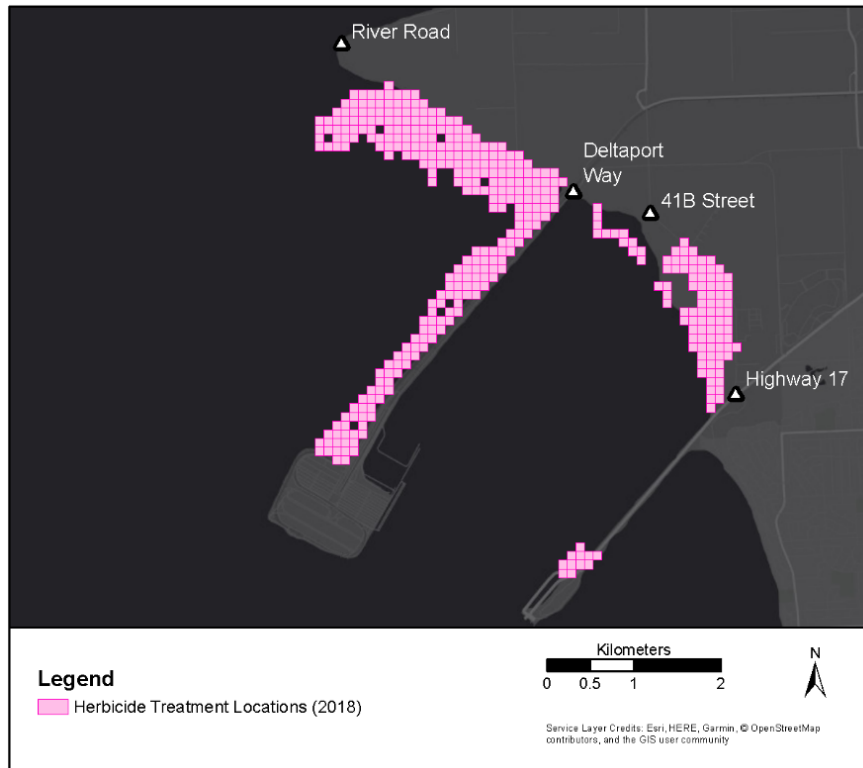


Figure 14. 2018 herbicide treatment locations in Roberts Bank, B.C.

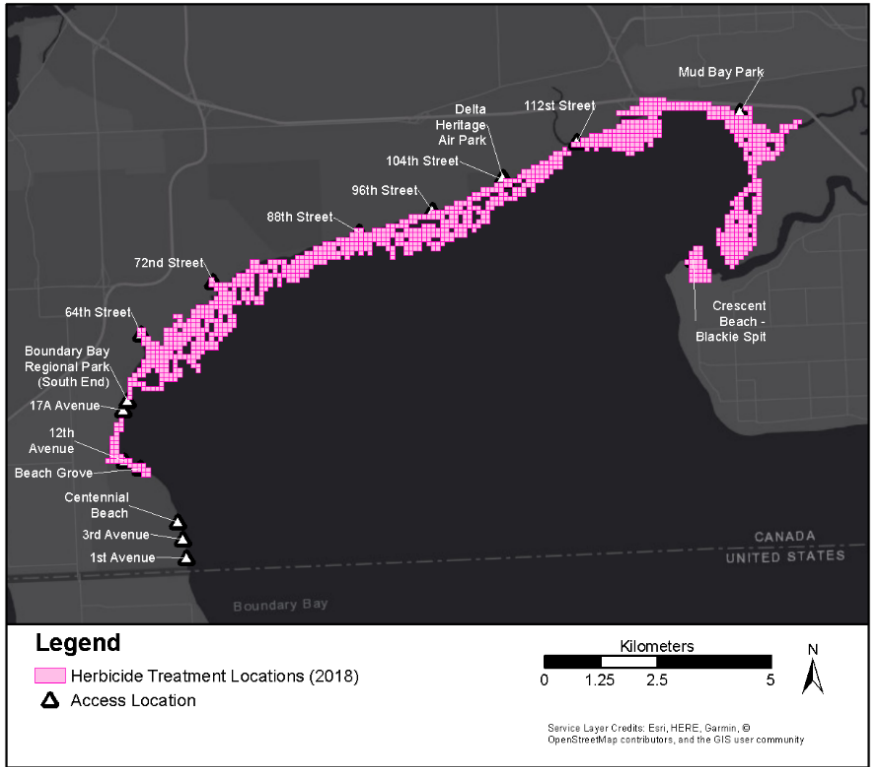


Figure 15. 2018 herbicide treatment locations in Boundary Bay, B.C

S. PATENS

Approximately 10 people-days were spent on herbicide spot treatment in Port Moody, B.C. Treatments were used on patches ranging from < 10 m² to 33 m². Approximately 0.034 ha of *S. patens* over 44 ha of foreshore was treated with 17L of herbicide.

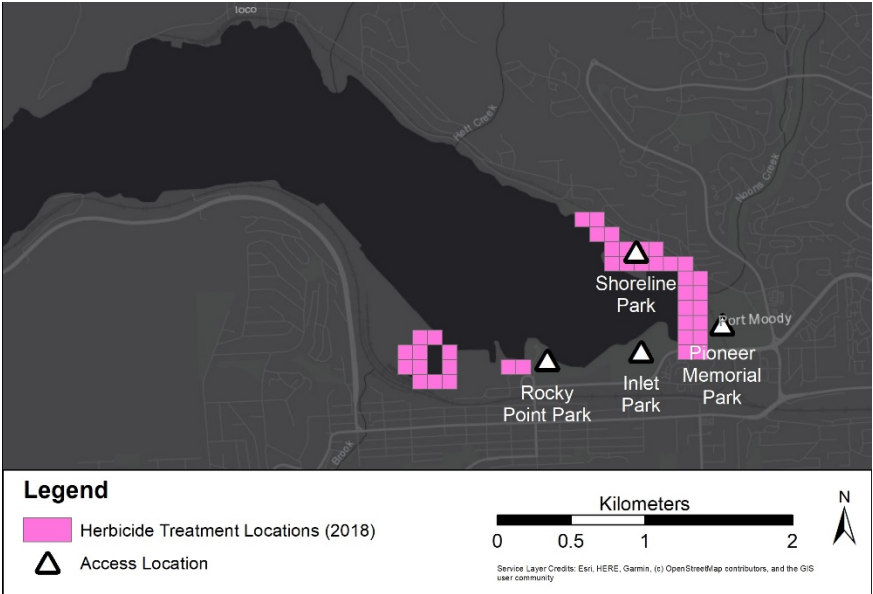


Figure 16. 2018 herbicide treatment locations in Burrard Inlet, B.C.

EVALUATING SPARTINA SPP. CONTAINMENT AND ANNUAL CONTROL EFFORT EFFICACY

Annual mapping occurs to evaluate efficacy of previous year’s control efforts to ensure containment and reduction in Spartina populations.

To effectively track and convey the status of the Spartina invasion a few different metrics are used:

1. the number of plants detected;
2. the size of those plants (single seedling, clone <0.3m, clone 0.3m - 1.0m, clone > 1.0m in diameter, or 5m area of single plants);
3. the estimated leaf area (size x number of plants = ~ how many square meters a dispersed population would occupy if all Spartina plants were grouped together);
4. how much shoreline is impacted (a measure of how many 1-hectare (Ha) grid cells had one or more Spartina occurrence points); and
5. Site level reporting (a roll up of metrics 1 thru 5 at the site level; see Figure 17)

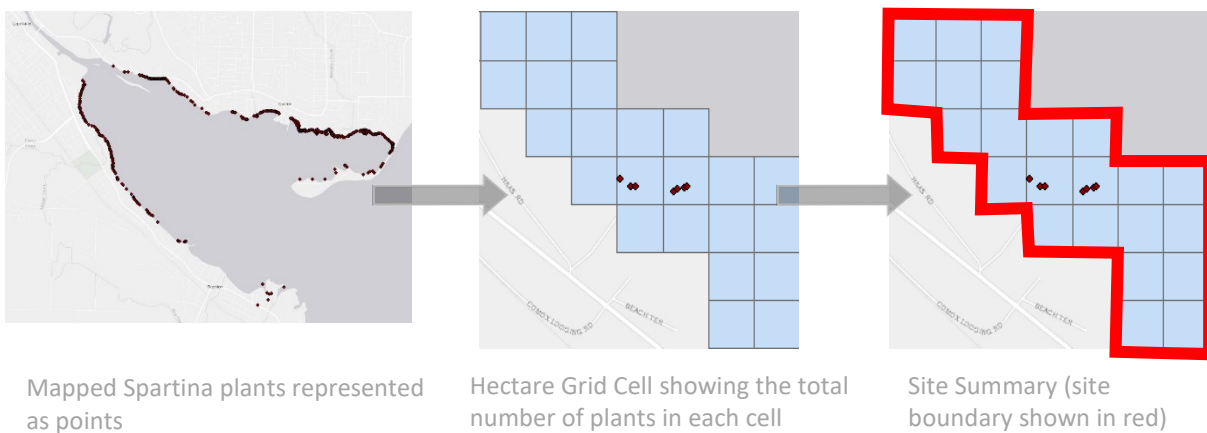


Figure 17. Spartina invasion tracking and evaluation analyses

The area impacted might go down while the number of plants increases, which might indicate that the containment boundary is getting smaller and there is likely a seedbank or seed source generating many new small plants. These numbers are evaluated at the species level across the province and by region and the site level. Tracking and reporting across all these metrics gives a better indication of the species invasion status/control progress provincially while lending insights to site specific nuances. Additionally, after herbicide treatment crews walk through and flag any plants that were missed for follow up treatment. Throughout the season a site is returned to two or three times to check for new plants and observe signs of herbicide efficacy.

MAPLEWOOD FLATS

In 2016, BC SWG determined the elevation preference of *S. patens* in relation to other salt marsh plants to improve our understanding of its habitat characteristics and future restoration methods after removal.

Plots located on the east and west side of Maplewood Conservation Area marsh were surveyed for *S. patens* and other marsh plants. Each plot, alongside vegetation surveys were measured for elevation using a Real-time kinematic (RTK) GNSS Survey device.

RESTORATION

Due to *S. patens* ability to transform high-elevation zones into a dense monoculture, native species are either sparse to non-existent. The BC SWG understands the importance of restoring marsh conditions after eradication to prevent reinvasion. To address this concern, the BC SWG is working with the City of Port Moody to test the planting of nursery *Carex lyngbyei*, a dominant species that thrives at low- to middle- elevation tidal zones, in areas previously infested with *S. patens*.

To adaptively assess whether *Carex lyngbyei* nursery plugs are successful at reducing the spread of *S. patens*, all six plots were replanted with their respective treatment including one control.

Completion of planting was followed immediately by the installation of fencing around each plot with a 0.5 m buffer from the first plug. The fencing is used to prevent Canadian geese from grazing on new growth allowing transplanted *Carex lyngbyei* time to establish. An example of a plot once covered in *S. patens*, treated with a geotextile mat and planted with *Carex lyngbyei* nursery plugs is shown in Figure 18.



Figure 18. Photo on the left shows a *S. patens* patch along the shoreline in Port Moody, B.C. The middle photo shows the same area after treatment with Nilex geotextile fabric that was installed in 2016. The photo on the right shows the same area planted with *Carex lyngbyei* plugs in 2018.

Areas treated with herbicide will be planted with *Carex lyngbyei* plugs in 2019 and further experimentation with native marsh species will be implemented in 2020 followed by continuous monitoring of plots.

OUTREACH

- Spartina Open-House Event, January 29, 2019, Union Bay Community Hall, Union Bay, BC
- Regional Planning Advisory Committee (RPAC) –Regional Invasive Species Subcommittee, Spartina Program Overview, History and Update, January 24, 2019, Burnaby, BC
- INVASIVES 2019, the Invasive Species Council of BC's Annual Forum & AGM, Concurrent Session Presentation on Spartina Program: Overview, History and Update, February 5 - 6, 2019, Richmond, BC

FINANCES

The BCSWG partners and individual volunteers contributed over \$348,996 of in-kind time and resources to the project, in addition to external funding from grants and partners. These in-kind contributions were essential to the success of the project however these contributions were not tracked as effectively as in previous years. In 2018 approximately \$30,000 in in-kind contributions were made by the following agencies:

BC Conservation Foundation	Community Mapping Network
BC Ministry of Environment	Corporation of Delta
BC Ministry of Forests, Lands and Natural Resource Operations	Environment Canada- Canadian Wildlife Service
City of Surrey – ShaRP & SNAP Programs	Friends of Semiahmoo Bay Society
Vancouver Island Conservation Land Management Program	K’omoks First Nation
	Port of Vancouver
	City of Port Moody

The recent history of financial contributions (cash and in-kind) of the BC Spartina Working Group is found in Figure 19. Table 2 and Table 3 summarize the income and expenditures for 2018, respectively.

Table 2. BC Spartina Eradication Program 2018 Revenue

Revenue		
Source	Through DUC	Through BC SWG Member
Province of BC	\$200,000	
Port Metro Vancouver	\$25,000	
Wildlife Habitat Canada	\$161,500	
Government of Canada -Coastal Restoration Fund	\$39,840	
Government of Canada – Canada Summer Jobs		\$14,156
Subtotal	\$304,840	\$14,156
Grand Total	\$318,996	

Table 3. BC Spartina Eradication Program Direct Cost (Cash) Contributions - BCSWG 2018

Expenditures		
Category	Fraser Delta	Baynes' Sound
Travel	\$14,645	\$1,528
Gas, Mileage, Truck Rental	\$7,202	\$130
Personnel - Contractors	\$110,598	\$50,393
Personnel - Staff	\$78,421	\$41,445
Small tools, Supplies etc...	\$10,722	\$3,912
Subtotal	\$221,587	\$97,409
Total	\$318,996	

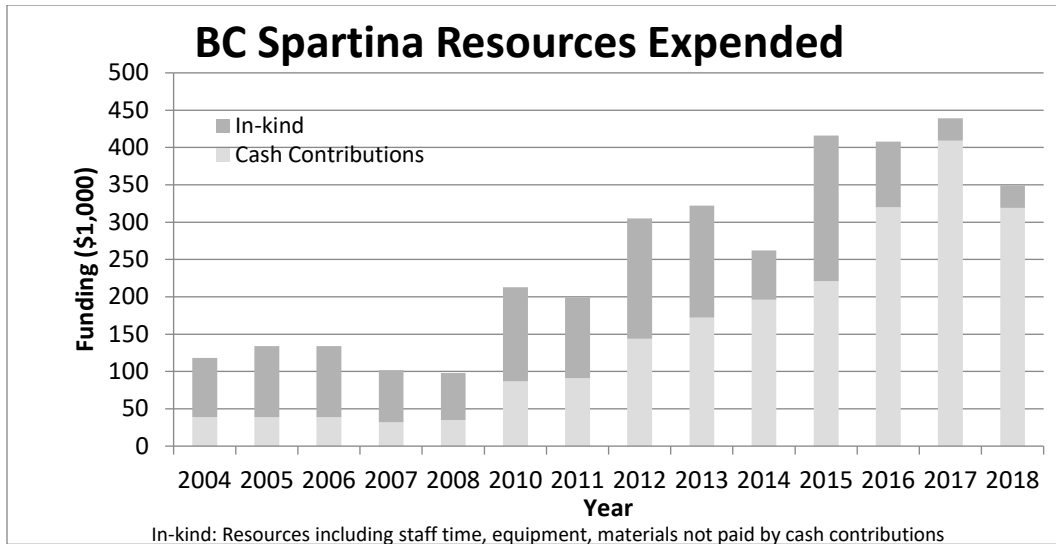


Figure 19 BC Spartina Resources Contributed Over Time

RECOMMENDATIONS FOR 2019

COORDINATION

- Streamline reporting process and improve clarity in reporting on program’s eradication progress

MONITORING:

- Systematic expansion of search areas rather than annually checking the same areas and confirming non-presence. If an area has had non-presence consistently then check it every other year or every 3 years and check new areas annually

TREATMENTS:

- Target herbicide application with two complete passes to ensure every plant is treated once
- Begin herbicide treatments on Vancouver Island under the new P.U.P.
- Treat all *S. patens* in Burrard Inlet

SCIENCE AND EVALUATION:

- Complete a preliminary assessment of the herbicide efficacy on *S. anglica* and *S. patens*
- Test aerial detection techniques with new technologies such as a remote controlled, electric, unmanned aerial vehicle (UAV). These activities would be most suitable to detecting large clones and large meadows of *Spartina*

RESTORATION

- Assess the success of *Carex lyngbyei* restoration planting and monitor for reinvasion of *S. patens*
- Work with BCIT Ecological Restoration Program to develop marsh restoration plans for *S. patens* treated sites to prevent reinvasion