

Dense-flowered Cordgrass *Spartina densiflora*

Denman Island, Hornby Island &
Jáji7em and Kw'ulh Marine Provincial Park, BC
2018-2019



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Abstract

The former “infestation” of dense-flowered cordgrass *Spartina densiflora* plants on the foreshores of the islands of Denman, Hornby and the Jákí7em and Kw’ulh Marine Provincial Park (JKMPP) has been successfully controlled using manual removal methods. The data from monitoring and removing seedlings on the foreshores in the fall of 2018 and again in the spring of 2019 followed the four-year trend of steadily declining numbers of re-seeding juvenile plants. The source of seeds for these juvenile plants is unknown. One possible origin is that the seeds come from plants that were hidden and missed during the fall monitoring. These plants may go to seed in their first season and at any given monitoring time, the plants may be hidden by large mats of seaweed or by piles of log debris on the foreshores. It is also possible that a percentage of the ten’s of thousands of seeds, originally shed by the mature plants that were removed from 2013 to 2015, are still viable, or that new seeds are arriving with ocean currents from other sites or transported by boats or equipment.

This season, the field use of province-wide digital collection methods using an Iphone was explored and a recording system was piloted that was tailored specifically for maximizing data collection for the number, size and foreshore coverage of *S. densiflora* plants. A resident of Hornby Island, Leanne Letson agreed to take over the monitoring of *Spartina* on Hornby Island and was shown the removal techniques. Both monitors for Hornby and Denman were present for the BC *Spartina* Working Group’s (SWG) January Open House in Union Bay on Vancouver Island. Unfortunately an estimated less than ten members of the public attended.

The total *S. densiflora* removals from Denman dropped from 274 in 2017-8 to 138 in 2018-9. The Beacon site in Management Area 1, as designated by the SWG, formerly had ‘critical’ status (> 100 plants), but the number of plants removed dropped from 106 regenerating seedlings to 60, and the status is now ‘of concern’ (50-99 plants). Two other sites have dropped from ‘of concern’ status to that of ‘important’ (20-49 plants). These sites are Hinton Rd north, with 28 plants, and Hinton Rd south covering the Valens Brook estuary with 33 plants in Management Areas 5 and 19, down from 79 and 66 respectively. Four other sites in three Management Areas (8,15 and 18) had between 4 and 9 seedlings.

On Hornby, in the fall, seedlings were found and removed from two of the three known sites. One of the sites had expanded in length with a new beach was affected and this site still has ‘critical’ status. On the other hand, overall removal numbers were less than half of those in 2016-17 for both sites (numbers are unknown for last year) and the status of second site has gone from ‘critical’ to ‘of concern’. No seedlings were found at the third site.

On the shores of JKMPP the number of seedlings removed increased due to a new group of seedlings growing on a new sandbar just off Snake Islet. Due to the erosion of the backshores in Baynes Sound, a large amount of eroded-material is accumulating in the foreshore area, enlarging salt marshes and creating new shoals very visible around the JKMPP. The fact that only the north of this area was affected and not northern Denman, suggests that these seeds came from an outside source. New seedlings had also been found on the northern Lambert Channel side of Hornby. Tree Island remains a critical area for monitoring although less than one third of the seedlings were removed compared to 2016-17 and the shoals between the islets is an area of concern.

Monitoring and removal remains the only method of retaining shorelines free of *S. densiflora* as each growing season a few new seedlings establish in the foreshores and unless the source of the new seeds is controlled. Currently the source is unknown and may be an outside the local area.,

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Acknowledgements

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As always, thanks to Mark van Bakel, IS/GIS manager with the Islands Trust, who provided the initial mapping layers. Also many thanks to the residents of Denman Island who continue to support the program and allow access across their lands. Special appreciation goes to the owners of Komas Ranch for removal-access not only to Komas shorelines but also to the shores around JKMPP.

Abbreviations

DUC	Ducks Unlimited Canada
SWG	Spartina Working Group
JKMPP	Jáji7em and Kw’ulh Marine Provincial Park

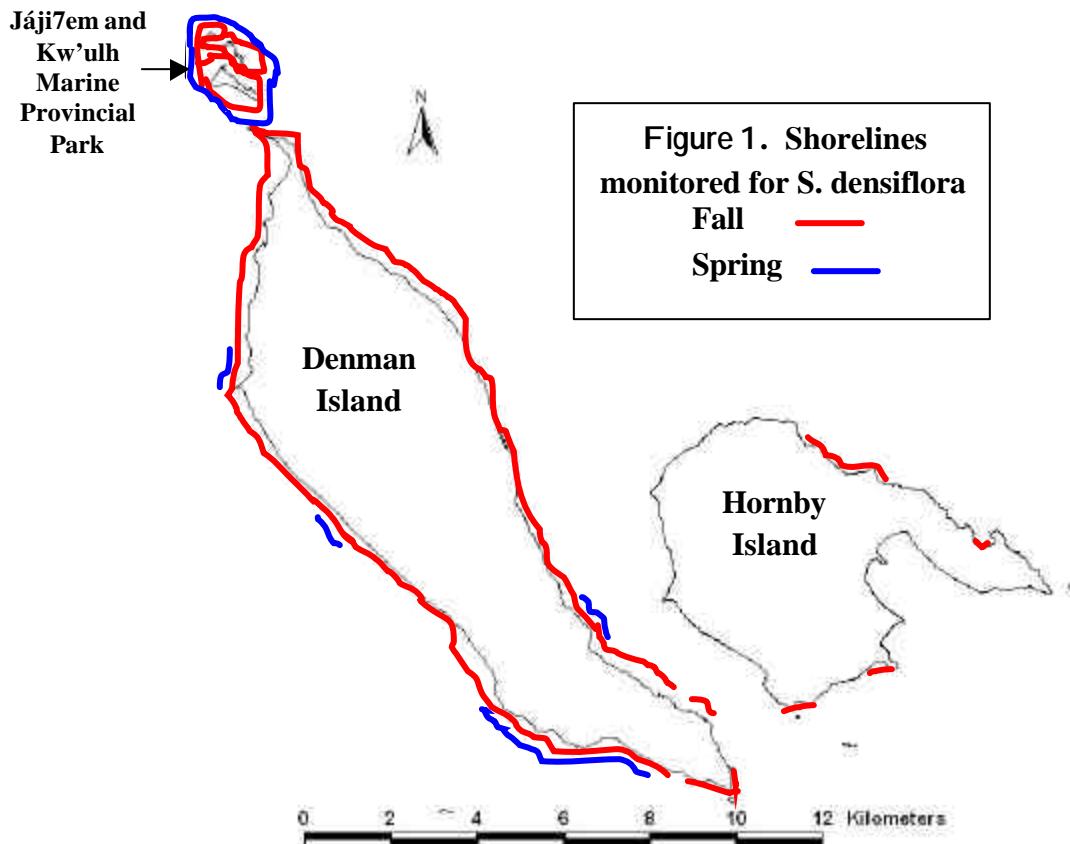
Introduction

The goal of the 2017-18 *Spartina* Project was to remove as many regenerating *S. densiflora* plants as could be located in the fall on the shorelines of the islands of Denman, Hornby and Jáji7em and Kw'ulh Marine Provincial Park (JKMPP), and then to recheck major sites in the spring and remove any missed seedlings. This report covers the complete removal data from Denman and JKWPP and the fall removal from Hornby shores. Manual removal continues to be a very simple and effective method for controlling the occurrence of *S. densiflora*. Regular monitoring and removal remains the key to keep out *S. densiflora* as the source of seeds for the few new regenerating seedlings is unknown.

Methods

The *Spartina* control activities took place in the fall, in October and December 2018 and in the spring, in February and March 2019. In addition, a *Spartina* Working Group (SWG) Open House was attended in Union Bay on January 29, 2019.

Activities for the 2018-19 *S. densiflora* monitoring season included checking all three locations: Denman, Hornby and JKMPP. All of the Denman Island shoreline with the exception of the few steep rocky sections at the south end was examined in the fall, and then the major known *S. densiflora* sites were rechecked in the spring. All the shorelines and all of the inter-tidal salt-marsh areas around the islets in JKMPP were inspected in both fall and spring. On Hornby Island, the shorelines of previously known *S. densiflora* sites were checked in the fall and the removal methods were demonstrated for the new Hornby monitor. The shorelines monitored are shown in Figure 1.



All *S. densiflora* plants were manually dug with a small pick-mattock as shown in Figure 2 below. The plant material was removed and composted on Denman, except for the plants removed from

JKMPP shorelines that were added to a previously established compost site on Tree Island. One limb making up one half of the dead tree over the Tree Island compost site collapsed in this winter's snow. The previous year's compost at this site has decomposed and shoots of the adjacent reed canary grass shoots are beginning to sprout under the tarps.

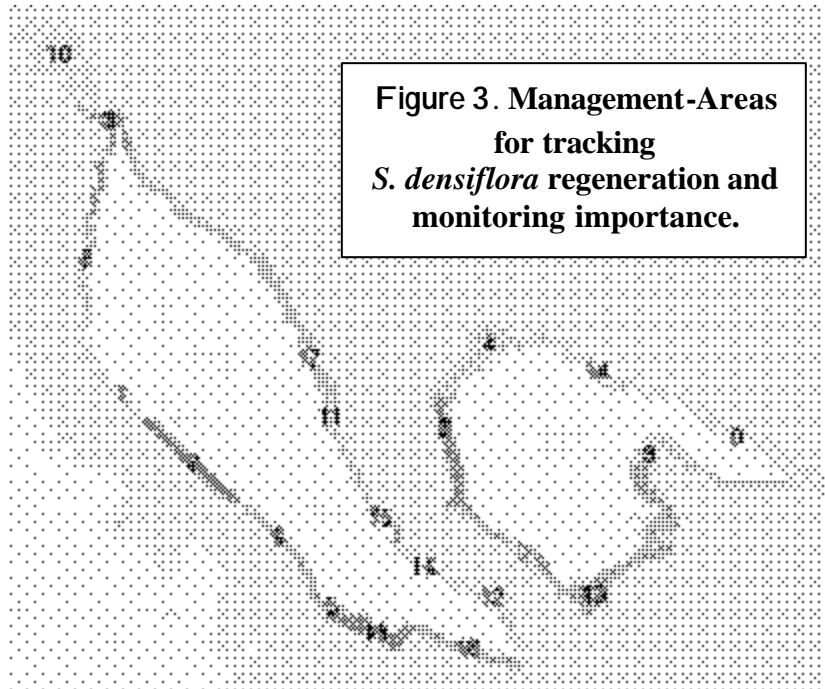
Trials were conducted using an Iphone in the field to digitally record this season's monitoring work. The Iphone was loaded with two specially designed programs: one for mapping the route taken and a second for recording the information about the plants collected. An adaptation of the second program was piloted that was designed specifically for collecting data on *S. densiflora* plant removals.

Individual *S. densiflora* seedlings often tend to grow in small groups or clusters and on removal appear like a single plant unless pulled apart to reveal separate individual plants. Thus for an accurate summary of the data, each plant-removal is referred to as a 'plant cluster' or plant bunch rather than simply a 'plant'. The size of the plant cluster is a reflection of a combination of the growing time and the quality of the substrate where the cluster grew. Thus, the size suggests the season or year the plant got established and whether the site is likely to be a good growing area and therefore an important site to monitor. The size is also useful to identify the actual area of beach covered by the *S. densiflora* regenerating seedlings. In addition, the numbers and sizes also indicate the overall effort expended for removal and transportation. Plant cluster sizes were recorded as Medium for >10 major stems, Small for 5 to 10 major stems and Tiny for <5 major stems.

Management Areas were established by the SWG to track the level of seedling re-establishment in specific sites. The Management-Areas for Denman, Hornby and JKMPP shorelines are shown in Figure 3. The relative significance of Areas in terms of the level of *Spartina densiflora* re-seeding and the need for future monitoring is recorded by classifying the Areas based on the numbers of plant clusters removed including: Critical = >100 plant clusters, of Concern 50-99 plant clusters and Important 20-49 plant clusters. These areas for the 2018-2019 season are shown in the tables for each island.



Figure 2. A tiny *S. densiflora* and small pick-mattock removal tool.

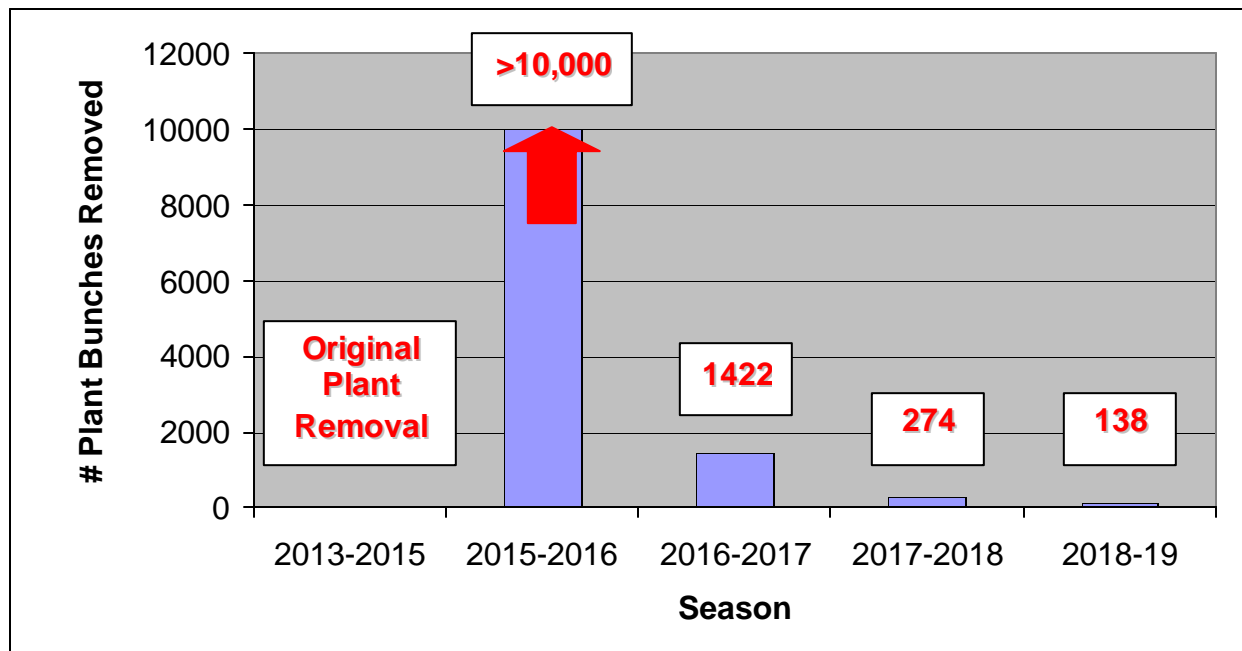


Results and Discussion

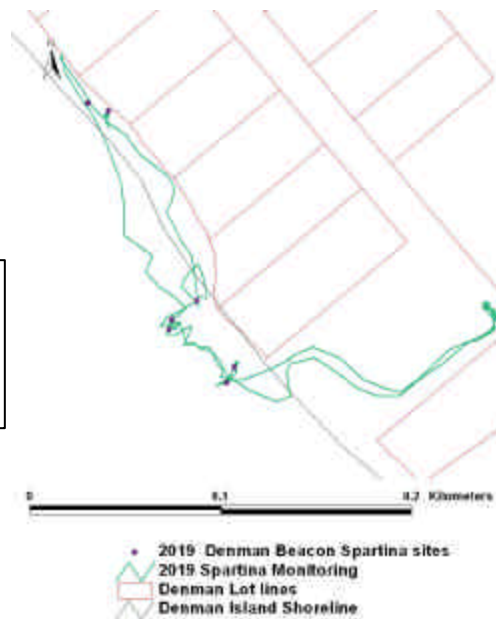
Denman Island

In the 2018-19 season, a total of 138 plant-clusters were removed from Denman shorelines, 113 in the fall and 25 in the spring. This number is down from last year's island-wide removal of 274 plant-clusters and continues the decreasing trend shown in Table 1. The most important site for monitoring is still the Denman Beacon, one of the salt marsh sites in Management-Area 1, just north of the Denman West ferry terminal. But the number of plant-clusters removed from the Beacon site has dropped from 86 last season to 55 this year, and Area 1 with a total of 60 removals, down from 108, is now "of concern" instead of critical. The Beacon site monitoring and removal is mapped in Figure 4.

Table 1. Summary of the *S. densiflora* on Denman removals for the fall 2013 to spring 2019.



**Figure 4. Beacon Site
Spring Monitoring
and Removals.**



The Beacon site is a salt marsh with a combination of Sea asparagus *Salicornia virginica* and Seashore saltgrass *Distichlis spicata*. Tiny *S. densiflora* are difficult to see in *Distichlis* marsh grass as shown by the cover photo, also repeated below in Figure 5. Also, as noted in 2017-18, the winter weather of 2018-19 was hard on the over-wintering Spartina plants. Due to the long periods of freezing temperatures and snow-cover on the shoreline, the *S. densiflora* plants tended to lose their obvious “green” colour by the spring - February-March recheck. Thus, the normally obvious bright green seedlings within the brown salt marshes, this year had become brownish and more difficult to see.

**Figure 5. Tiny
S. densiflora in *Distichlis
spicata* salt marsh.**



The Management-Areas 5 and 19 containing the salt marsh sites both north and south of Hinton Road, respectively, have dropped from areas of “concern” to “important”. Twenty-eight and 33 plant-clusters were removed in these Management-Areas respectively this season. This is down from 66 in Area 19, the Vale ns Brook estuary south of Hinton Road and down from 79 in Area 5, with the

two salt-marsh points north of Hinton Road. This long stretch of shoreline just south of McFarlane Road includes the estuary of Denman's second largest salmon-spawning creek, as well as many small bays and salt marshes. This shoreline's suitable growing habitat seemed to be one of first locations that had a dense coverage of mature *S. densiflora* plants. At this time, *S. densiflora* appears to be well-controlled in these sites and the native vegetation is filling in where the dense areas of former plants were removed. The overall removal numbers for all the sites are shown in Table 2.

Table 1. *Spartina densiflora* removed from Denman Island in 2018-19.

		AREA Importance (by # plants):		20-49 Important		50-99 Concern		>100 Critical	
PLANT SIZE:		M > 10 stems,		S 5-10 stems,		T <5 stems.			
AREA	Area Location (from N to S)	Site	Site #	Fall Count	Fall Total	Spring Count	Spring Total	Area Total	
3	Morning Beach to Gladstone			0	0	0	0	0	
8	Gladstone to Scott Rd	1st bay N	9	4	4	0	0	4	
1	Scott Rd to Ferry W	Denman Pt N	14	0	52	1	8	60	
		Denman Pt S & Lone Pine	18	4		0			
		Beacon	28	48		7			
7	Ferry W to Millard			0	0	0	0	0	
6	Millard to McFarlane			0	0	0	0	0	
5	McFarlane to Hinton	2nd Pt N	49 & 50	15	28	0	0	28	
		1st Pt N	51	13		0			
19	Hinton to Reginald	Bays N	53	1	17	0	16	33	
		Old Valens N	54	5		16			
		new Valens N (inter)	55	2		0			
		new Valens S	56	2		0			
		SB 3 marshes	57 58 59	2		0			
		Reginald N	67	5		0			
18	Reginald to Boyle Pt	Boyle Bay	74	8	8	1	1	9	
12	Ferry E to Boyle Pt			0	0	0	0	0	
16	McFarlane E to Ferry E			0	0	0	0	0	
15	Mallard Way to McFarlane E		76	4	4	0	0	4	
11	Beadnell to Mallard Way			0	0	0	0	0	
17	Morning Beach to Beadnell			0	0	0	0	0	
				Denman Total Removals =					138

Thick beds of shed-seeds were obvious when the large mature plants were removed between 2013 and 2015. At first the previously shed-seed was thought to remain viable for many years. But the dramatic decrease in seedling regeneration at these sites over the last three years suggests that while a few old seeds may be contributing to new seedlings each year, the extensive old seed-beds do not appear to be a major source of regenerating *S. densiflora* on Denman. Also, these old seeds are unlikely to be a major problem in the future as gradually the majority will decompose, be eaten or be deeply buried by moving sediments.

Setting future monitoring schedules for continuing to control *S. densiflora*, on Denman depends on the source of seed that is contributing to new seedling regeneration. The first possible source, the old seed-beds is discussed above. While the current seedlings may be growing from old seed, this source is unlikely to be important for the future. The second source is the potential seed production of the new first-season plants on Denman. The removal-data have indicated that in each season a very small number of newly regenerating plants on Denman have produced seeds in their first season prior to removal, occasionally by as early as mid-September. On the other hand, very few seed shoots were observed per plant and an even smaller number of seed heads had shed any seed prior to removal. While some plants may have been missed in each year, it is unlikely that any major seed-producing plants were missed. Thus, while the risk of seed production by young plants exists, the current level of yearly monitoring appears to be sufficient to prevent the spread of *S. densiflora* from first season plants.

The third possible source is seed from other locations, at present probably within the Baynes Sound region, such as Vancouver or Hornby islands or the salt marshes in JKMPP. In addition, possible seed sources could be world-wide, as ocean-travel, shipping networks and trade in maritime products is increasing with the growing human population. As the ocean is shared worldwide, the potential drift of *S. densiflora* seeds into the region, possibly assisted by vessels or equipment carrying seeds, will remain a concern. Thus, to ensure that the shores remain free of *S. densiflora*, continuing the current yearly monitoring is likely to be required.

This season, digital recording of plant removal data and monitoring tracks was undertaken with some success. A hands on training session with Megan Winand was beneficial. Due to technical difficulties, portions of the data was lost. From a monitors' perspective, it would be beneficial to have some immediate chart-form of feedback of the data on sites monitored and plants removed so that the results could be checked and progress could be tracked, particularly when sites are being re-checked. Without feedback, it becomes necessary to also record the results manually for local use and for re-checking. Also, in general more time was expended on the digital recording of each plant than removing the plant.

Jáji7em and Kw'ulh Marine Provincial Park

In 2018-19, the total number of *S. densiflora* plant-clusters removed from JKMPP shorelines was 677. While the total number of plants removed in the 2017-18 season is unknown, this is an increase from the 473 removed in 2016-17. JKMPP or Management Area 10 is a large exposed foreshore zone of shifting sediments and the sediment deposition is increasing, as the surrounding islands' backshores are progressively eroded. This sediment provides the ideal habitat for the foreshore-growing *Spartina* species to thrive. Several new shoals off the ends of the existing islets have been formed in the last five years and these are beginning to have salt marsh vegetation.

One of these new shoals is off the exposed northern tip of the second islet (Snake Islet). This shoal seems to attract the growth of more *S. densiflora* seedlings each year and it has become the most

critical site for *S. densiflora* monitoring in the Park area. In the fall huge mats of seaweed covered much of this shoal, but despite the limited exposure, 393 new seedlings were removed. In the spring monitoring no seaweed was present and an additional 145 plant-clusters were removed. Re-checking the site two weeks later, no trace of the *S. densiflora* presence was evident. Tree Island sites had 111 plant-clusters in the fall and three more were removed in the spring. Overall the number of seedlings removed from Tree Island dropped to one third this season compared with 342 removed in 2016-17. The inter-islet salt marshes had a total of 20 and two more seedlings were removed from the south end of Snake Islet. Thus, both Snake Islet and Tree Island are critical sites and the inter-islet salt marsh is an important site.

The source of seeds for the large number of seedlings removed from Management Area 10 is unknown but seeds may have come from the plant-clusters removed in the spring of 2018 from the north shore of Hornby Island. Some of these seedlings had shed seeds prior to removal. Of note, the adjacent Tree Islet was less affected than northern Snake Islet, and the northern tip of Denman was not affected at all. The scale of growth in one season re-enforces the need for yearly monitoring and also suggests that seeds may still be arriving from other regions.

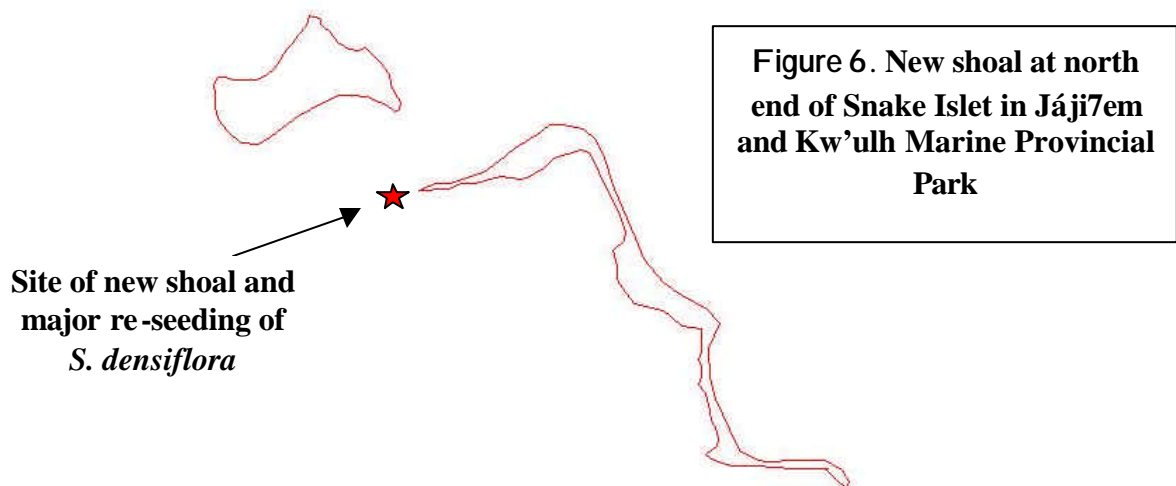


Table 3. *Spartina densiflora* removed from around Jāji7em and Kw'ulh Marine Provincial Park.

SITE SIGNIFICANCE:		20-49 Important		50-99 Concern		>100 Critical	
Site	2018 Fall Total	2019 Spring Total	2018-19 TOTAL	2017-18 Total	2016-17 Total	2015-16 Total	
Tree Island	111	3	114	unknown	342	453	
Inter Islet salt marsh N shoal	0	0	0		2	1	
Inter Islet salt marsh S shoal	20	0	20		11	0	
Snake Islet (2nd island) Shoal N tip	393	145	538		62	20	
Snake Islet Shoal S tip		5	5				
Square Islet NE (3rd island)	0	0	0		56	17	
Area 10 Totals	524	153	677	unknown	473	491	

Hornby Island

This report only covers the fall monitoring for Hornby Island as the new Hornby monitor completed an inspection of nearly the entire shoreline in the spring. Sites in three Management Areas were checked in the fall and a total of 185 plant-clusters were removed, as shown in Table 4. The small salt marshes along the Grassy Point-east site, all the way to the beach on the east side of Tralee Point, had 169 *S. densiflora* seedlings. This remains a critical site. Only three plant-clusters were removed from the Heron Rocks site and 13 from the south side of Dunlop Point, both in Management Area 13. The numbers of plants removed from both the Heron Rocks and Dunlop Point sites are reduced from 51 and 213, respectively, in 2016-17 and neither site has a significant monitoring rating at this time.

Table 4. *Spartina densiflora* removed from Hornby Island 2018

		Site Significance											
		20-49 Important				50-99 Concern				>100 Critical			
		2017 PLANT SIZE: M > 10 stems,				S 5-10 stems,				T <5 stems			
		2018				2017-18				2016-17			
Area	Site	Fall Removal	Fall Site Total	Fall Area Total	Area Total	Area Total (spring-only)	Site Total	Area Total	Site Total	Area Total	Site Total	Area Total	Site Total
13	Dunlop Pt S	Oct 10 R S4 T 9	13	16	*	31	213	264	181	251	61	270	
13	Heron Rocks	Oct 11 R M1 S2	3			0	51		70		209		
14	Grassy Area	Oct 10 R M 18 S 34 T 117	169	169	*	138	462	462	492	492	90	90	
0	Whaling Stn Bay	Oct 11 0	0	0	*								
Total # Removed		185								726	743	360	

* Numbers from new monitor

Conclusions & Recommendations

- Yearly monitoring and manual removal of *S. densiflora* continues to be a very successful method of controlling the re-growth of seedlings along the foreshore. Overall the numbers of new seedlings on the islands, particularly on Denman are declining.
- Unless the source of seed for new plants can be identified and controlled, annual monitoring will have to be continued to prevent the re-introduction and spread of *S. densiflora* within the Baynes Sound region. During one season, such as this year in JKMP, over 500 new seedlings, from an unknown seed source, were able to establish in a new small site. If left to go to seed in the first year, such a site could re-establish a major plant population.
- Increased effort needs to be directed to identifying continued sources of seed for *S. densiflora* within the Baynes Sound region. To do this, coordination of monitors within the region is recommended to ensure that all sites are being thoroughly monitored. Along the Vancouver Island shoreline, additional monitors could be identified that could check their local areas. A specific low tide week between late September and mid-October could be identified as "Fall Spartina-removal week" and all monitors could report and share their findings during that time. A review at the conclusion of the week could then target key areas where seed sources might remain. In this way, the removal of all local seed sources of *S. densiflora* could be accomplished.

Additional Notes:

- In May, the tarps covering the compost site on Tree will be removed from the previous decomposed plant mass and a single tarp will be re-placed over the new plant material.
- The author is disturbed by the apparent failure by the BC Spartina Working Group to recognize the success of manual methods for the removal of *S. densiflora* used in the SWG control program and the subsequent inclusion of this species in a pesticide permit application for the Baynes Sound region. The author does not understand the need to include pesticide-use as a tool for controlling *S. densiflora* at this time in this area. It is clear from the author's personal experience of manually removing *S. densiflora* for 6 years in a variety of sites in the Baynes Sound region from Vancouver Island to Hornby Island, that all *S. densiflora* plants in this area can be controlled manually and that no benefit can be gained from the use of a pesticide. On the other hand the inherent unknown risk of applying pesticides to plants in the marine environment, in the author's opinion, is a significant detriment. Thus, it appears to the author that the best science is not being applied to this issue.
- The author is also deeply concerned about the 2019 pesticide permit application for Baynes Sound and the intent to use Imazapyr herbicide as a treatment for the removal of *Spartina patens* on JKMP and on Hornby Island. The author has suggested two alternative methods for the treatment / control of this species and although these methods were initiated and showed some promise, neither method neither was supported through completion.