2023

British Columbia Spartina Eradication Program Progress Report

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On Behalf of the BC Spartina Working Group

B.C. SPARTINA
Working Group
protecting our shorelines

EXECUTIVE SUMMARY

In 2023, the British Columbia Spartina Working Group (BC SWG) continued to work towards the eradication of non-native, invasive *Spartina* spp. (*S. anglica*, *S. densiflora*, and *S. patens*) along the coastline of British Columbia (BC) through the BC Spartina Eradication Program. The BC SWG recognizes the potential impacts of *Spartina* spp. on local shorelines and wildlife habitat and strives to eradicate all non-native, invasive *Spartina* spp. along BC's coastline.

In 2023, $385,000 of in-kind and direct-value contributions were applied to complete program components focused on monitoring, removal, herbicide, coordination, and outreach within the Spartina Eradication Program. Approximately $10,692 CAD in funding was provided by the Federal Canada Summer Jobs program to hire summer students. 179.5 km of BC's coastline was surveyed for *Spartina* spp. in 2023. Surveying efforts indicate that, in the lower mainland, *S. anglica* is limited to the South Fraser River Delta and Boundary Bay, while *S. patens* is limited to Burrard Inlet. On the East Coast of Vancouver Island, both *S. patens* and *S. densiflora* are limited to the Baynes Sound area of Vancouver Island, with a new population of S. densiflora mapped in 2023 in the Comox Valley Region just North of the Baynes Sound area.

There was a decrease in most *Spartina* metrics this year, indicating efforts are back on track towards eradication after a "rebound" observed in the 2021 season due to treatment delays caused by the Covid-19 pandemic. However, both the estimated leaf area and impacted area of *S. densiflora* increased due to the previously unknown population that was reported outside of the programs normal survey boundaries. In 2023, crews, alongside volunteers, were able to manually treat this "*new*" population of *S. densiflora*, along with the established population in Baynes Sound to the largest extent yet. In 2024, a large decline in plant numbers is expected from this year's treatment activities, both in the Lower Mainland and Vancouver Island. *S. densiflora* was treated using manual digging efforts, which have been effective so far. *S. patens* and *S. anglica* continue to be treated with targeted herbicide application, which has been effective at bringing the population and impacted area down.

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ACKNOWLEDGEMENTS

The work completed for the 2023 Spartina Eradication Program (SEP) could not have been undertaken without funding from:

Government of Canada | Gouvernement du Canada | British Columbia | Port of Vancouver

The British Columbia Spartina Working Group (BC SWG) is a Collaborative group that formed in 2004. It includes members from both government and non-government organizations. The SEP is primarily lead by the technical committee. However, the success of the programs early detection rapid response efforts is only possible from the entire Working Group (Figure 1).

Figure 1. Members of the BC SWG.

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 British Columbia (BC). Many landowners provided access through their properties to map and control *Spartina*, and we thank them for their support. Those contributions to the BC SWG program are acknowledged in Table 1.

Table 1. List of 2023 participants who helped in the mapping and control of *Spartina* spp. in BC

Organization	Participants
City of Surrey; SHaRP Program	Emilio Yanes-Pawlowski along with 16 SHaRP crew members. The names were not recorded this year; however, the BC SWG is grateful for those that did participate in 2023 efforts.
British Columbia Conservation Foundation	Katie Calon, Johnny Gooldrup, Matthew Watts,
Ducks Unlimited Canada	Matt Christensen, Richard Topp, Taylor Marriott
Environment Canada – Canadian Wildlife Service	Kathleen Moore
Little River Residents	Rick and Julie Howell
Ministry of Forests	Val Miller, Becky Brown, Derek Hogan
Nature Trust of British Columbia	Claire Ethier, Laura Holt, Keegan Wilcock and Megan Bunsko
Port Metro Vancouver	Kim Keskinen, Spencer Chaisson
Tsleil-Waututh First Nation	Haley Crozier, Graham Nicholas, Klaup George, and others. Some names weren't recorded this year, however, the BC SWG is grateful for those that did participate in 2023 efforts.
Tsawwassen First Nations Youth Summer Stewardship Program - Raincoast Conservation	Megan Sutherland along with the TFN Youth Summer Stewardship members. The names were not recorded this year; however, the BC SWG is grateful for those that did participate in 2023 efforts.

BACKGROUND & ECOLOGY

Today, three different species of invasive *Spartina* are found in B.C, *Spartina anglica, Spartina densiflora,* and *Spartina patens*[1]. *S. patens* was first identified in B.C. in 1979 in both the Burrard inlet and the Courtenay River Estuary. In 2003, Gary Williams, a consultant for Port Metro Vancouver, discovered *S. anglica* growing in the Fraser River Delta while conducting habitat surveys of intertidal areas. This finding raised concerns about the spread of this invasive cordgrass as this species had not yet been discovered in BC. While *S. densiflora* was later identified in the Baynes Sound area of Vancouver Island in 2005, this species was likely present there for some time before, based on anecdotal reports.

Invasive *Spartina* spp. are detrimental to intertidal habitats. Throughout their establishment, *S. anglica* and *S. densiflora* convert important mudflat, low salt marsh, and rocky shore habitat into monoculture stands. These stands accrete sediments, modifying drainage patterns and reduce habitat for waterfowl and fish. *S. patens* invades the higher salt marsh areas, outcompeting the diversity of salt marsh plants and replacing them with a dense, monoculture meadow that is very difficult to remove manually. Intertidal areas that became dominated by invasive *Spartina* in the state of Washington, USA, experienced large declines in the abundance of shorebirds and waterfowl. As a result, significant expenditures were required to control *Spartina* in the state, costing approximately $1,000,000 USD per year for more than two decades. The states of Oregon and Washington combined spent approximately $50,000,000 USD over a ten-year period in a concerted effort to eradicate *Spartina* spp. along their coastlines. It is only recently, with sustained funding and the use of herbicide, that these two states have significantly reduced their infestations of *Spartina.*

Controlling the spread of an invasive species early in its expansion is the most cost-effective approach to its eradication. The Fraser River Delta on its own contains approximately 25,000 ha of tidal mud flats that are internationally recognized as important habitat for fish and migratory birds. It hosts the highest density of wintering waterfowl, shorebirds, and raptors in all of Canada. Failing to control invasive *Spartina* in BC would result in a tremendous loss of essential habitats beyond just the Fraser River Delta and would require considerably more resources to manage in the future. It is crucial to control invasive *Spartina* spp. in BC as early as possible.

The BC SWG formed in 2004 with the intent of eradicating invasive *Spartina* spp. from BC's coastlines. The working group is comprised of members from both government and non-government organizations. The BC SWG liaises with the San Francisco Estuary Spartina Project and the Washington State Department of Agriculture, two USA agencies involved in eradicating invasive *Spartina* spp. along the Pacific Coast. The BC SWG has built upon the Pacific Coast Collaborative Agreement as well as the West Coast Governor's Agreement to eradicate *Spartina* spp. from BC's coastlines. The focus of the BC SWG is to employ early detection and rapid response methods to eradicate invasive *Spartina* spp. in BC. In 2023 these methods took the form of mapping and actively controlling for *Spartina* throughout its known range, between BC's Lower Mainland and Vancouver Island. (Figure 3). Continued pressure is needed to further reduce the presence of *Spartina spp.* in BC. It is a goal of the BC SWG to expand control efforts on all *Spartina spp*. to eventually eradicate them from BC shores.

[1] Since a molecular phylogenic study was published in 2014 by Peterson, P.M. et al., there is some contention whether *Spartina* species should be re-classified into another genus *Sporobolus*. For simplicities sake, we will continue to refer to these plants by the genus *Spartina*.

DETECTION

The compilation and storage of data of *Spartina* spp. in BC has historically been a joint effort between Ducks Unlimited Canada (DUC) and the Community Mapping Network. In recent years, DUC has been responsible for the collection and storage of spatial data for all *Spartina* spp. in BC. The collected data is used for evaluating the progress of *Spartina* eradication between years, as well as for planning future monitoring and control activities. In 2023, the spatial data of *Spartina* spp. in BC was uploaded to the provinces new Invasives BC platform, a replacement to the Invasive Alien Plant Program (IAPP) database. DUC also maintains a geodatabase of all the collected *Spartina* data since the beginning of the eradication program. The data is available for view through a digital web-atlas accessible through the BC SWG website. For more information on mapping methodology and spatial analyses, please visit www.spartina.ca. The location and approximate distribution of *Spartina* in BC in 2023 is shown in Figure 3.

DUC on behalf of the SWG also verifies reports from the Province of BC on new occurrences of invasive *Spartina* spp. The province of BC searches for new occurrences using the following naming conventions (Table 2).

Table 2. *Spartina* naming conventions (Jan. 2024, BC Ministry of Forests, Invasive Plant Program).

Commonly Accepted Scientific Names	Synonyms
Spartina patens	*Sporobolus pumilus*
Spartina anglica	*Sporobolus anglicus*
Spartina densiflora	*Sporobolus montevidensis*
Spartina alterniflora	*Sporobolus alterniflorus*

SURVEY METHODS

Since 2017, survey data for *Spartina* spp. was collected using two ESRI[2] applications, *Collector* and *Survey123*. In 2022, *Collector* was replaced by another ESRI application, *Field Maps*. Both products are applications used on smart devices which take the place of Global Positioning System (GPS) units. *Survey123* records the location, size, and additional attributes of individual plants or clones of *Spartina* spp. and *Field Maps* provides real-time tracking of surveyors as well as pre-existing *Spartina* mapping and tracking information. Data from multiple surveyors' *Field Maps* and *Survey123* applications are routinely uploaded to shared cloud databases which surveyors can then download onto their *Field Maps* app. This process provides surveyors with accurate, updated visual representations as to what areas have already been surveyed and treated, as well as when these activities were conducted. Such information is used to determine where subsequent surveying and control efforts are to be applied. These applications allow the BC SWG to accurately and consistently track populations of *Spartina* spp. over time across multiple regions.

Spartina program data can be accessed through the spartina.ca website, as well as the InvasivesBC webapp.

[2] ESRI (Environmental Systems Research Institute) is an international supplier of geographic information system software, web GIS and geodatabase management applications.

Site boundaries were set to align with the provincial IAPP sites when it was in operation. The BC SWG analyzes the surveyed sites by using several metrics:

1. The number of plants or plant clones detected
2. The size of each plant or plant clone
    I. Size S: single plant or seedling
    II. Size A: plant with diameter less than 30 cm
    III. Size B: plant with diameter of 30 cm to 1 m
    IV. Size C: plant with diameter of 1 m to 5 m
    V. Size D: plant with diameter of approximately 5 m
    VI. Size M: plant with diameter greater than 5 m
3. The estimated leaf area (number of plants or plant clones detected x size of each plant or plant clone = number of square meters a dispersed colony would occupy if all *Spartina* plants were grouped into a single cluster, see Appendix for full equation)

4. Each site is divided into a grid of 1 ha cells. The three metrics are then summarized at a single cell level within the grid as well as an accumulation of all the cells within a site. These summaries are titled Cell Summaries and Site Summaries, respectively (Figure 3). These summaries are generated on a per-species basis each year. With these summaries, the BC SWG determines how much shoreline has been impacted by *Spartina* spp. (how many 1 ha grid cells had one or more occurrences of *Spartina*). Together, the metrics used by the BC SWG depict spatial trends over time. By analyzing these trends, the BC SWG can effectively plan and develop monitoring and control activities for the future. For more information on how these metrics and summaries are calculated, see Appendix B.
5.

Map of Comox Harbour with Spartina plants represented as

Cell Summary showing the total number of plants in each cell representing total abundance

Site Summary (site boundary shown in red)

Figure 2. Cell Summaries and Site Summaries example in Comox Harbour, BC.

In 2023 the Provincial government of BC introduced InvasivesBC as the new province wide invasive species database. Collection methods in 2023 remained the same as previous years when IAPP was in use. Collected data had to be reformatted and edited to include relevant attributes required for upload to InvasivesBC. For the 2024 season, data collection will be updated to include the necessary information for InvasivesBC and methods of collection will be altered to be more aligned with InvasivesBC's formatting.

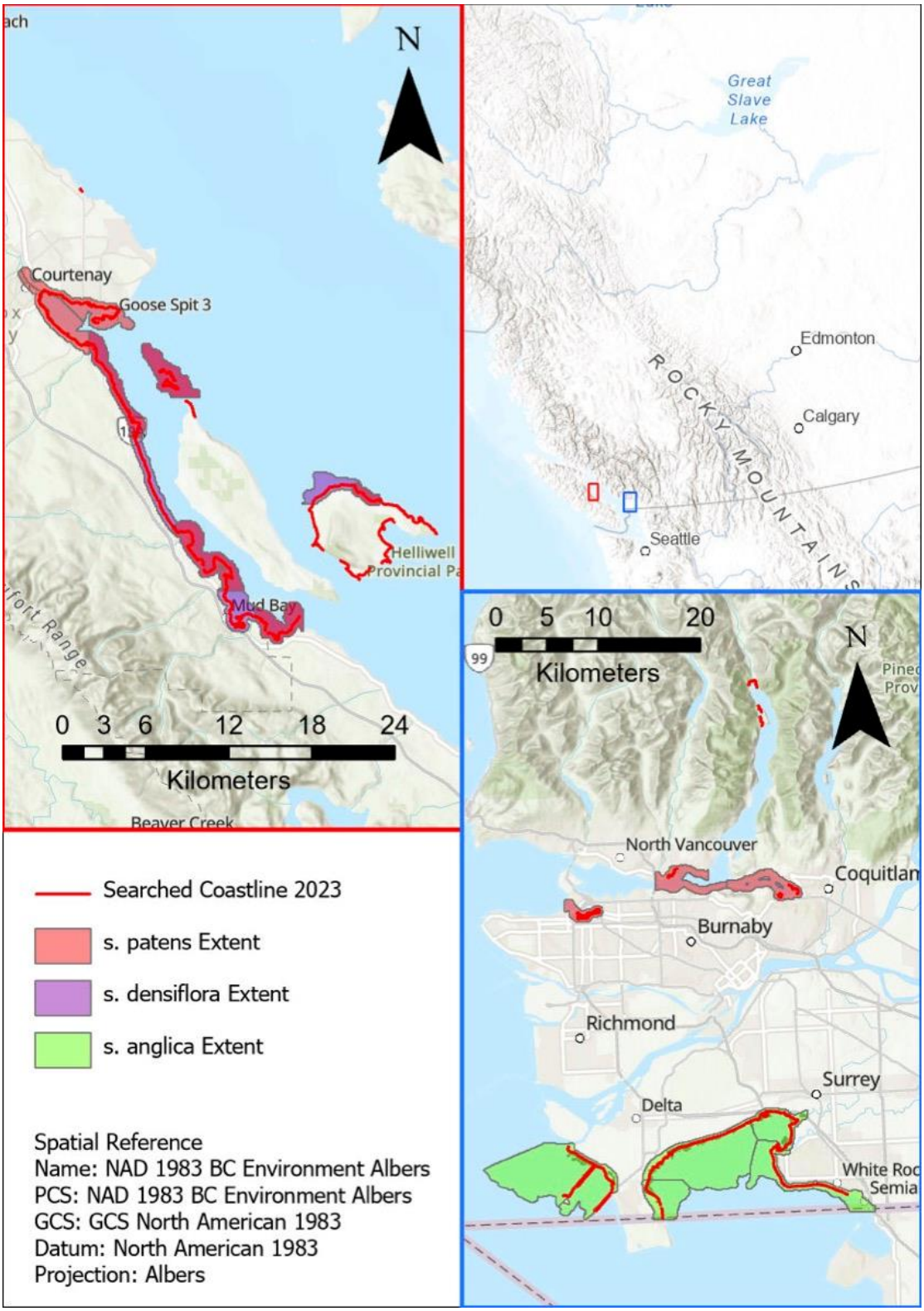


Figure 3. Approximate extent of *Spartina* spp. in BC, as well as the searched coastline (179.5 km) in 2023.

MAINLAND BC – SURVEY EFFORT

In 2023, approximately 220 person days were spent surveying the Fraser River Delta, Boundary Bay, and Burrard Inlet areas for *Spartina* spp. (Figure A1). Surveying in the Fraser River Delta occurred from the tip of Brunswick Point at Robert's Bank to the Canada-USA border South of the causeway that leads to the BC Ferries Terminal in Delta. Surveying along Boundary Bay occurred from the Canada-USA border South of Beach Grove Park, Delta, to where the Campbell River joins Boundary Bay in White Rock.

Surveying in Burrard Inlet occurred in False Creek within the City of Vancouver, the Maplewood Flats Conservation Area within The District of North Vancouver, as well as in Port Moody, at the Pacific Coast Terminal property, in Old Mill Park, and in Old Orchard Park (Figure A1). Additional exploratory surveys were conducted with the help of the Tsleil-Waututh Nation in Deep Cove and up the Indian Arm.

Of all the surveys that took place in mainland BC in 2023, *S. anglica* was only found in the Fraser River Delta and Boundary Bay areas, and *S. patens* was only found in Burrard Inlet (Figure 3). In total, 78.3 km of coastline was surveyed in the Lower Mainland of BC.

EAST COAST VANCOUVER ISLAND & GULF ISLANDS – SURVEY EFFORT

A total of 117 person-days were spent mapping the Baynes Sound area for *S. patens* and *S. densiflora* in 2023 (Figure A2). Surveying occurred from Goose Spit Park in Comox to Deep Bay in Bowser. Surveying also occurred around both Hornby Island and Sandy Island Marine Park (Jáji7em and Kw'ulh Marine Park). *S. densiflora* and *S. patens* were found within the Baynes Sound Area on Vancouver Island and some of the Gulf Islands (Figure 3). In total, 101.2 km of coastline was surveyed in the Baynes Sound Area.

CONTROL & REMOVAL

MANUAL REMOVAL

S. DENSIFLORA

In 2023, manual removal was the only treatment method used for *S. densiflora*. Manual removal has been effective in reducing plant numbers, and the plant's biology and habitat preference make it easier to remove by hand than the other species of invasive *Spartina*. In 2023, technicians on Vancouver Island and adjacent islands within Baynes Sound removed entire *S. densiflora* plants using pickaxes and transported them using barrel-packs (Figure 4). Most of the plant material was loaded into contractor-grade plastic bags and dropped off at a local landfill for proper disposal. This year DUC trialed another form of disposal, covered burial above the high tide line, at a few of the more remote sites with heavy infestation. This allowed crews to cut down considerably on transport time and labour to instead focus on mapping and treating a greater area. Based on the extent that field crews were able to map and treat *S. densiflora* in 2023, large reductions in plant metrics are expected in 2024.

Figure 4. Manual removal of *S. densiflora* using pickaxe and barrel-pack.

S. densiflora was controlled during the fall and winter as it is the only standing green plant in the coastal marshes during these months. The timing of control helped reduce search efforts. DUC led the operations on *S. densiflora* removals on the East Coast of Vancouver Island with the help of The British Columbia Conservation Foundation (BCCF). This led to increased travel costs for work crews travelling from the mainland to Vancouver Island but ensured consistency in the mapping and inventory of plants.

While on Vancouver Island, the BC SWG was able to check on a report of *S. densiflora* at Little River in the Comox Valley Region, made by local resident's Rick and Julie Howell. They were considerable help with removal as they worked alongside field crews to clear the patch. DUC would like to extend a sincere thank you to both Rick and Julie for the accommodation, hard work, as well as the use of their land for disposal of S. *densiflora* by burial.

Approximately 1550 kg of plant material was disposed of at landfill over the 2023 season, and an estimated 1700 kg was buried. This value reflects the combination of plant matter as well as any mud and rocks entangled in the root system of the plants and is therefore an overestimate of the actual amount of plant matter removed over the season.

HERBICIDE

For more than a decade, the treatment of *Spartina* spp. solely used non-herbicide control methods with limited success. Since 2010, a sub-group of the BC SWG has worked with federal and provincial Canadian agencies to determine the requirements and process of using herbicide to control *Spartina* spp. in BC. The sub-group evaluated the ecological impacts and best management practices of two herbicides used to control Spartina in the states of Washington, Oregon, and California, USA. From these evaluations, it was determined that herbicide was to be used but that the project first required the herbicides be registered with the federal Pest Management Regulatory Agency (PMRA) and that a Pesticide Use Permit (PUP) would be required from the BC provincial Ministry of Environment.

Figure 5. Herbicide (with blue dye) applied to *S. anglica*.

As members of the BC SWG, the BC Ministry of Environment and the BC Ministry of Forests submitted an emergency use registration to the PMRA in February 2012 for the use of two herbicides with different active ingredients to control *Spartina*. These were Rodeo (glyphosate) and Habitat (imazapyr). The emergency use registration also included proposed methods on using the herbicides as well as proposed evaluation and monitoring processes. The PMRA granted the emergency registration of Habitat and Rodeo on February 13, 2013, allowing for their use until December 31, 2013. The PMRA requires a new application be submitted annually for the emergency use of herbicides. In 2013, it was decided that only Habitat, mixed with the surfactant Ag Surf II, was to be used to treat *Spartina* spp. in BC. This decision was made following consultation with agencies from Washington State, USA, with the purpose of minimizing the use and impact of herbicide to treat invasive *Spartina*. By mixing Ag Surf II with Habitat, the herbicide would bind to targeted plants, reducing undesired spreading of herbicide to the adjacent environment. The decision to use Ag Surf II was made by the PMRA following a review of multiple surfactants. The review identified Ag Surf II as having a lower toxicity than the other surfactants.

In 2021, Habitat Aqua (a.i. Imazapyr) was fully registered for use in Canada thanks to the efforts of the Spartina Eradication program. This formulation is specifically designed for use in and around aquatic environments and is the product of choice for *Spartina* treatment moving forward.

Annual reports are provided to the Section Head of the Integrated Pest Management Coastal Region by January 31 as a requirement of the PUP. Approval to use herbicides in Boundary Bay and Roberts Bank Wildlife Management Area for the 2022-2024 application seasons has been provided by the West Coast Operations Division of the BC Ministry of Forests.

S. ANGLICA

In 2023, herbicide application was the only treatment method used for *S. anglica*. Field crews also clipped and removed seed heads as they mapped to further prevent seeding events. Throughout the duration of the Spartina Eradication program, herbicide has shown to be most effective at controlling the spread of this species. All individuals of *S. anglica* were targeted for treatment.

In 2023, approximately 62 person-days were spent applying herbicide to *S. anglica* in the Fraser River Delta and Boundary Bay areas (Figure A3 & Figure A4). 248 hectares of infested area were treated in 2023 with a total of 2100 plants receiving treatment, 98% of the population mapped (Table 3). Second passes of herbicide treatment were conducted in Robert's Bank to treat any remaining plants that were missed during the first pass or any new plants that had appeared. Prioritization of other sites and a reduction in field crew capacity meant that no other sites received second pass treatment in 2023. Special attention was given to *S. anglica* plants in the area between the Deltaport and the Tsawassen Ferry Terminal as treatment as that area was missed in 2022 due to weather and scheduling conflicts.

S. PATENS

Early methods of control for *S. patens* involved covering colonies of this species with a geotextile fabric (Nilex 2002). The intent behind this was to kill the plants by shading them out over a period of multiple years. Geotextile fabric was used to shade out *S. patens* in Burrard Inlet and Baynes' Sound between 2012-2016 with limited success. Numerous locations, methods and patch sizes have been trialed using the covering method. The fabric was installed over patches of *S. patens* for a minimum of 2 years and only reduced *S. patens* biomass temporarily. The invasive plants rapidly re-established once the covers were removed, typically within 1 growing season. Baynes' Sound has a more active shoreline, subject to wind and wave action that disturbs and removes the cover fabric, which required maintenance and monitoring that is impractical. Due to the limited success with eradicating *S. patens* using covering and manual removal techniques and following a small herbicide pilot trial at PCT in 2015, operational scale herbicide treatment was employed on *S. patens* beginning in 2016. No manual removal was applied to *S. patens* in 2023. For a full breakdown on the timeline of different treatments by the BC SWG, see Figure 6.

Nine hectares of infested area containing approximately 171 plant individuals were treated in Burrard Inlet between The Maplewood Flats Conservation Area, Old Orchard Park, and Old Mill Park, 95.5% of the population mapped in 2023 (Figure A5 & Table 4). Pacific Coast Terminals did not receive treatment this year as no plant individuals were found within the site, for the first time since surveying began. Roughly 8 plant individuals were found over 4 hectares in False Creek, but these did not receive treatment this year due to weather conditions late in the season. They will be targeted for treatment in 2024. Due to the decline in population of *S. patens* in Burrard inlet, the amount of herbicide needed in 2023 was much lower than previous years (Table 4).

S. patens is the only *Spartina* species treated with herbicide on the East Coast of Vancouver Island. In 2023 a total of approximately 368 plant individuals were treated within Bayne's Sound, only 39% of the population mapped in 2023 (Figure A6 & Table 5). The majority of *S. patens* treatment occurred within the Courtenay River Estuary on Vancouver Island.

Previously, special arrangements were made with the residents around Goose Spit in Comox, BC regarding treatment of plants near unregistered water wells. The special arrangements for this area include keeping a 30 metre buffer from active wells where no chemical treatment will occur, and the implementation of a treatment barrier between private properties and the herbicide applicators. This agreement was made under the expectation that the residents living in this area are responsible for manual removal of *S. patens* within the 30 metre buffer zone around any water wells. Only two water wells were identified which resulted in one contiguous area where herbicidal treatment shall not occur. A large portion of the *S. patens* population in Baynes Sound around the Goose Spit area was unable to be treated due to untimely weather during scheduled treatment window. As this area now comprises the largest *S. patens* population, successful treatment will be the top priority of the BC SWG in 2024.

Table 3. Amount of herbicide used to treat *Spartina anglica* since 2013.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Volume of herbicide mix used (L)	1090	2595	1950	3744	2412	1109	566	178	492	164	188
Volume of Habitat used (L)	8.17	19.46	14.62	28.08	18.09	8.32	4.25	1.33	3.69	1.23	1.41
Amount of active ingredient (Imazapyr) used (kg)	1.96	4.67	3.51	6.74	4.34	2.00	1.02	0.32	0.89	0.30	0.34
Volume of surfactant Viterra Ag Surf II used (L)	5.44	12.97	9.75	18.72	12.06	5.55	2.83	0.89	2.46	0.82	0.94
Amount of active ingredient (alcohol ethoxylate) (kg)	5.01	11.94	8.97	17.22	11.10	5.10	2.60	0.79	2.20	0.73	0.84
Estimated ha	1.75	4.17	3.90	6.01	3.87	1.78	0.91	0.29	0.79	0.26	0.30

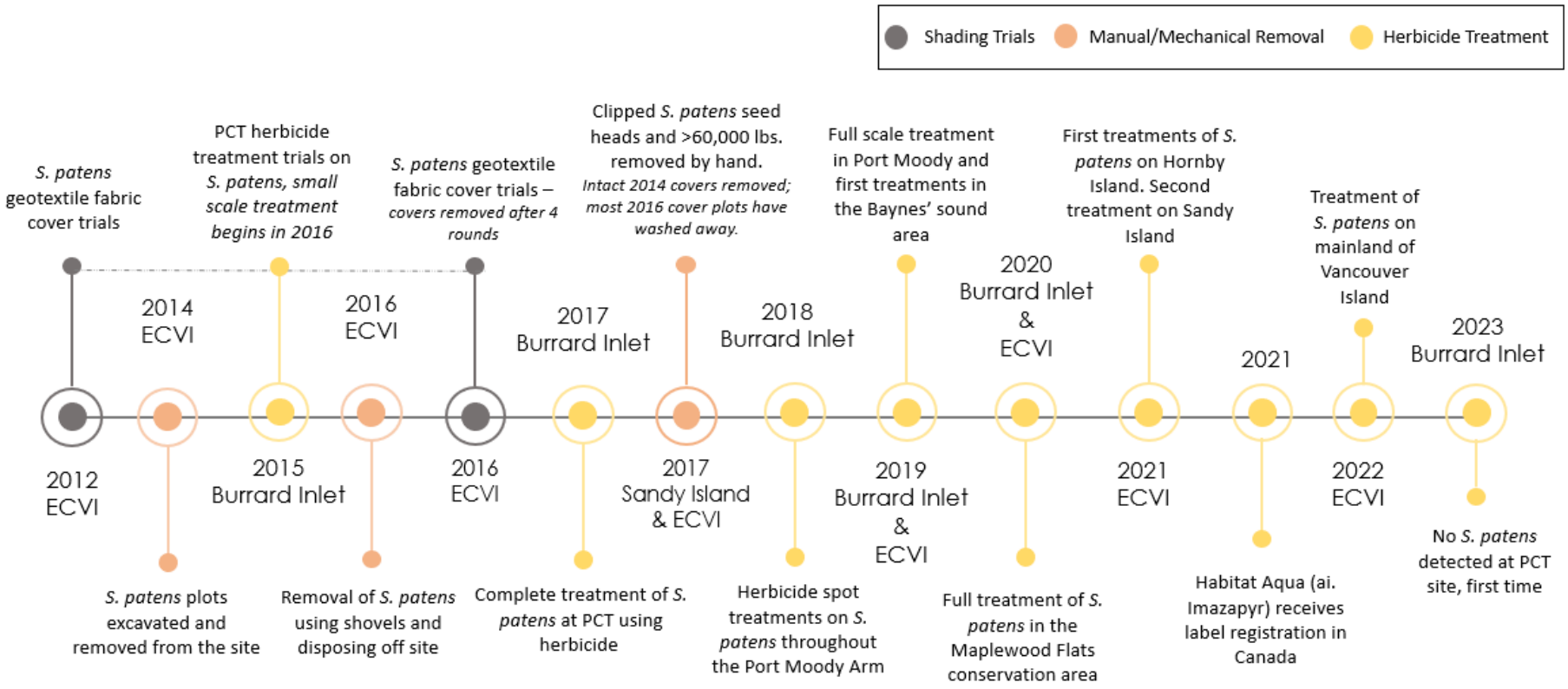
Table 4. Amount of herbicide used to treat *Spartina patens* in the Lower Mainland since 2016.

	2016	2017	2018	2019	2020	2021	2022	2023
Volume of herbicide mix used (L)	216	583	17	25	782	48	67	35
Volume of Habitat used (L)	1.62	4.37	0.13	0.19	5.87	0.36	0.50	0.26
Amount active Ingredient (Imazapyr) used (kg)	0.39	1.05	0.03	0.05	1.41	0.09	0.12	0.06
Volume of surfactant Viterra Ag Surf II used (L)	1.08	2.92	0.09	0.13	3.91	0.24	0.33	0.17
Amount active ingredient (alcohol ethoxylate) used (kg)	1.17	3.17	0.09	0.14	3.60	0.22	0.31	0.16
Estimated ha	0.35	0.94	0.03	0.04	1.26	0.08	0.11	0.06

Table 5. Amount of herbicide used to treat *Spartina patens* in the Bayne's Sound area since 2019.

	2019	2020	2021	2022	2023
Volume of herbicide mix used (L)	567	345	298	531	456
Volume of Habitat used (L)	4.25	2.59	2.24	3.98	3.42
Amount active Ingredient (Imazapyr) used (kg)	1.02	0.62	0.54	0.96	0.82
Volume of surfactant Viterra Ag Surf II used (L)	2.84	1.73	1.49	2.66	2.28
Amount active ingredient (alcohol ethoxylate) used (kg)	2.61	1.54	1.33	2.37	2.04
Estimated ha	0.91	0.55	0.48	0.85	0.73

Figure 6. Timeline of *Spartina patens* control methods in BC.



PLANT METRICS

When reporting on mapping results from year-to-year we rely on the three metrics: plant abundance, impacted area, and leaf area (Table 6). Plant abundance is defined by the sum-total of all identified plant individuals in a given area or site. Plant abundance can sometimes be over or underestimated, especially with regard to *S. patens*, as distinguishing where one plant ends, and another begins can be tricky due to their colonial nature. Abundance by size class is an important tool used to decipher this, as a decrease in larger size classes corresponding with an increase in smaller size classes indicates that the plant colonies are fragmenting due to treatment even if there are slight increases in the number of plants mapped by field crews. Impacted area is based on a grid of cells, 1 hectare in area, where an occurrence of one or more *Spartina* plants within that cell counts as the entire cell being impacted. Impacted area helps give an understanding of the extent of the population. Lastly, leaf area is an estimation based on the size of a given *Spartina* plant and its association to a leaf area coefficient (See Appendix C).

In 2023 DUC trialed field crews collecting additional data on the presence of seed heads as they mapped. The hope is that this data can provide an insight into whether there is a difference in timing of seed production between sites, which can guide future survey schedules. Due to the difficulty crews had distinguishing between flower and seed heads, this data will be treated as an indication of the timing of flowering at each site, which can still give an indication of which sites are likely to go to seed first.

S. ANGLICA

In 2023, we saw a slight increase in *S. anglica* abundance with a total of 2142 plants found in 2023 across all sites, an increase of approximately 9.6% from 2022 (Table 6, Figure B1 & Figure B2). Additionally, the estimated total leaf area (ha) of *S. anglica* increased by 2.6% from last year (Table 6 & Figure B9). While there was an increase in plant abundance across all sites, the metrics within sites varied, and the increases were concentrated to a few areas. The impacted area has still decreased by approximately 9% since 2022 (Table 6 & Figure B1).

Beach Grove and Boundary Bay had major decreases in abundance, -64.3% and -53.7% respectively, while Robert's Bank and Mud Bay had increases, 73.2% and 19.7% respectively. Blackie spit also had an increase +71.4%, however this site has a smaller population, so that figure only represents an increase of 15 plants. Impacted area stayed relatively the same or decreased at all sites. Using our map data, we can narrow down these increases to specific areas for each site. The large increase at Robert's bank took place mostly along the Northern shoreline, which historically has had very little presence of *S. anglica* and is some of the most difficult terrain that our field crews encounter. Our 2023 field crew were able to re-map this site later in the season and spent considerable time in this area. The increase at Mud Bay is similar, where field crews spent more time mapping around the mouth of the Serpentine River during a second pass than previous seasons. Robert's Bank is usually the earliest site mapped due to herbicide restrictions at other sites, Mud Bay is mapped after Robert's Bank. This shows the importance of prioritizing specific parts of sites for re-mapping later in the season, rather than entire sites, allowing crews to catch more plants that have emerged or grew larger since the first pass. The marsh at Tsawwassen First Nation's (TFN) also had an increase in abundance (205%) and impacted area (56.3%), but this was expected, as treatment did not occur in 2022 due to scheduling issues. TFN lands and Robert's Bank will be our highest priority *S. anglica* sites in 2024.

S. PATENS

The overall *S. patens* population saw a 15% decrease in abundance across all sites from 1326 to 1127 plants (Table 6, Figure B3 & Figure B4). Impacted area also decreased by 6.9% (Table 6 & Figure B3), and estimated leaf area decreased by 37.1% across all sites (Table 6 & Figure B10).

Burrard inlet saw decreases in all metrics (-39.9% in plant abundance, -56.7% in impacted area, -39.5% estimated leaf area), including the Pacific Coast Terminals site which had no *S. patens* at all for the first time. Sandy Island saw major reductions in plant metrics (-41.4% in plant abundance, -46.7% in impacted area, -93.9% in estimated leaf area). Even with increases observed at Goose Spit due to difficulties treating there, the East Coast of Vancouver Island region saw overall decreases in two of three plant metrics (-19.5% in plant abundance, +24.3% in impacted area, -36.2% in estimated leaf area). While *S. patens* abundance continued to decrease (-25%) on Hornby Island, we saw an increase in both impacted area (33.3%), and estimated leaf area (52%). This is consistent with a lack of proper treatment on Hornby Island in 2022 due to issues securing a contractor. Numbers on Hornby Island are still very low, total plant abundance on Hornby was 15 plants in 2023.

S. DENSIFLORA

The abundance of *S. densiflora* decreased by approximately 36.4% from 2022, down to 733 plants, even with surveying of an additional area (Southwest section of Deep Bay) and the discovery of the Little River population outside of previous survey areas (Table 6, Figure B7 & Figure B8). Impacted area also decreased by 13.5% (Table 6 & Figure B7). Total estimated leaf area increased by 250.6% from last year with the inclusion of the Little River Patch (Table 6 & Figure B11). The Little River patch accounted for 80% of the estimated leaf area of *S. densiflora* in 2023.

Particularly of note, the local abundance of *S. densiflora* decreased greatly from Union Bay to Trent River (down to 26 plants from 510 plants in 2022), along with a significant decrease in the impacted area and estimated leaf area (-61.1%, and -95% respectively). While there was a significant change at this site, it is a larger reduction than would typically be observed or expected from one year to the next. Some of the difference could be due to an error with data uploading properly from the field in 2023.

WEATHER

A large factor in the success of planned mapping and treatment activities has been weather. In 2023, the BC SWG lost 6 days of scheduled treatment to weather that restricted herbicide application. Many other treatment opportunities were missed as bad weather in the forecast prevented scheduling treatment. In 2023 the field crew lost out on one day of mapping due to extreme heat, less than recent years which have been affected by heat dome and wildfire smoke events.

Table 6. Summary of *Spartina* spp. invasion since 2004. Note that leaf area (m^2) data for *S. patens* and *S. densiflora* in italics from before 2019 may not be accurate, as there were inconsistencies in how size classes were measured and reported during the switchover to digital data collection methods.

	S. anglica			***S. patens***			***S. densiflora***		
Year	Estimated Leaf Area (ha)	Impacted Area (ha)	Number of Plants Detected	Estimated Leaf Area (ha)	Impacted Area (ha)	Number of Plants Detected	Estimated Leaf Area (ha)	Impacted Area (ha)	Number of Plants Detected
2004	0.0250	105	433	-	-	-	-	-	-
2005	0.0681	194	864	-	-	-	-	-	-
2006	0.2202	137	584	-	-	-	-	-	-
2007	0.1158	75	342	-	-	-	-	-	-
2008	0.1263	125	334	-	-	-	-	-	-
2009	0.1020	184	691	-	-	-	-	-	-
2010	0.2312	261	1217	-	-	-	-	-	-
2011	0.5525	242	2387	-	-	-	-	-	-
2012	0.5785	797	6846	-	-	-	-	-	-
2013	0.8209	940	8511	-	-	-	-	-	-
2014	0.5502	937	13921	-	-	-	-	-	-
2015	1.4353	898	18074	3.3502	107	320	*0.2133*	197	14090
2016	1.6373	973	23260	3.3892	127	354	*0.3992*	292	4181
2017	1.1676	900	12512	*2.6770*	156	823	*0.0151*	149	2872
2018	0.6362	709	8051	*1.1295*	165	617	*0.4950*	200	1836
2019	0.2578	496	4742	3.3382	167	963	0.0065	206	2557
2020	0.2352	338	2317	3.9784	196	977	0.0089	127	1222
2021	0.2073	348	3844	4.9115	162	618	0.0144	153	1633
2022	0.0466	272	1954	4.0969	188	1326	0.0071	111	1153
2023	0.0478	248	2142	2.5778	175	1127	0.0249	113	733

RESTORATION

Control and eradication efforts to date in B.C on *S. anglica* and *S. densiflora* have been successful without requiring additional restoration efforts. *S. anglica* and *S. densiflora* invade mudflats and areas of shoreline that typically have limited plant abundance and diversity. Where *S. anglica* and *S. densiflora* occur within native vegetation, it is typically in clusters surrounded by native vegetation that rapidly re-establishes after treatments.

S. patens can invade the high salt marsh where there is a higher density and abundance of native plants and turns these areas into monoculture meadows of *S. patens*. Planting of native species in the areas left barren following *S. patens* treatment can speed up native re-vegetation and increase the resilience of these habitats while reducing the ability for invasive species to monopolize them again.

Previously, the BC SWG trialed replanting after *S. patens* treatment with the City of Port Moody. Replanting was done using nursery stock of *Carex lyngbyei*, a dominant species that thrives at low- to middle-elevation tidal zones, which include high marsh elevations where *S. patens* grows. *Carex lyngbyei* was planted at the end of the 2018 program year. Goose grazing is a known pressure on marsh plants and particularly marsh restoration plantings, as such goose ex-closure fencing was installed to minimize these pressures, which required regular monitoring and maintenance to ensure the goose ex-closure fence remained intact and the plantings took root. Scaling a planting operation like this would have challenges. Often *Spartina* spp. grow in exposed habitats with high tidal and wave action, as well as interference from debris in the water column, making these structures time-intensive to check-on and maintain across a broad range of locations.

In 2023 DUC evaluated whether to focus time and effort on replanting *S. patens* treatment sites with native vegetation. The state of infestation of *S. patens* in Burrard inlet has reached a point where most monoculture patches have broken up into sparser smaller patches. Native vegetation so far has been able to re-establish itself where *S. patens* was. Currently, the *S. patens* population on Vancouver Island more closely resembles the monoculture meadows that would typically be candidates for replanting. However, difficulties with fully treating some of these areas have prevented the need for replanting.

Given the limited time and capacity of the BC SWG, we feel it's best at this moment to focus attention and time on achieving adequate mapping and treatment of these areas, before focusing on supplemental replanting. As we go forwards with treating *S. patens* on Vancouver Island, importance will be placed on monitoring for specific scenarios that call for a need to replant, such as risk of erosion after *Spartina* removal, large monoculture patches that may be slow to regenerate with native plants, or invasion potential of other plants in the vicinity.

There may be opportunities to resource or collaborate on replanting with other members of the BC SWG, volunteers, or other local stakeholders such as the Tsleil-Waututh Nation in the future. The Tsleil-Waututh Nation is in a review period for the Burrard Inlet Action Plan which includes commitments to supporting the BC SWG's efforts in Burrard inlet.

FINANCES

The Spartina Eradication Program has generated over $3,830,000 CAD of direct cash funding since its creation in 2004 with an additional $1,412,000 CAD of In-Kind contributions to the program. $2,100,000 CAD of this funding has been provided by the province of BC through the Ministries of Environment, FLNRORD, Forestry, and Agriculture over the life of the program. The total program revenue in 2023 was approximately $370,000 CAD through various donors, of which $360,000 CAD was raised for the Program directly through DUC. Another $12,000 CAD of in-kind contributions were put towards the program by various organizations. Approximately $9,913 CAD was unspent on the program in 2023 and will be carried forward into the next program season.

For a breakdown of the revenue and expenditures for 2023, see Table 7 and Table 8. The recent history of financial contributions (cash and in-kind) of the BC Spartina Working Group is found in Figure 7, below. The in-kind contributions were provided by the following agencies:

- BC Conservation Foundation
- BC Ministry of Environment
- BC Ministry of Forests
- City of Surrey – ShaRP & SNAP Programs
- City of Delta
- City of Port Moody
- Environment Canada- Canadian Wildlife Service
- Port of Vancouver
- West Coast Conservation Land Management Program
- Friends of Semiahmoo Bay Society
- The Tsleil-Waututh Nation
- Raincoast Conservation Foundation & Tsawwassen First Nation
- The Nature Trust of BC

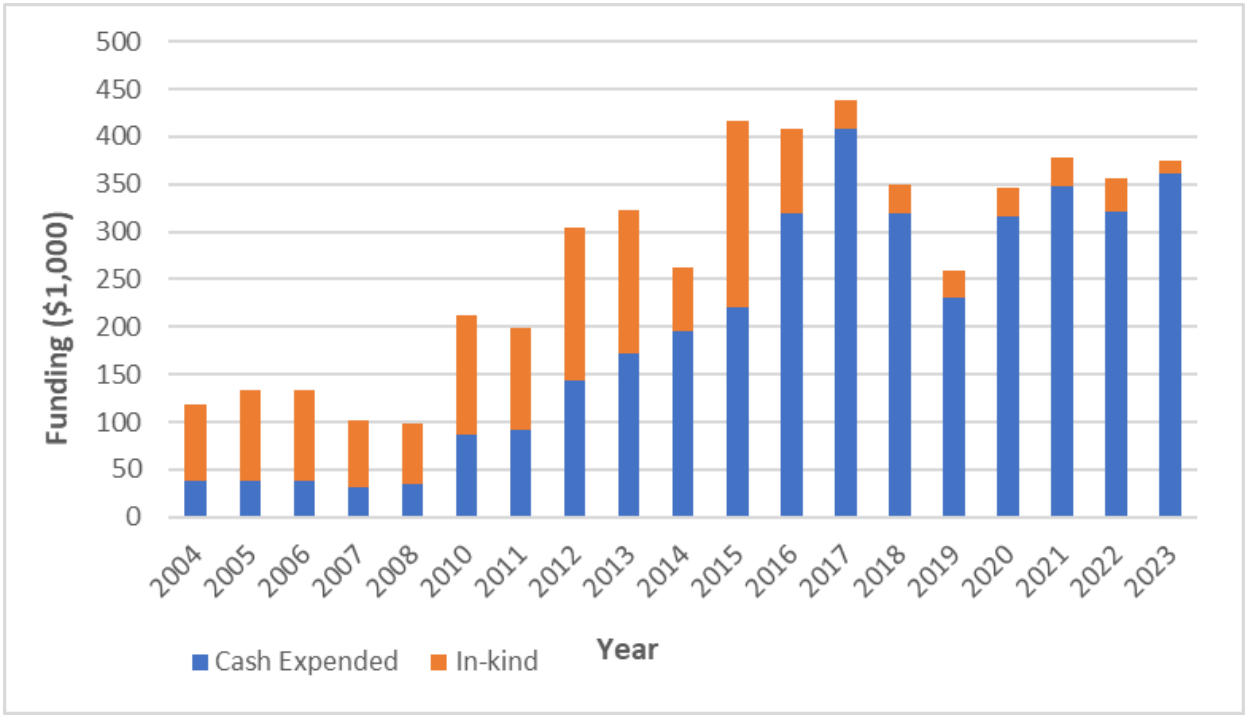


Figure 7. Funding history of the Spartina Eradication Program comparing in-kind donations to total cash expenditures each year since 2004.

Table 7. Total revenue from all funders towards the Spartina Eradication Program in 2023.

Revenue		
Source	**Through DUC**	**Through BC SWG Member**
Province of BC	$342,198	-
Port Metro Vancouver	$20,000	-
Government of Canada – Canada Summer Jobs	-	$10,692
Subtotal	$362,198	$10,692
Grand Total	**$372,890**	

Table 8. Expenditures related to the Spartina Eradication Program in 2023.

Expenditures		
Category	**Mainland BC**	**Vancouver Island & Gulf Islands**
Travel	$6,818	$11,637
Gas, Mileage, Truck Rental	$16,209	$9,046
Personnel - Contractors	$75,703	$46,205
Personnel - Staff	$86,781	$44,634
Small tools, Supplies etc.…	$3,460	$484
Administration/Overhead	$16,000	$16,000
Subtotal	$234,971	$128,006
Total	**$362,977**	

INFORMATION AND INTERNET RESOURCES

- The spartina.ca website provides information on the Spartina Eradication Program and houses the historical distribution of *Spartina* spp. in BC: www.spartina.ca .
- Coastal Invasive Species Committee website: http://www.coastalisc.com/priority-invasive-plants

RECOMMENDATIONS FOR 2024

COORDINATION

- Work towards building a network of groups to collaborate with on Vancouver Island to increase capacity there.
- Host two planning meetings, one for each region.

MONITORING

- Typically, we monitor metrics across sites based on the IAPP site boundaries from the provinces Invasive alien plant program (IAPP), as this was where plant data was reported to. This program changed to the non-site based InvasivesBC in 2023. The BC SWG now has the opportunity to change site boundaries to smaller areas which would allow for more informative metrics to schedule priority areas. This would also align with the fact that the overall populations are much smaller than their peak levels.
- Consider including some metric of distribution/density as an additional evaluation lens for the program
- Target secondary mapping later in the season to specific areas before conducting a second pass of treatment.
- To reduce error from technicians between years, physical size guides are being created for the 2024 mapping season.

TREATMENTS

- Apply herbicide twice, over two passes at each *S. anglica* site, to decrease chances of missing plants.
- Continue expanding herbicide treatment on *S. patens* in Baynes' Sound to the extent feasible without compromising any progress made on *S. anglica* eradication to date.
- Identify opportunities to improve herbicide treatment program delivery efficiency between regions given limited treatment season and treatment condition windows (tides and weather).
- Work with Tsawwassen, K'omoks, and Tsleil-Waututh First Nations to map and treat *Spartina* spp.

SCIENCE AND EVALUATION

- Expand herbicide treatment efficacy monitoring to include a higher number of duplicates. Target specific areas of sites with increasing abundance.
- Set a reasonable target of mapping areas adjacent to existing infestations or at risk of invasion to catch new infestations, alternating areas between years.
- Test aerial detection techniques with new technologies such as remote-controlled, electric, unmanned aerial vehicles (UAVs). These activities would be used to detect large clones and large meadows of *S. patens* in particular. This could also reduce survey time for *S. anglica* in large mudflat areas that are slow to survey due to the muddy conditions and long distance to cover, but often have few plants present.
- Begin planning to test aerial detection techniques in 2025 to survey large mudflat areas with typically low numbers of *S. anglica* plants.

RESTORATION

- Continue steps towards working with a graduate student program to improve program delivery, such as modelling and restoration.
- Continue to monitor for scenarios where re-planting could be beneficial.

CONCLUSION

Data continues to show that current treatment methods are effective. With limited time and capacity over the summer season, the program's success entirely comes down to how time and effort are prioritized for mapping and treatment. As the population continues to decline, the BC SWG needs to narrow its scope from large sites to individual areas, or clusters, for prioritization. As most increases in the population that were observed this season occurred in relatively small areas. Consistently, as expected, sites which did not receive adequate treatment last year had the highest increases in plant metrics. DUC on behalf of the BC SWG will continue to work towards the goal of treating 100% of the population of each invasive *Spartina* species, and 100% of the population of *S. anglica* with both a first and second pass of herbicide.

Plant numbers continue to decline and the area that they impact is also in decline. The highest levels of infestation for *S. anglica* were observed in 2016. While there have been small fluctuations year-to-year, efforts have reduced the abundance in the lower mainland by 90.8% since its peak. While *S. anglica* remains the top priority for the eradication program, the reduction in infestation has allowed the working group to expand monitoring and control efforts to the two other invasive *Spartina* spp. in BC that pose significant threats to the sensitive ecosystems of the coast.

One of the wins this year included finding no *S. patens* plants at one of the sites in Burrard inlet for the first time. Crews were also able to remove *S. densiflora* to the largest extent yet at our regular sites, in addition to a large population outside of the previous program boundaries. This patch of *S. densiflora* took two weeks to remove and was a grueling effort by field teams as well as the volunteers who reported the patch.

The *S. densiflora* population in Baynes' Sound should continue to be inventoried and progress towards eradication should be evaluated. Manual removal has shown very effective results so far, as overall abundance has decreased by 95.6% since peak levels and impacted area and estimated leaf area have reduced by 68% and 99% respectively. However, the SWG may want to consider more aggressive treatment methods in the future, if declines in plant numbers begin to show signs of plateauing, as manual removal is likely to always leave some presence of seeds and root fragments in the environment.

The population of *S. patens* in Burrard inlet is in decline, estimated leaf area is down 47.5% since its peak level in 2021. While the population on Vancouver Island and the offshore islands has declined as well, estimated leaf area is down 46.7% from 2021, it has been a challenge to treat successfully. Achieving 100% treatment coverage will be the number one goal in 2024. The Spartina eradication program has continually evolved its methods to match the changes in technology and best practices since the start of the program. The program has seen massive strides towards eradication of *Spartina* spp. in BC since 2016. With more years of intense treatment pressure, the SWG can continue to significantly reduce the presence of *Spartina* spp. in BC and eventually move into the monitoring stage until *Spartina* spp. can be declared as eradicated from our sites. The BC SWG will continue with its partnership approach in striving to protect BC's shores and eradicate invasive *Spartina.*

REFERENCES

Peterson, P., Romaschenko, K., Arrieta, Y., & Saarela, J. (2014). Proposal to conserve the name *Sporobolu*s against *Spartina, Crypsis, Ponceletia*, and *Heleochloa* (*Poaceae: Chloridoideae: Sporobolinae*). Taxon. 63. 10.12705/636.23.

APPENDIX A – MAPS

Figure A1. Fraser River Delta, Boundary Bay, and Burrard Inlet areas surveyed for *Spartina* spp. in 2023

Figure A2. Baynes' Sound area surveyed for *Spartina* spp. in 2023.

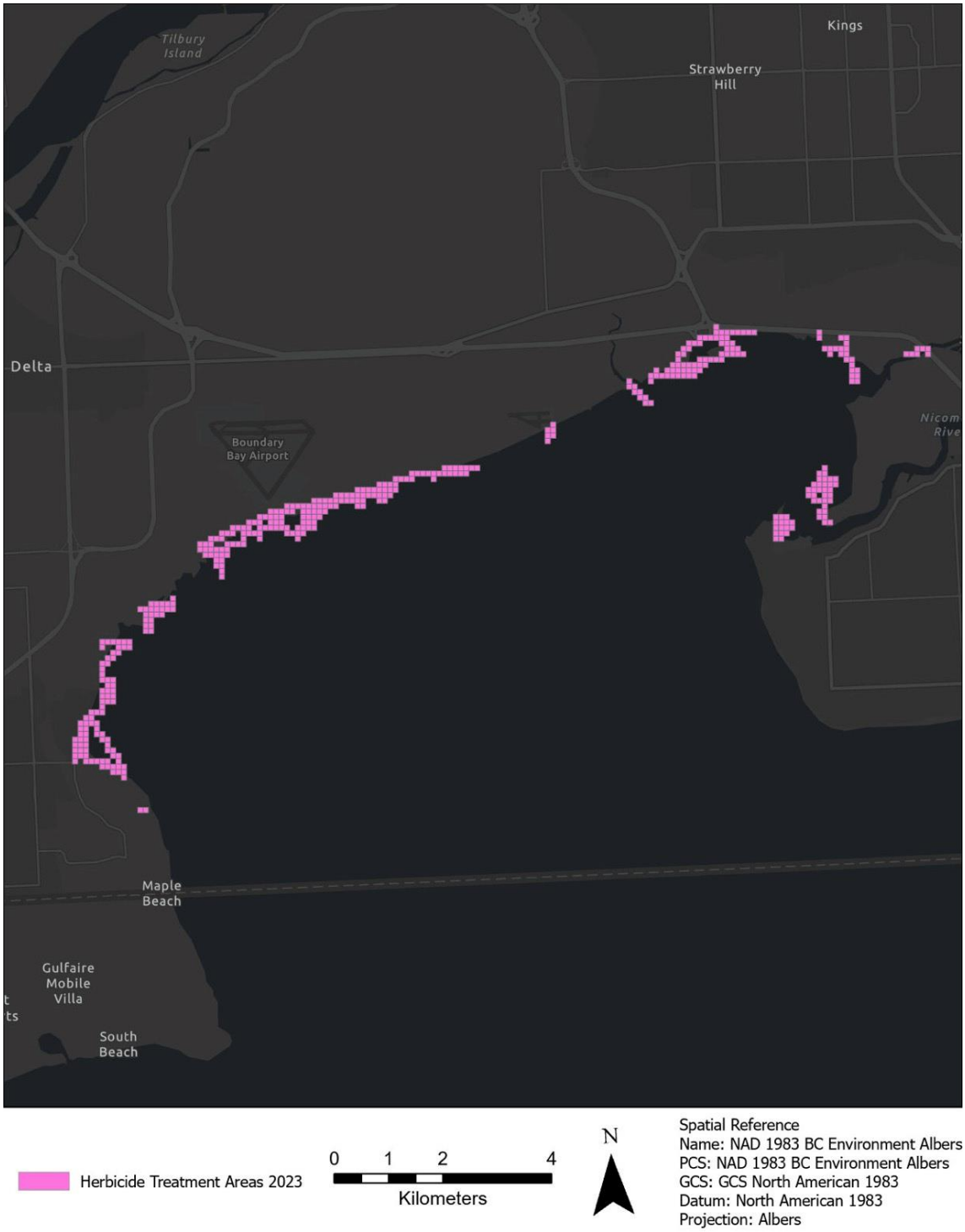


Figure A3. 2023 *Spartina anglica* treatment areas in Boundary Bay. Each pink square represents a 1 ha cell where one or more *Spartina anglica* plants were treated.

Figure A4. 2023 *Spartina anglica* treatment areas in the Roberts Bank Wildlife Management Area and Tsawwassen First Nation. Each pink square represents a 1 ha cell where one or more *Spartina anglica* plants were treated.

Figure A5. Herbicide treatment locations for *Spartina patens* in Burrard Inlet. Each pink square represents 1ha cell where one or more plants were treated.

Figure A6. 2023 *Spartina patens* treatment areas in the Baynes' Sound area. Each pink square represents a 1 ha cell where one or more *Spartina patens* plants were treated.

APPENDIX B – PLANT METRICS | FIGURES

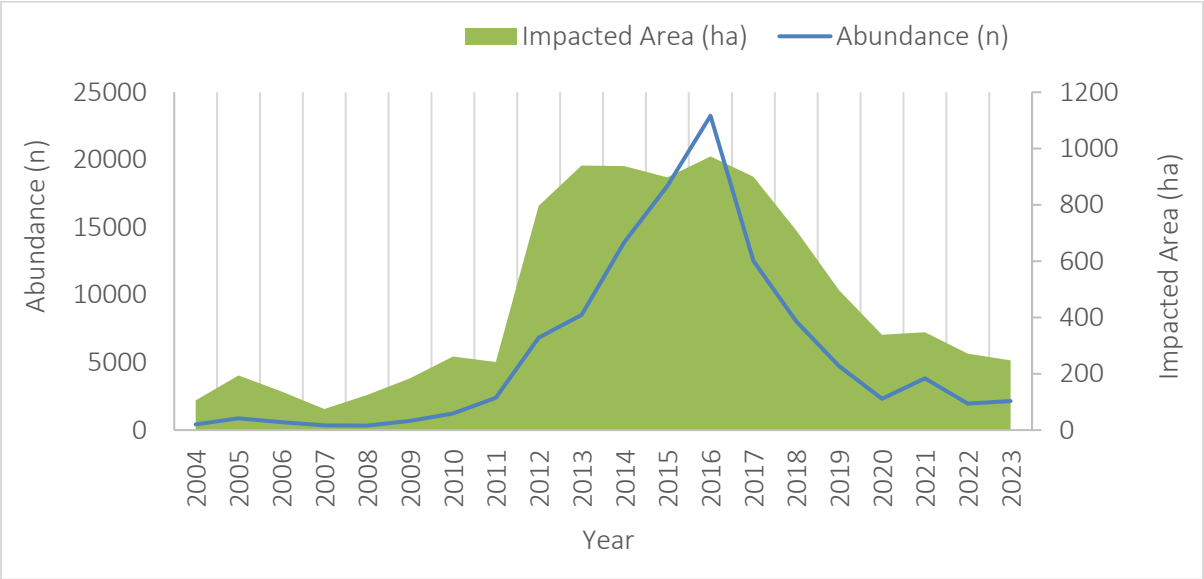
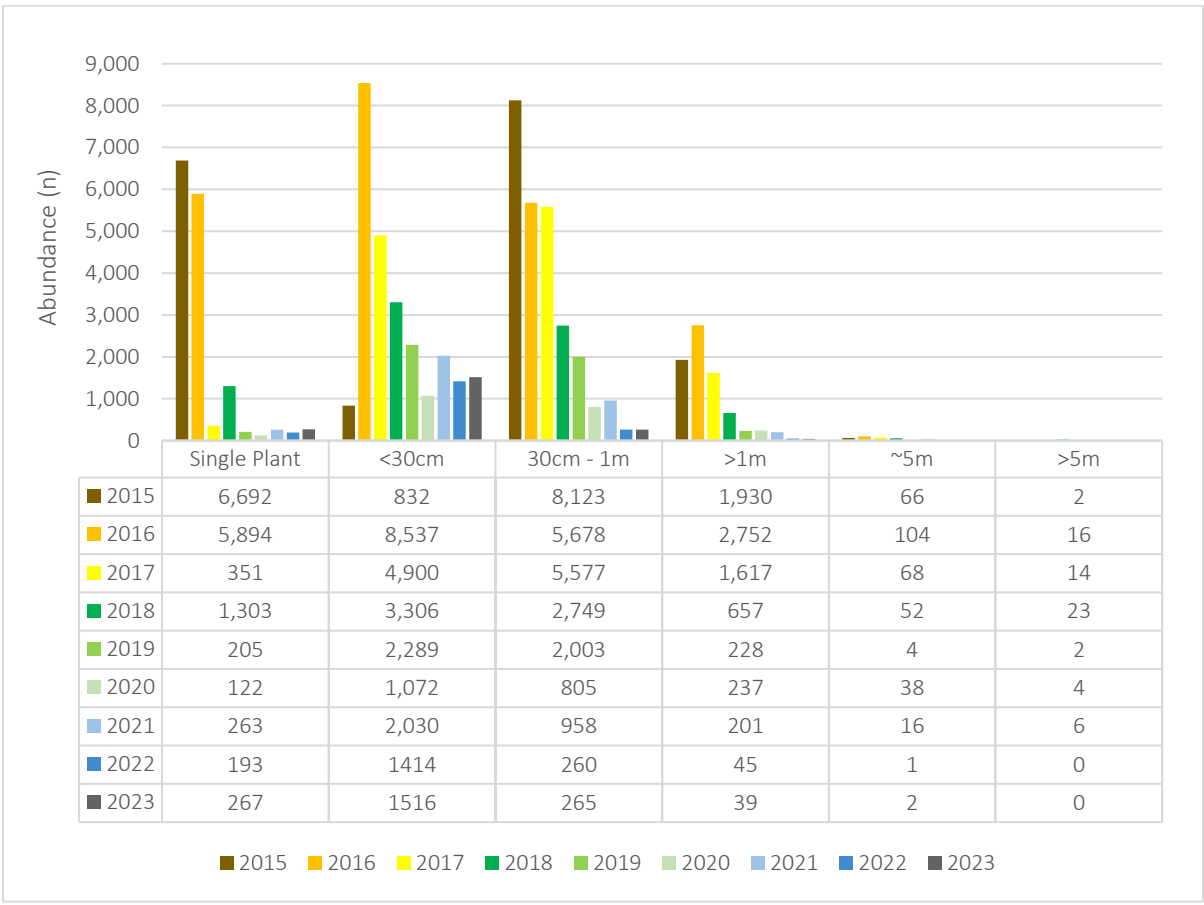


Figure B1. Plant abundance (n) and impacted area (ha) of *Spartina anglica* from 2004 – 2023.



	Single Plant	<30cm	30cm - 1m	>1m	~5m	>5m
2015	6,692	832	8,123	1,930	66	2
2016	5,894	8,537	5,678	2,752	104	16
2017	351	4,900	5,577	1,617	68	14
2018	1,303	3,306	2,749	657	52	23
2019	205	2,289	2,003	228	4	2
2020	122	1,072	805	237	38	4
2021	263	2,030	958	201	16	6
2022	193	1414	260	45	1	0
2023	267	1516	265	39	2	0

Figure B2. Plant abundance (n) of *Spartina anglica* between 2015-2023 by size class.

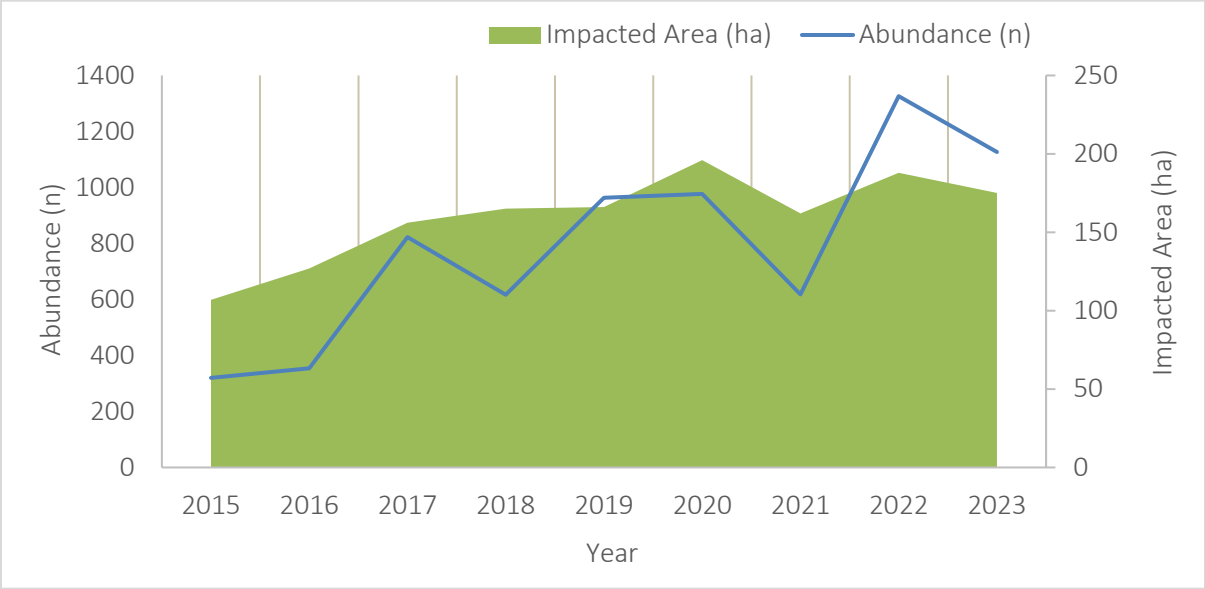
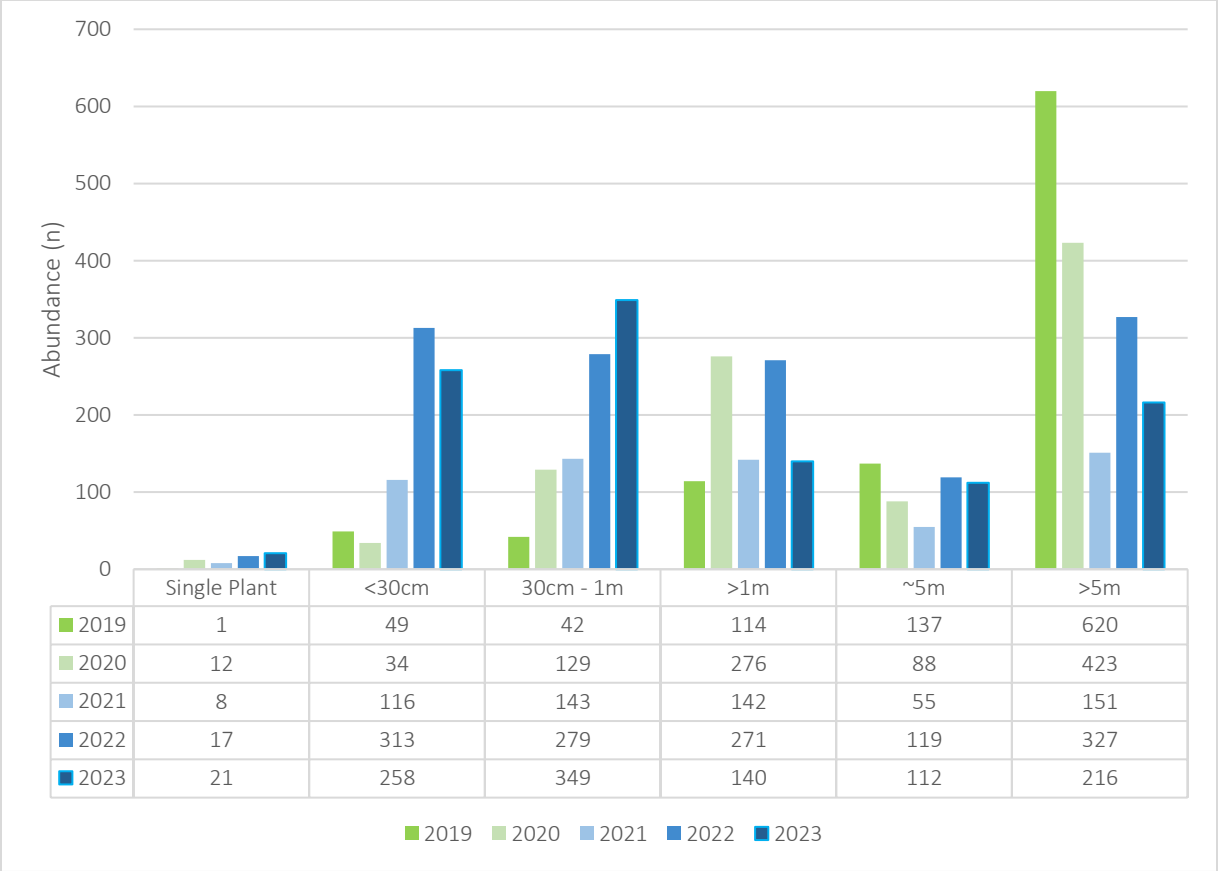


Figure B3. Overall plant abundance (n) and impacted area (ha) of *Spartina patens* from 2015 – 2023.



	Single Plant	<30cm	30cm - 1m	>1m	~5m	>5m
2019	1	49	42	114	137	620
2020	12	34	129	276	88	423
2021	8	116	143	142	55	151
2022	17	313	279	271	119	327
2023	21	258	349	140	112	216

Figure B4. Overall plant abundance (n) of *Spartina patens* between 2019-2023 by size class. *Data from before 2019 weren't included, as there were inconsistencies in how size classes were measured and reported during the switchover to digital data collection methods.*

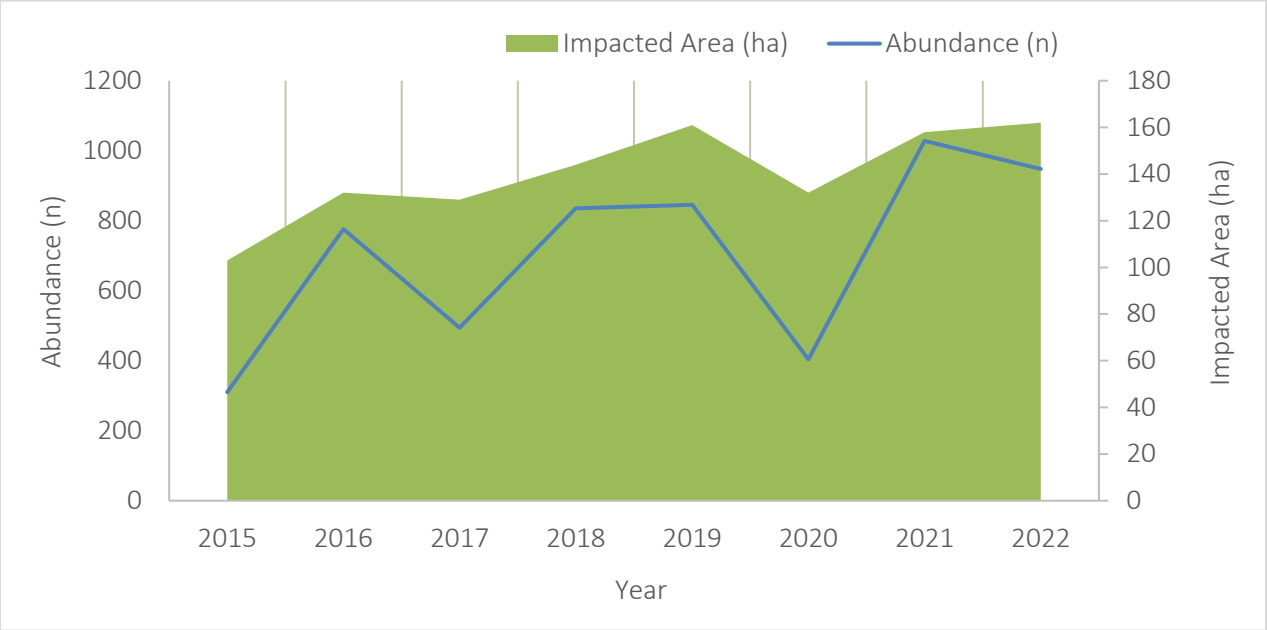


Figure B5. Plant abundance (n) and impacted area (ha) of *Spartina patens* in the Baynes Sounds area from 2015 – 2023.

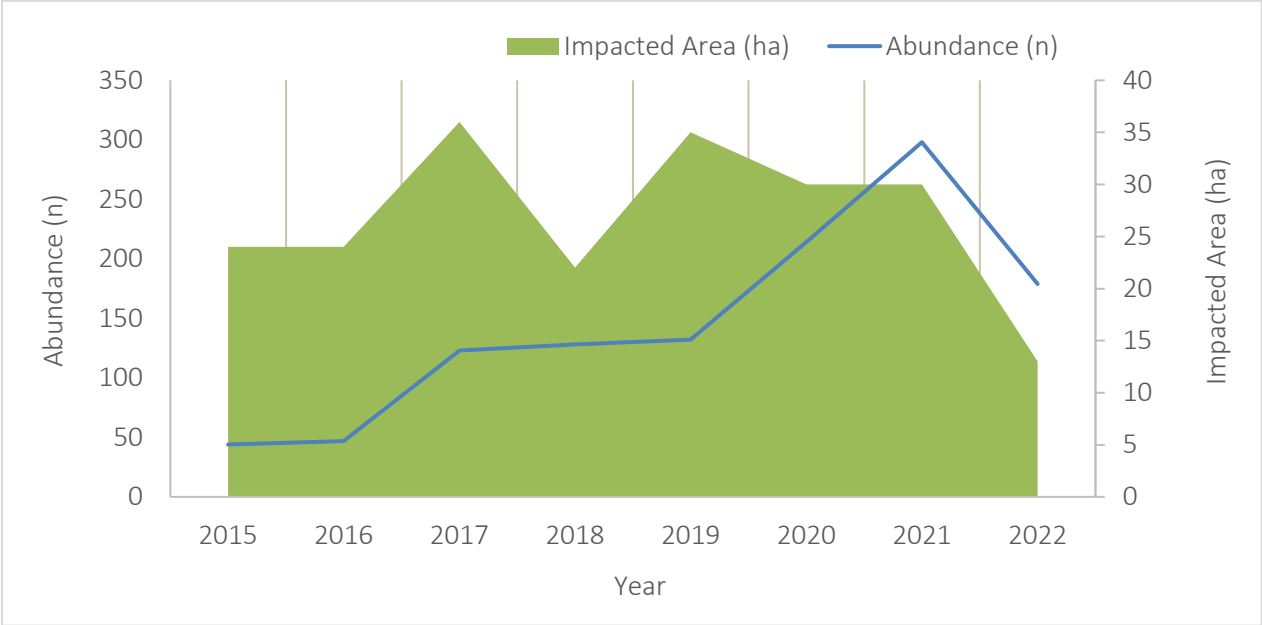


Figure B6. Plant abundance (n) and impacted area (ha) of *Spartina patens* in the Burrard Inlet area from 2015 – 2023.

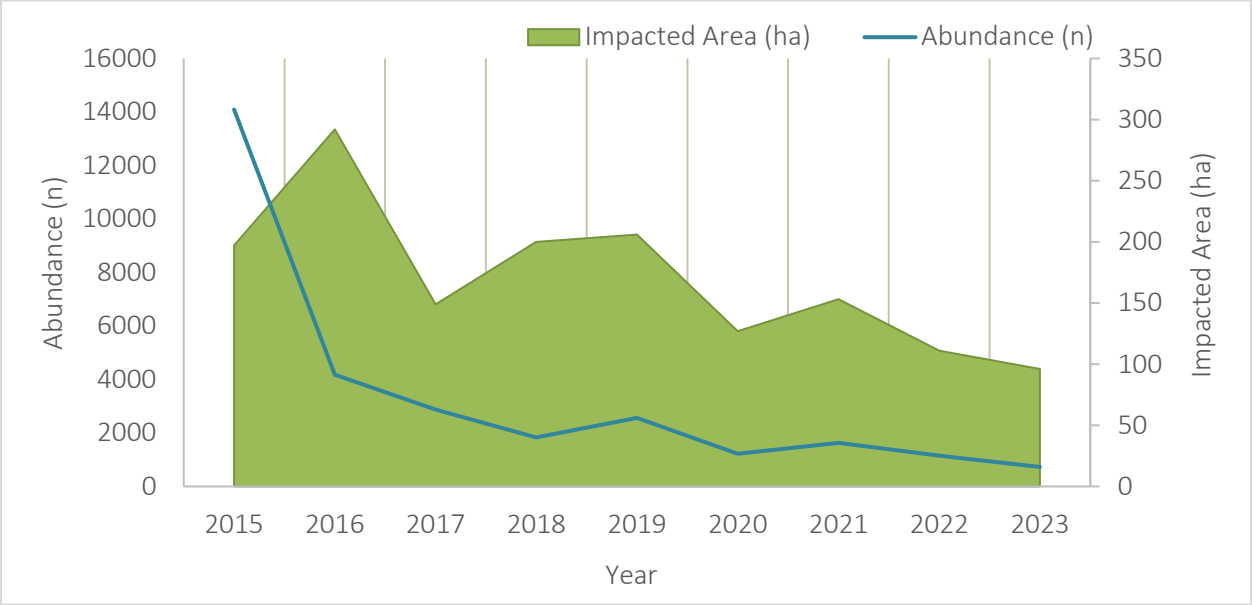
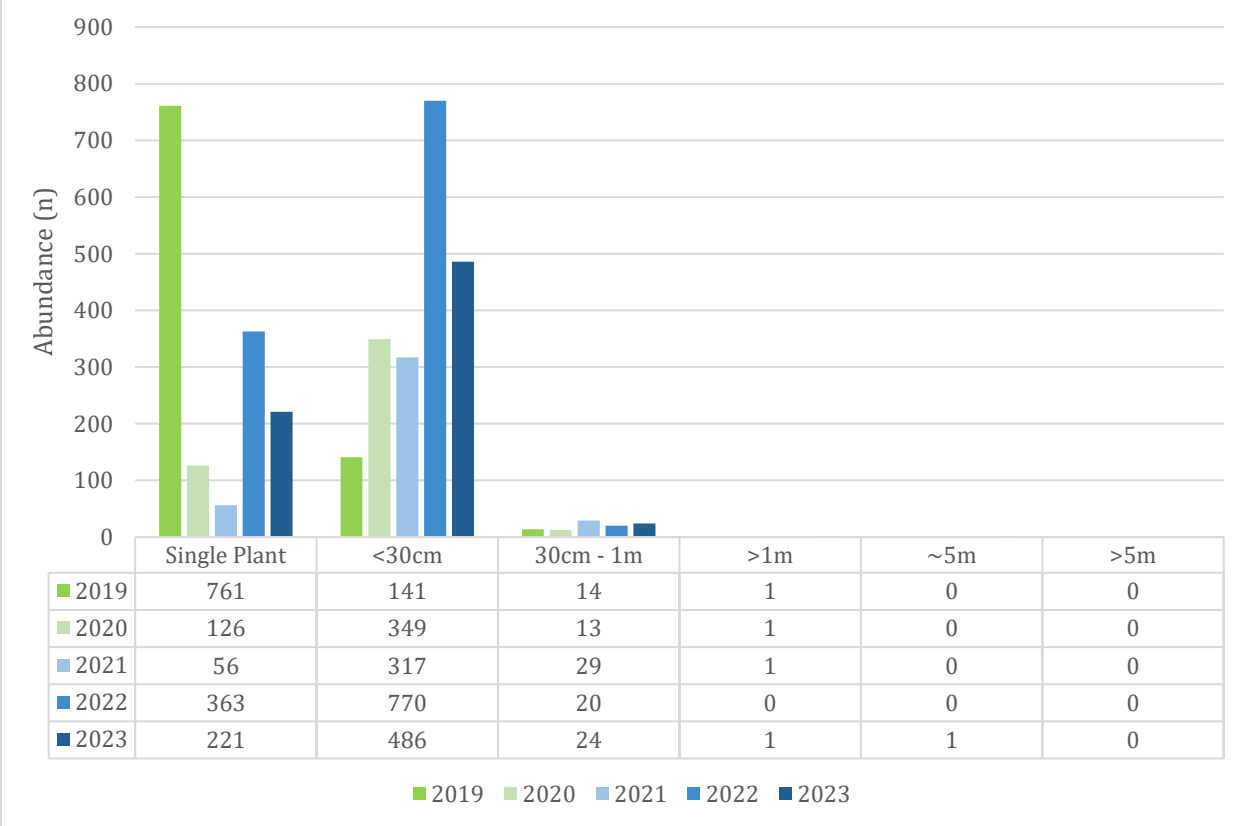


Figure B7. Plant abundance (n) and impacted area (ha) of *Spartina densiflora* from 2015 – 2023. Note that one site, Denman Island, was not surveyed in 2023, Denman Island typically has less than 10 individual plants.



	Single Plant	<30cm	30cm - 1m	>1m	~5m	>5m
2019	761	141	14	1	0	0
2020	126	349	13	1	0	0
2021	56	317	29	1	0	0
2022	363	770	20	0	0	0
2023	221	486	24	1	1	0

Figure B8. Plant abundance (n) of *Spartina densiflora* between 2019-2023 by size class. *Data from before 2019 weren't included, as there were inconsistencies in how size classes were measured and reported during the switchover to digital data collection methods*.

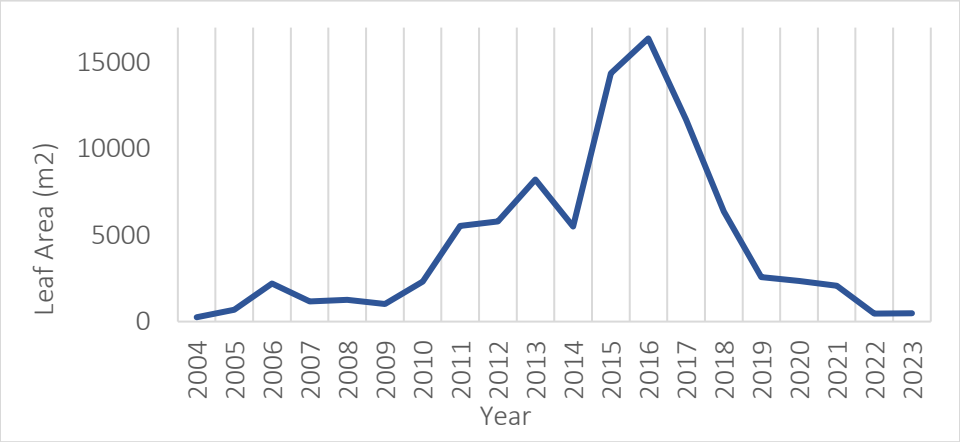


Figure B9. Estimated leaf area (m2) of *Spartina anglica* from 2004 - 2023.

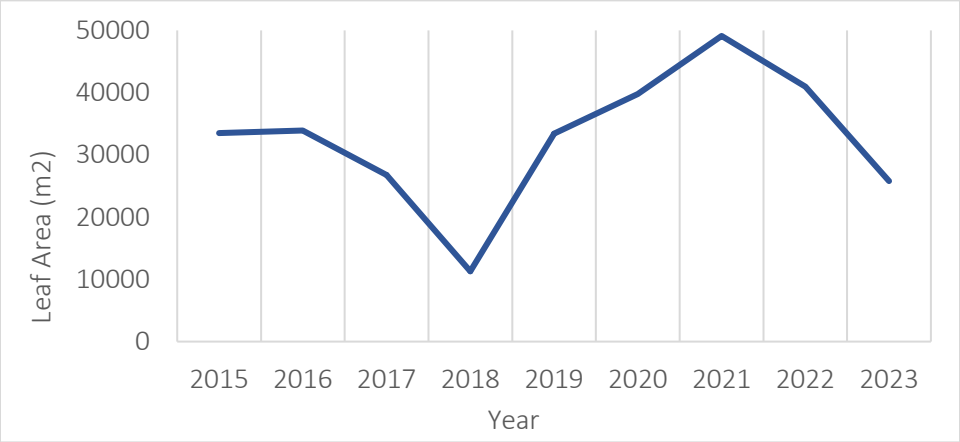


Figure B10. Estimated leaf area (m2) of *Spartina patens* 2015 - 2023[3].

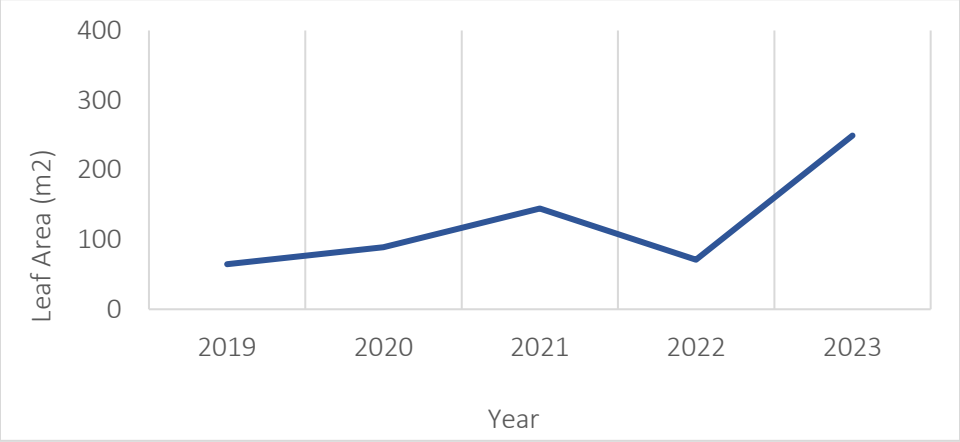


Figure B11. Estimated leaf area (m2) of *Spartina densiflora* from 2019 - 2023.

[3] Note that the dotted line represents a period where there was inconsistency in how size classes were measured and reported in these species during the switchover to digital data collection methods, leaf area (m^2) data from this time may be inaccurate.

APPENDIX C – METRIC & SUMMARY CALCULATIONS

The point data for each species of spartina is collated into a spatial database for subsequent analysis using three different metrics:

1. The number of plants or plant clones detected
2. The size of each plant or plant clone (single plant or seedling; patch with diameter less than 30 cm; patch with diameter of 30 cm to 1 m; patch with diameter of 1 m to 5 m; patch with diameter of approximately 5 m; patch with diameter greater than 5 m)
3. The estimated leaf area (number of plants or plant clones detected x size of each plant or plant clone = number of square meters a dispersed colony would occupy if all Spartina plants were grouped into a single cluster)

Each IAPP site is divided into a grid of 1 ha cells which is used to summarize the data that has been analyzed through the metrics above. These summaries occur at a single cell level as well as an accumulation of all the cells within the site. They are titled Cell Summaries and Site Summaries, respectively. Summaries occur on a per-species basis. Moreover, with these summaries, the BC SWG determines how much shoreline has been impacted by *Spartina* spp. (how many 1 ha grid cells had one or more occurrences of Spartina).

Cell Summaries: The total number of observations for each size class is calculated for each cell on a per species basis. The estimated leaf area of a species in a cell is calculated by multiplying the total number of observations for each size class by the size class's Areal Coefficient (Table 7) and summing the values for each size class.

Site Summaries: The summing of the metrics of all of the cells within an IAPP site.

Table C1. Size classes and their areal coefficients.

Size Class	Description	Areal Coefficient (m^2)
S	Single Plant or Seedling	0.002
A	Patch with diameter less than 30 cm	0.071
B	Patch with diameter of 30 cm to 1 m	0.785
C	Patch with diameter of 1 m to 5 m	3.14
D	Patch with diameter of approximately 5 m	19.625
M	Patch with diameter greater than 5 m	38.465

The resulting equation for the estimated leaf area of a Spartina species in a cell is:

Estimated Leaf Area =(**Σ**S*0.002)+(**Σ**A*0.071)+(**Σ**B* 0.785)+(**Σ**C*3.14)+(**Σ**D* 19.625)+(**Σ**M*38.465)

For example, a cell with multiple *S. anglica* observations of 10 seedlings (Size S), 3 patches of a diameter of 30 cm to 1 m (Size A), 5 patches with a diameter of 1 m to 5 m) Size C, and 1 patch greater than 5 m (Size M) would have an area of $54.398\ m^2$.

Area = (10*0.002 m^2)+(3*0.071 m^2)+(5*3.14 m^2)+(1*38.465 m^2)

$\text{Area} = 0.020\ m^2 + 0.213\ m^2 + 15.7\ m^2 + 38.465\ m^2$

$\text{Area} = 54.398\ m^2$

APPENDIX D – DATA INTEGRITY OVER TIME

The methods of collecting, analyzing, and reporting of spartina data has changed significantly since the start of the program. The method of calculating leaf area, as described in Appendix A, was first introduced in the 2015 season and several IAPP sites were standardized between 2011-2013. We are now at a stage where our methods of collection, analysis, and reporting are consistent between years. As such, references made to previous years' data, regarding infested area, should be taken from the most recent spartina report or from the online spartina web-atlas.

In 2023 the Province of BC released a new invasive species database and application InvasivesBC. InvasivesBC collects invasive plant data in polygon geometries whereas plant detections in the Spartina Eradication Program have primarily been point geometries. Collection methods for the Spartina Eradication Program are set to remain the same which will mean new GIS post-processing tools will need to be created to format the collected data in a way that is consistent with the InvasivesBC schema.