

**Dense-flowered Cordgrass *Spartina densiflora*
Regeneration Removal**

**Denman & Hornby Islands
Winter 2015-2016**



Report Submitted to D. Buffett & M. Christensen Ducks Unlimited

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Abstract

Monitoring the shorelines of Denman and Hornby Islands, during the winter, 2015-2016, for new seedlings of dense-flowered cordgrass *Spartina densiflora* was the primary objective of this year's Spartina Removal Project. The monitoring followed the spring-2015 removal of thousands of the remaining mature plants from an extensive area of the Denman shoreline, as well as the removal of all of the mature plants from Hornby. This digging could have released into the water column, years of accumulated seeds, of varying viability, from seedbeds around large *Spartina* plants. To identify any new sites with seedlings, a complete shoreline inspection of both islands was undertaken.

S. densiflora seedlings were found on both islands. The seedlings were small and were easily removed for composting. The monitoring results indicate that the manual control program for *Spartina* on Denman is continuing to be very successful. Overall 95 active *Spartina* sites were recorded on Denman. The number of new sites with seedlings was 27 this season, while 28 previous sites had no seedling regeneration. Of 37 sites with two full growing seasons since the removal of all mature plants, 25 showed a decreasing number of regenerations, while 5 showed an increase. The decrease in seedling growth between 2014 and 2015 reached 100's and 1000's of seedlings, while the increase in number of seedlings removed from all five sites was less than 100. Seven sites had no regeneration in either growing season.

S. densiflora was not observed in any new general areas of Hornby Island, but regenerating seedlings were found in all three previous locations, on the north, east and southern coasts. The extensive northern coast of Hornby had 14 new sites with 38 seedlings and these sites were spread further across this northern shoreline. Careful monitoring of this area is warranted, as there is considerable suitable habitat for the growth of future *Spartina*. In all three former Hornby locations, there were previous sites with several hundred small and tiny seedlings. All plants were removed and combined with the composted Denman plants and the spread of this plant on Hornby is being controlled.

Various *S. densiflora* monitoring issues continue to be refined throughout the project. The recognition that small seedlings may be missed during a single monitoring, particularly when beach debris has accumulated, and the fact that a few seedlings were sufficiently advanced by fall to have formed seeds, indicated that early and repeated yearly monitoring is necessary to prevent further spread of *S. densiflora*. A pilot volunteer monitoring program for major areas along the Denman shoreline is proposed for the next year. Composting of *S. densiflora* is continuing with most piles remaining stacked for a second summer. Where, after two summers of composting, some of the early piles were used as mulch, the material appeared withered, although not quite completely rotted, but has not shown any evidence of re-growth. One of the most notable features of the shoreline monitoring has been the continued dramatic erosion of the Denman backshore and the inter-tidal deposition of eroded sediments. The effects of these marked changes in the inter-tidal zone on the future growth of *S. densiflora* are unknown.

Table of Contents

Abstract	i
Introduction	1
Methods	1
Monitoring Survey Area	1
Data	1
Spartina Removal	1
Outreach	2
Results and Discussion	2
Spartina Regeneration on Denman After Three Years of Removal	2
Spartina on Hornby	5
Comments on Monitoring/ Re-growth / Removal	7
Shoreline Habitat changes	12
Composting	13
Outreach	13
Conclusions	13
Recommendations	14
Volunteer Monitoring Proposal	14
Appendix	16
Outreach Articles	17



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Ryan May and Flynn monitoring *S. densiflora* on Hornby

Abbreviations

DUC	Ducks Unlimited Canada
IAPP	Invasive Alien Plant Program
CIPC	Coastal Invasive Plant Committee – replaced by the CISC in 2012
CISC	Coastal Invasive Species Committee http://www.coastalisc.com/

Plant Names

Dense-flowered cord-grass *Spartina densiflora*
Dunegrass or Beach grass *Elymus mollis*
Sea asparagus (American glasswort) *Salicornia pacifica (or virginica)*
Seashore saltgrass *Distichlis spicata*

Introduction

Following the spring 2015 removal of the last of the mature *Spartina densiflora* plants from Denman and Hornby Islands, the continued *Spartina* monitoring has focused on removal of all seedling regeneration. The specific objectives for the winter of 2015-2016 were to check all known *Spartina* sites in the fall of 2015 and then to re-check the entire shorelines in the spring of 2016. Compost locations for *Spartina densiflora* were also monitored and project updates were presented in the local media of both islands.

Methods

Monitoring Survey Area

Denman

Initially the entire western shoreline of Denman Island, plus the previous *Spartina* sites on the eastern shoreline were checked in the fall of 2015. At this time there was an unusually large amount of seaweed washed up along the western shoreline. Drifts of up to three feet of seaweed had accumulated, preventing adequate viewing of any small *Spartina* seedlings. Thus, the entire island shoreline was re-checked in the spring of 2016. Much of the seaweed had dispersed or had been washed high up on the shoreline as a result of substantial storms.

The inter-tidal area of Denman Islands continues to change dramatically. High tides and occasional severe storms have caused excessive shoreline erosion along most of Denman Island. Deposition of eroded substrate in the high inter-tidal zone is considerable in many areas. In addition, a late spring storm washed a unusually large amount of woody debris onto the inter-tidal and low backshores.

Hornby

In the fall-winter of 2015, only previous *Spartina* sites were monitored and all the regenerating seedlings were removed. In the spring of 2016, a local Hornby biologist contractor was able to begin as the monitor for *Spartina* on Hornby and undertook to check the entire shoreline.

Data

Amalgamated records of all *Spartina* monitoring and removal were completed. New site data entries included the site identification, UTM location, length and width of polygon sites, the distance of plants from the high tide line, as well as the numbers and sizes of plants removed. In addition data summaries were prepared for the overall numbers of plants removed from each site and for tracking the seedling regeneration.

Spartina Removal

Digging

Manual removal of *S. densiflora* seedlings is a much simpler process than that of mature plants. A small pick was used to dislodge the substrate at the base of the seedling and then the plants were easily removed. Plants were placed in a convenient carrier bag while the shoreline was walked and eventually all plants were included in a small compost pile with other plant material.

Composting

Compost piles on the eight private landowner sites were checked. All but two compost sites had been covered with tarp material and the largest of these piles will be covered before the 2016 summer. Some rotted material from the July 2014 plant removals has already been used as mulch but most of the material will remain covered for a second summer.

Outreach

Articles were written for both monthly newspapers on Denman and Hornby Islands and as updates for the Denman Conservancy Association newsletter. A presentation of the Denman-Hornby *Spartina* project was made to the annual *Spartina* Working Group session.

Results and Discussion

Spartina Regeneration on Denman After Three Years of Removal

Overall Denman Records

Charts tracking the mapping and removal of *S. densiflora* plants from the entire Denman shoreline for each monitoring period from the fall of 2013 to the spring of 2016 are attached. A chart summary of the overall number of plants in each site each year and a chart tracking the number regenerating seedlings removed from each site were prepared for the records.

Important Note about the Term "Site" The data in this report are presented in the existing "site" format but a new format is proposed for use in the future. The term "site" was initially used to describe a point or polygon area of mature plants. The term has continued to be used for describing the original locations and also the locations of points where new seedlings have been found. New seedlings are now growing in various small areas of original large site-polygons, thus the use of the old "site" location for these seedlings becomes a less accurate description of their locations. Also, as seedlings sprout in between original site points and polygons, identifying 'new' sites at various distances from existing sites has created a messy data set.

As mature plants on Denman were spread fairly thickly along the shoreline, many original "sites" were chosen because they had a fairly identifiable geographic context, e.g. "3rd point north of Hinton Road". In terms of finding and tracking seedling plants in the future, retaining these site-areas has merit. In addition, as nearly the entire western shoreline of Denman has had seedlings, it makes sense to use the entire shoreline as a framework for the data set. The portion of the eastern shoreline where seedlings have grown is a discrete location, easily identifiable, and could be included in a new shoreline framework.

The **suggestion for managing the future data set of Denman** is to divide the shoreline into segments. On Denman's west coast, where geographically appropriate, some of the existing sites could be identified as the new "site-segments" and the shoreline between these could be geographically subdivided and identified as specific site-segments of approximately similar lengths. Also, one or two site-segments could be defined for the affected eastern shoreline. Then accurate UTM locations of removed-regenerated-seedlings for each monitoring period could be entered into the appropriate site-segments. Future data could then be organized and managed by these geographic site-segments.

This method would reflect the locations and approximate amount of regeneration along the shoreline. Unfortunately three reasons would make using this technique to track an accurate

number of seedling-plants per unit of equal shoreline inappropriate. First, creating segments of exactly equal length would be difficult, given shoreline irregularities, next, the inter-tidal substrate habitats are not comparable and lastly “linear distance” defined segments could be difficult to track in the field leading to confusion and inaccurate data recording. But using geographically-appropriate segments and attaching the UTM coordinates within these specific shoreline segments, rather than to arbitrarily numbered sites, would make tracking future seedling regeneration more accurate and habitat/location-focused.

Regeneration Data Denman 2015-16

Number On Denman **118 “sites”** have been recorded and are shown in Figure 1. This winter 2015-16, **27 “new” sites** were recorded, **28 previous sites had no regenerating seedlings** and **95 sites were currently active**. The number of new sites is up from the 11 new sites recorded during the 2014 growing season. This is likely due to the removal of a substantial area of the remaining mature plants just prior to the 2015 growing season. This removal of plants dislodged layers of old seedbed and may have left 1000’s of seeds potentially moving in the water-column.

During both fall and spring monitoring 2015-16, **12,952 seedlings were removed** from all the sites, plus a additional few seedlings were removed during a Spartina Working Group field session on Denman in October and others were likely removed by volunteer beach-walkers.

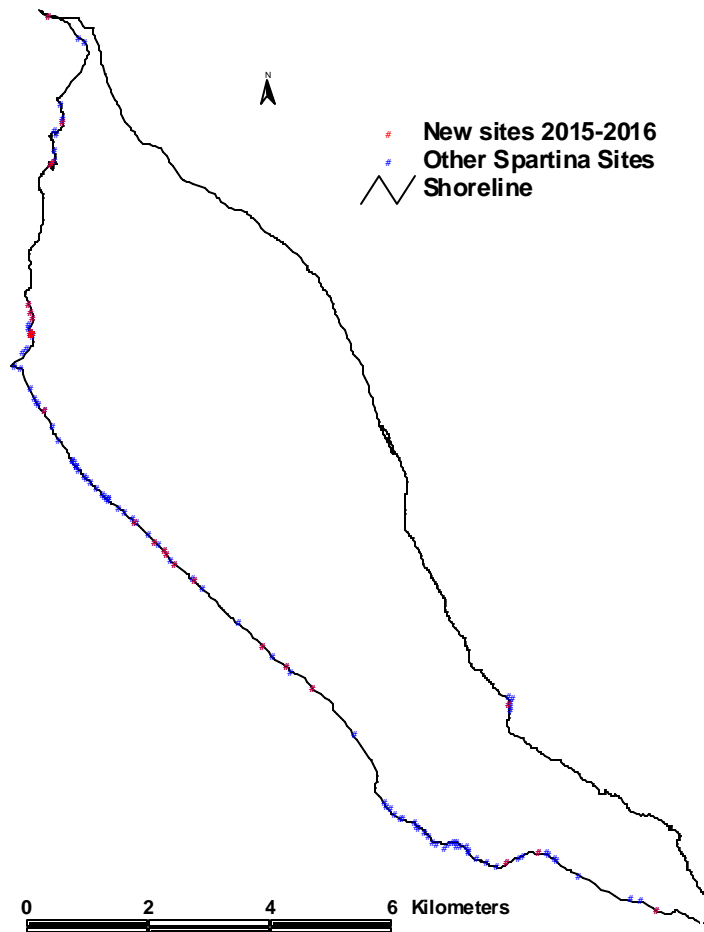


Figure 1. Spartina densiflora sites, Denman Island, B.C Fall 2013 to Spring 2016.

Plant Size The regenerating seedlings were all classified as **small or tiny** as compared to the sizes of mature plants. “Tiny” was defined as a single main stem, with or without small attached tillers. Tiny plants likely reflect the most recent regeneration. A “Small” seedling was defined as less than 10 cm wide and most were less than 2cm. A few seedlings grew to close to 40 cm high, but most were less than 15 cm and many less than 10 cm. An occasional plant was called a “Small +” that was both tall and wide. The small size of the seedlings meant that they were very easily removed and carried away in a small bag for composting. A small pick was used to loosen the substrate and the plants were easily pulled with the roots attached.

During the fall monitoring a few plants were found in seed or in flower. While the summer of 2015 was an extraordinarily prolific growing season, seedlings that went to seed may have been very young seedlings that were missed in the previous spring removal or were seeds that sprouted quite early in the growing season. A discussion of reasons for inevitable “missed” plants follows.



New *S. densiflora* seedlings in seed Oct-Nov 22015

Amount of Regeneration An early effort was undertaken to analyze the current available data to assess the amount of *Spartina* regeneration and thus the success of this manual control project. 37 sites or combinations of sites could be used for this analysis. These were sites for which all the mature plants had been removed during the fall 2013 monitoring season, and for which the subsequent monitoring for regenerating seedlings was conducted after each of 2 full growing seasons (2014 & 2015). Thus the regeneration results for two seasons could be compared.

In 7 of the 37 regeneration comparisons there was no regeneration in either growing season. In 2 comparisons, the number of regenerating seedlings remained the same, at 2 and 3 seedlings each. In 5 comparisons the number of regenerating seedlings increased and in 25 the number of seedlings decreased. The amounts by which the number of regenerating seedlings increased or decreased are shown in Figure 2. The magnitude of the decreased regeneration reaches the 100’s and 1000’s of seedlings, while that of the increase in all five sites is less than 100.

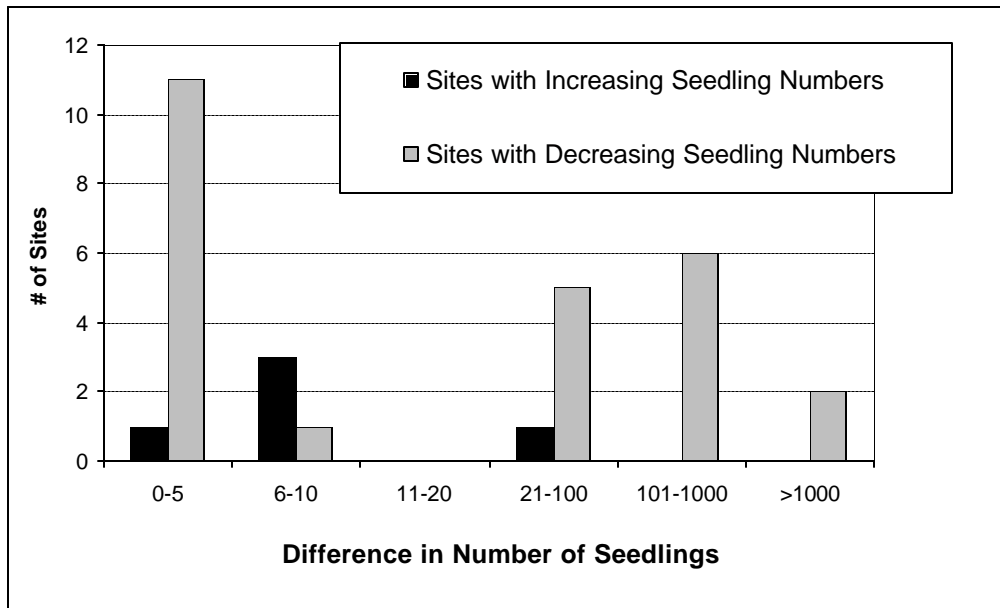


Figure 2. Comparison of the difference in seedling numbers over two growing seasons in 37 sites.

Spartina on Hornby

In the initial monitoring of Hornby Island *Spartina* sites, new seedlings were observed and removed from all three known areas, including Heron Rocks, south Dunlop Point and near Grassy Point. The largest extent of shoreline affected is on the northern coast, as shown in Figure 3. The new sites have extended this *Spartina* area both to the west of Grassy Point, as well as east almost to Trailee Pt. There are large diverse salt marshes in this area, extending well out from the shoreline. Most new sites on this coastline had 1 to 4 seedlings. A small very dense patch of short plants, covering 2 by 3 m, had over 217 tiny seedlings, as well as 17 small plants, and these seedlings were firmly anchored in a mud patch high among rocks only 3 m from the high tide. Another new site, near previous ones, had 19, mostly tiny seedlings. The former *Spartina* polygon site, at the far eastern edge of this area had over 200 seedlings including two small seedlings that had already formed seeds when removed in December 2015. The potential for *Spartina* expansion in this area is high.

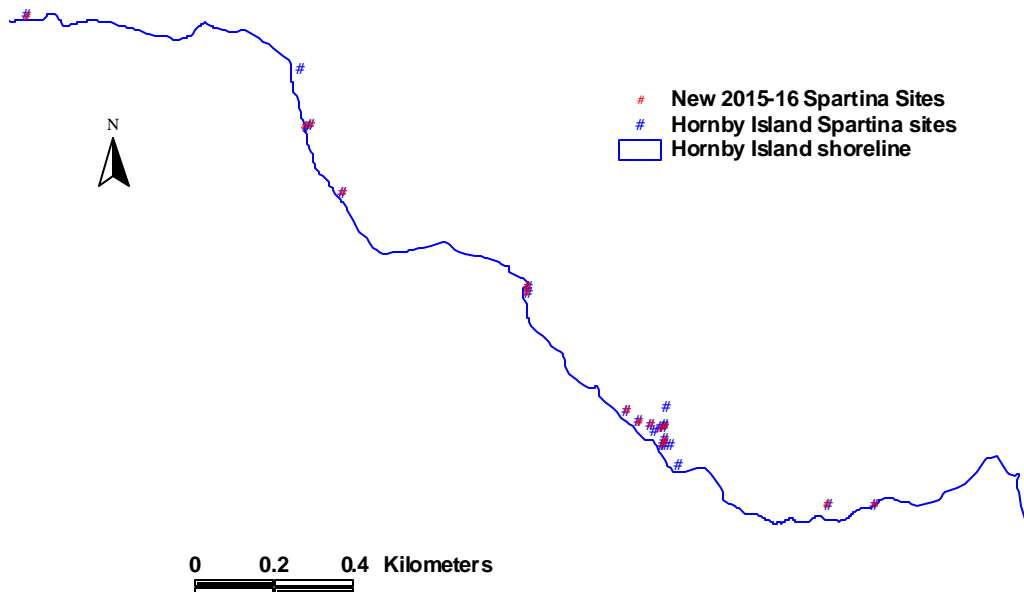


Figure 3. *Spartina* sites on Hornby Island's northern coast, near Grassy Point.

The shore near the Heron Rocks Friendship Centre, particularly close to Toby Island also had substantial *Spartina* regeneration, 61 small and 5 tiny seedlings, considering that only two very large and one medium mature plants were removed from this area in the spring of 2015. In addition, 3 new sites with a total of 4 seedlings were found in the area of former plant sites, as shown in Figure 4. The source of this regeneration could have been the local seedbed or perhaps seeds from other locations. The third Hornby *Spartina* area, just south of Dunlop Point, also had a prolific but fairly concentrated seedling re-growth, with 101 small plants and 77 tiny seedlings.

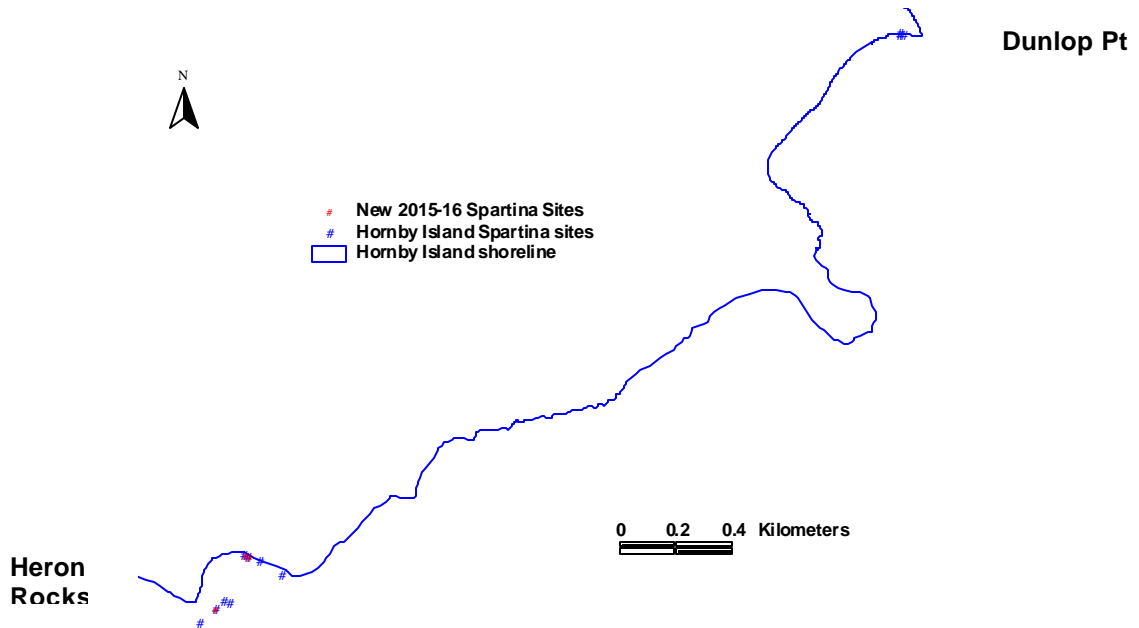


Figure 4. *Spartina* sites on Hornby Island's southern coast, near Toby Island.

All of these Hornby areas merit watching closely. Fortunately a young biologist, who had recently moved to Hornby, was willing to take over the monitoring program and he conducted the complete shoreline monitoring in March 2016. Three additional seedlings were found along the Galleon coast in a training session and then 3 more were found by the new monitor, also in part of this area. All of the sites on Hornby Island where *Spartina* has been found are shown in Figure 5.

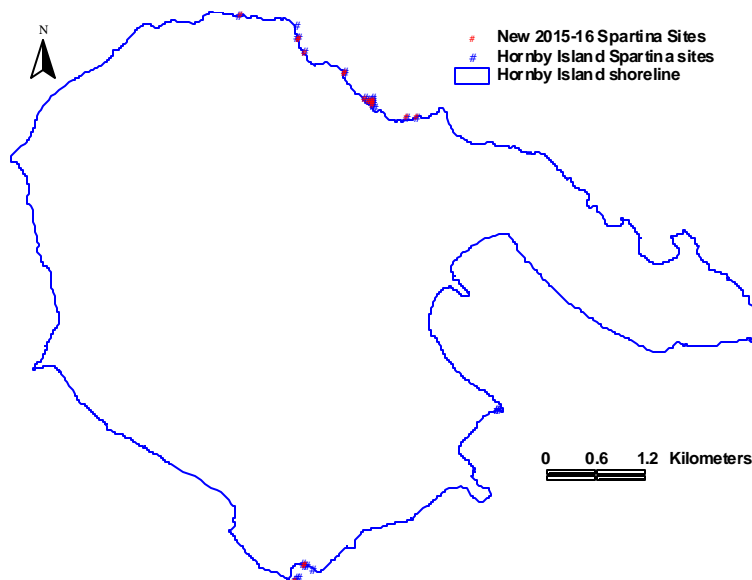


Figure 5. *Spartina* sites on Hornby Island, showing new sites identified in the winter 2015-16 monitoring.

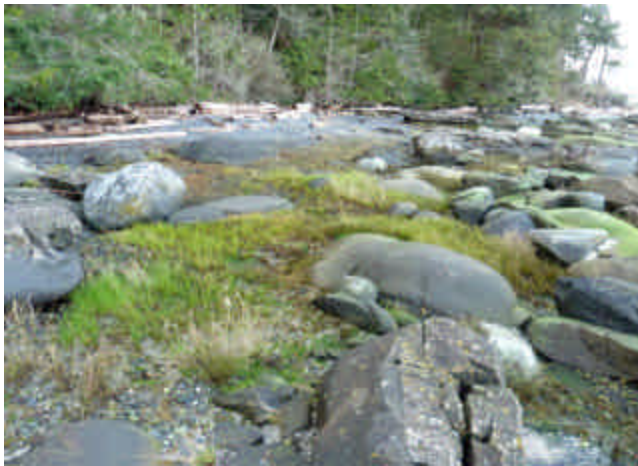
Comments on Monitoring/ Re-growth / Removal

Timing of Monitoring

The author remains even more convinced that the best time to monitor for *S. densiflora* is in the winter, especially when looking for small regenerating seedlings. Even small *Spartina* seedlings tend to stand out among the partially withered brown stems of the other salt marsh plants.



***S. densiflora* seedlings in seashore saltgrass and sea asparagus marshes in November**



The best monitoring window begins to close towards mid to late March when the upper inter-tidal salt marsh plants become green and growing as shown in the photo opposite.

A New Monitoring Issue

Extensive areas of dune grass *Elymus mollis* were noticed growing out into the inter-tidal all around the Denman shorelines. Normally dune grass is a plant of the beach backshore. But it appears this grass also took advantage of the high inter-tidal sediment deposition and long growing summer season of 2015 to advance metres into the inter-tidal area. This is the same area where *S. densiflora* grows and in at least one case, dune grass was growing all around *Spartina* plants, as shown below.

Monitoring for *Spartina* in the inter-tidal area is likely to become increasingly difficult, as dune grass is also green in winter; the young Dune grass sprouts resemble *Spartina*; and also large dune

grass plants may obscure small *Spartina* seedlings. The future survival of Dune grass in the inter-tidal zone is unknown. Some of the abundant growth of dune grass has suffered considerable damage during the tide tides and winter storms.



Dune grass growing far out in the inter-tidal / salt marsh area.



Dune grass patch in the inter-tidal area after heavy abuse by tides and marine debris.



Dune grass mixed with *Spartina* (←) and sea asparagus in the inter-tidal area.

Hardy *Spartina*

As always *S. densiflora* continues to demonstrate its resilience and persistence. These photos show in one case a seedling established in an open exposed sloping cobble shoreline, at some distance from the high tide, and in another case, established on a sandstone shelf among rocky debris.



Isolated *Spartina* seedlings in harsh environments.

Re-growth of *Spartina* on Denman

Buried Plants & Plant Fragments During the fall monitoring in 2015, a few tips of large *Spartina* leaves were observed above the beach-surface. These leaves had large stems that were connected to tiller/plant-growth deeply buried in shoreline sand. In one case the buried stems were longer than the large pick-mattock used for removal. Several recurring plant bases or tiller areas were situated along the length of this plant at varying intervals and this observation suggested that repeated burial and re-growth might have occurred. A couple of these buried plants were found, but they were rare and could be removed with a large pick. The occurrence of buried plants had been a major concern after the removal of the mature plants. At that time, it was obvious that some *Spartina* plants along dune-type areas of beach appeared to have re-grown from deeply buried tillers and had re-established new plants at the beach surface. How long tiller segments can survive burial without leaves, and whether any large amount of buried *Spartina* plant material will re-grow at some point in the future are questions that remain to be answered.

Another question raised last year was whether small plant fragments, occasionally broken off from huge mature plants during digging, would settle into the beach sediments and re-grow. At the time, an effort was made to collect as many of these fragments as possible, but many were washed away with the advancing tides or were trampled in the process of moving the massive amounts of plant material. During the subsequent fall 2015 monitoring, a few of these fragments were found on the foreshore. But nearly all these fragments were dead and partially rotted. Hopefully no fragments have landed and grown on neighbouring shores!



***S. densiflora* buried in beach sediment, having grown up re-establish leaf-growth**



***S. densiflora* growing from old fragments**

Dead Stems In the former dense *Spartina* areas, a few old mats of dead stems remained in the substrate. Whether these would re-grow was also a worry following the previous mature plant removal. Many of these dead mats of stems were removed, but some old fragments were lost in the digging of large areas and other very old stem-mats were left. As shown below, growth of these old mats was not observed, but some of these mats are also being eroded.



Dead stems of old *S. densiflora* growth

Missed Seedlings

A few regenerating seedlings were able to produce seed during the summer of 2015. These plants may have grown quickly in their first season or they may have been tiny seedlings that were missed in the 2014-2015 monitoring. Reasons for missed seedlings, other than just failing to see them include:

Shorelines covered in seaweed Sea weed not only obscures tiny plants from view, but large drifts may flattened small plants. Due to the heavy seaweed drifts on the western shore of Denman during the fall 2015 monitoring, a further spring monitoring was conducted. Although much of the seaweed had moved on, a few obscuring patches were still present in the spring 2016.

Shorelines covered woody debris Woody and other garbage debris provides an obvious cover, that could potential hide *Spartina* seedlings. As much of this debris moves around with the tide, *Spartina* plants hidden on one monitoring may be visible on the next.



Sea weed and woody beach debris can obscure *S. densiflora* seedlings.

Obscuring salt marsh plants While *Spartina* plants do stay green in winter and tend to stand out among the brown-dried local native salt marsh plants, a dense growth of salt marsh plants, particularly seashore saltgrass *Distichlis spicata* can hide *Spartina* seedlings. The dried grass-like stems of saltgrass resemble *Spartina* leaves and areas of dense dead saltgrass material can flatten tiny *Spartina* seedlings. Sea asparagus tends to have a different structure than *Spartina* so is less likely to hide seedlings. Yet dense stands of sea asparagus areas can also mask tiny *Spartina* seedlings. In these salt marshes, tiny *Spartina* may be obscure unless the observer happens to be directly over them or happens to get just the right angle to see them. Photos of tiny *Spartina* seedlings in salt marshes would make good make good “Where’s Waldo” pictures, as shown below.



Small *S. densiflora* seedlings in sea asparagus and seashore saltgrass marshes.

Volunteer Monitoring

As a result of issues of missed plants and the need to remove *Spartina* seedlings prior to any seed production a pilot volunteer monitoring program is proposed. This program would involve repeated monitoring throughout the year and could effectively control *Spartina* while also further involving the local community. The details of this program are included in the recommendations of this report.

Shoreline Habitat changes

Two habitat changes, shoreline erosion and foreshore deposition (or in some cases foreshore scouring) were described in last year's report. These have continued and increased this winter. In addition, large amounts of both seaweed and woody debris have been deposited on the backshore as well as in the inter-tidal area. In some areas the scouring within the inter-tidal zone has erased any evidence of the mounded beach substrate that had accumulated in the *Spartina* plant areas. Even the native plants such as the sea asparagus have undergone erosion of their roots.



The subsequent deposition of eroded sediments from the backshore has added layers of sand to the high foreshore. Also, the storms have massed thick deposits of oyster shell from the shellfish leases in some foreshore sites. In the inter-tidal area, one notable plant change has been the growth of dune grass into the foreshore as already mentioned. The potential effects on *Spartina* are as yet unknown, but scouring may be eroding and removing some *Spartina* plants, while added substrate may be creating additional habitat suitable for *Spartina* seed germination.

Composting

Composting of *S. densiflora* is continuing with most piles remaining stacked and covered for a second summer. The plant material appears wilted and dead. Two compost sites had been left un-covered and on the top of one huge un-covered pile, a few, less than five, *Spartina* leaf-sprouts were observed on the top surface, among other, mostly weeds that were growing. This pile will be covered this summer. Any of the rotted material that has already been used as mulch has not resulted in the successful growth of plants. Photos of compost piles are included in the Appendix.

Outreach

Articles prepared for the islands' monthly newspapers as well as an update from the most recent Denman Conservancy Association newsletter are included in the Appendix. Talking with islanders continues to be a major route for sharing information about the *Spartina* program and this often happens while monitoring is taking place on the beaches. The recent *Spartina* pesticide permit application process played a major role in increasing islanders' awareness of the importance of the control of this invasive marine grass. In the future, the proposal for a volunteer *Spartina* monitoring program could involve an even larger number of islanders in *Spartina* control and will continue to increase the profile of the control program.

Conclusions

The monitoring and manual removal of *Spartina densiflora* on Denman and Hornby Islands continues to demonstrate the successful control of this invasive marine grass. While large numbers of seedlings are regenerating, they are easily removed, and over the last two growing seasons, a large majority of sites have a decreasing number of regenerating seedlings.

The best time to monitor for regenerating seedlings of *S. densiflora* is in winter, although in completely open areas they can be easily seen at any time.

Due to the occurrence of some regenerating *S. densiflora* seedlings producing seeds during the first growing season after a single yearly monitoring, monitoring should occur if possible several times each year, including late summer to prevent seed spread.

Small seedlings of *S. densiflora* can be missed during a single monitoring check due to a variety of issues beyond the control of the monitor, such as accumulated and drifting seaweed and other beach debris. Thus repeated monitoring will be more effective for *Spartina* control.

Due to several of the above observations, setting up and testing a pilot, repeated, volunteer monitoring program with sustained support for the volunteers is suggested as an effective method to control the regeneration of *S. densiflora*.

Composting *S. densiflora* has been successful in providing a local method for handling *Spartina* plant material removed from beaches. The subsequent decomposing material is also providing useful garden mulch.

Shorelines of Denman Island are increasingly eroding and some of these eroded sediments are being deposited in the high inter-tidal zone. While the overall effects are unknown and various changes in plant growth may occur, one of the results may be the creation of additional suitable habitat for future *Spartina* growth.

Recommendations

A recommendation regarding tracking *Spartina* data on Denman by recording the UTM locations of regenerating seedlings within specified segments of the shoreline, as opposed to the former use of “site” is covered on page 5 under “An important note about Site”. This method will work well with the following proposed volunteer monitoring.

Volunteer Monitoring Proposal

Observations and data over the past three winters of *Spartina* removal on Denman and Hornby has lead to the recommendation to test a volunteer Denman shoreline *Spartina* monitoring program. Factors facilitating the proposal are that at this stage of program, all germinating plants are quite small and easily removed, thus material can be easily collected and composted locally on Denman. Issues driving this proposal are that some young seedlings can be missed in a single yearly monitoring visit due to unavoidable beach-debris or the impossibility of detecting tiny plants and / or those masked by other plant growth. Also some fast-growing seedlings will reach seed-stage prior to the best *Spartina* monitoring time, in the fall of the year. Thus monitoring repeatedly throughout the year is preferable to achieve more complete *Spartina* control.

Proposal Goal

To set up ad test a model volunteer shoreline monitoring program to control *Spartina densiflora* on the Denman shoreline.

Monitoring Program Objectives

- For volunteers to monitor the active *Spartina* shorelines of Denman at least four times a year and remove any *S. densiflora* seedlings.
- To keep track of the number sizes and general location of seedlings removed from each shoreline area.
- To remove all seedlings early so as to prevent any seedling from getting to the seed-forming stage.
- To compost the removed *Spartina* seedlings in a central location.
- To use a contract coordinator to organize and facilitate the program, set up and assist volunteers, keep track of and report all data, safely compost the removed material, monitor the previously inactive shoreline areas at least once a year and provide a liaison with the *Spartina* Working Group (SWG) and local Non-profit group.

Overall Structure of the Volunteer Program

- Ducks Unlimited Canada (DUC) for SWG as the over-seeing organization to contract the program coordinator /to provide funds to local Non- profit organization to run program/ and to ultimately receive all data and reports.
- Non-profit Denman Island organization to sponsor project and provide general liability insurance and equipment for volunteers
- 10-12 volunteer monitors
- Contract coordinator
- Annual report to SWG (DUC contract supervisor) from coordinator.

Proposed Duties of Coordinator

- Contract with DUC.
- Liaise at least 2x/year with Dan and Matt. Also liaise with other SWG's representatives as appropriate. Report regularly to Denman Island non-profit group e.g. monthly when activities are in progress.
- Choose, organize, instruct, guide, help out as needed with volunteers
- Through the Denman Non-profit Group purchase kit equipment and hand out to volunteers
- Map and assign areas – preferably as requested – give volunteers maps of data for each area
- Organize compost
- Collect data and compost from volunteers at least 2x/year
- Walk any active shoreline not covered twice/year
- Walk previously inactive shoreline once/yr
- Host annual celebration and update (SWG rep may wish to attend)
- Summary Year-end report of data, observations and tasks accomplished to DUC and Island non-profit group.

Proposed Duties of Volunteers

- Walk selected section of beach at least 4x/year- all 4 seasons
- Record #, size and location (descriptive) of any *Spartina densiflora* plants in waterproof notebooks
- Dig up *S. densiflora* plants, transport in bags & backpack and save compost in identified secure location to be picked up by contractor.
- Pass data on to coordinator who will check in at least 2x/year.

Involvement of Non-profit Denman Island Organization

- Sponsor project as one of their activities.
- Receive funds from SWG/DUC for providing general liability for volunteers and for purchasing equipment for volunteers.
- Contribute to advertising and facilitation of project within the scope of their normal outreach, e.g. web site, Facebook page, Newsletter.
- Liaise with other island groups as appropriate.

Appendix

Outreach Articles

Denman Newspaper Article - The Flagstone

Weeding Denman's Salt Marshes

Spartina densiflora also known as “Dense-flowered cordgrass” arrived from South America and established on the Baynes Sound shoreline probably in the late 1990's. The seeds and plant fragments of this invasive marine grass gradually travelled north and landed in bays and estuaries from California north to BC. Where, soon this tall, elegant and very productive grass grew and took over entire salt marshes and mud flats, excluding the native flora and fauna.

The seeds of *Spartina densiflora* often get anchorage among the stems of existing foreshore plants but soon overgrow them, reaching a height of almost 2 m. This species of *Spartina* is a bunch-grass, reproducing both by seeds and by spiky side-growths like bulbs, called ‘tillers’. A single plant can grow to over a metre in width, enlarging around the outside. *S.densiflora* grows high in the intertidal zone, near the shoreline. On Denman's west side entire areas of shoreline were lined by these huge plants, altering the whole foreshore ecosystem.

This vibrant growth of several *Spartina* species spelled trouble for salt-marshes all along the Pacific shoreline. Coastal marshes and mudflats normally so active and important for birds, invertebrates, fish and mammals soon became dense waving masses of tall, introduced marine grass and very little else. Needless to say, the clam and oyster industries were negatively affected in some areas.

So, agencies and organizations in the USA began programs to restore the earlier salt marshes. In 2010 the BC government signed an international agreement with the Pacific-coastal states of the USA to participate in the complete removal of invasive *Spartina* species from the Pacific shoreline. Thus fisheries staff in Canada began looking for *Spartina*. They were kept busy with other *Spartina* species in the lower mainland for a while, but then they noticed Baynes Sound!

In the initial years, chemical treatment of the “infestation” of *Spartina densiflora* on Denman was insisted on. But later, after the Denman public's reaction to using the herbicide “Imazapyr” was registered, a manual removal program for *Spartina* began on Denman's shores. Nearly all the Denman sites were dug by hand and many islanders got great muscles participating. A volunteer “*Spartina* Day” was also very successful.

The one-time use of trucks on our beaches allowed the prompt removal of well over 20,000 kg of *Spartina* plant material. BC Parks and the Centre for Shellfish Research assisted with the removal of *Spartina* material from the Boyle Point Park shoreline. Initially, *Spartina* plants from Denman were sent to the Pigeon Lake landfill, as was done with material from the Vancouver Island side of Baynes Sound. But after that first fall, *Spartina* vegetative material from Denman was composted here as an experiment. The compost material seems to be breaking down fairly quickly.

Finally, the last massive section of huge *Spartina* plants, along the south Lacon Road beaches, was dug out in one week using a tiny backhoe, assisted by many islanders. In the spring of 2015, the last mature plant of *Spartina densiflora* was removed from Denman's shoreline. The few plants found on Hornby were also removed and no other *Spartina* species has been found on Denman and Hornby, although *Spartina patens* is on Tree Island and in Courtenay. *S. patens* is quite a different plant.

The next few fall/winter seasons will involve the “weeding of the salt marshes”...checking for small *Spartina* seedlings and removing them. These seedlings regenerate from the many years of deposited seeds. They are easily pulled by hand, especially if a small pick is used to loosen the beach so that all those little tillers come out smoothly. Careful attention should be paid to not losing any tillers.

The manual digging of *S. densiflora* has been very successful on Denman. Where extensive areas of *Spartina* were removed, the native salt marsh plants, particularly American glasswort and seashore saltgrass are coming back prolifically. Soon Denman’s salt marshes will be fully restored from this initial *Spartina* incursion. .

Many many thanks to everyone who has assisted the *Spartina* program!

Pictures:

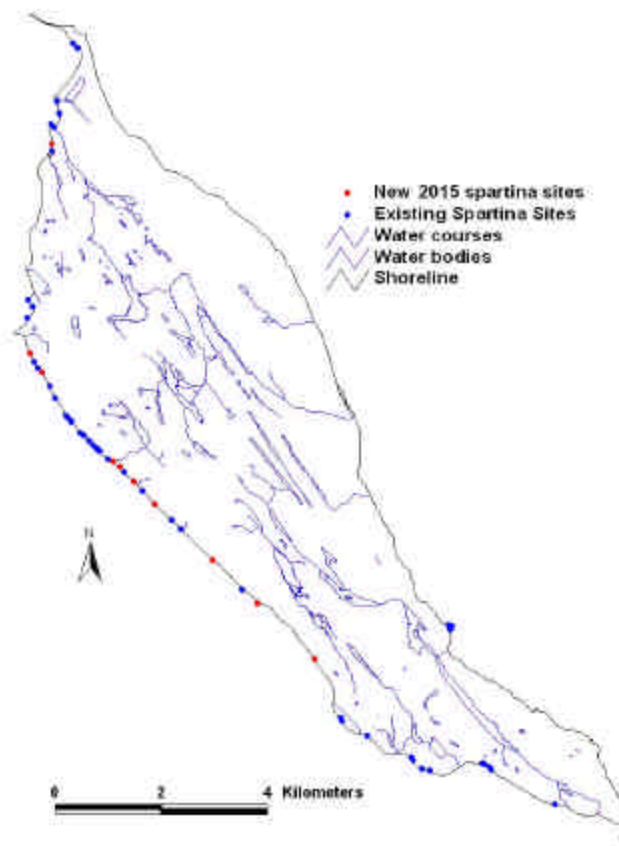
Spartina plant

Spartina tillers

Spartina Day – the volunteers

Last Plant and group

Map of Former Denman *Spartina* Sites Prior to Removal



Hornby Newspaper Article - The First Edition

Weeding Hornby's Salt Marshes

Spartina densiflora also known as “Dense-flowered cordgrass” arrived from South America and established on the Baynes Sound shoreline probably in the 1990's. This invasive marine grass has travelled north along the Pacific shoreline. The seeds and plant fragments from unknown sources landed in the salt marshes of bays and estuaries from California north to BC. Where, in no time this tall, elegant and very productive grass established and took over entire salt marshes and mud flats, excluding the native flora and fauna.

The seeds of this Spartina or cordgrass often get anchorage among the stems of existing foreshore plants but soon overgrow them, reaching a height of almost 2 m. This species, S. densiflora, is a bunch-grass, reproducing both by seeds and by spiky side-growths like bulbs, called ‘tillers’. A single plant can grow to over a metre in width, enlarging from tillers around the outside. S. densiflora grows high in the intertidal zone, near the shoreline. On Denman entire areas of shoreline were lined by these huge plants, altering the whole foreshore ecosystem.

The vibrant growth of several Spartina species has spelled trouble for salt-marshes all along the Pacific shoreline. Coastal marshes and mudflats normally so alive and important for birds, invertebrates, fish and mammals soon become dense waving masses of tall, introduced marine grass and very little else. Also, needless to say, in some areas the clam and oyster industries were negatively affected.

So, agencies and organizations in the USA began programs to restore the earlier salt marshes. In 2010, the BC government signed an international agreement with the Pacific-coastal states of the USA to participate in the complete removal of invasive Spartina species from the Pacific shoreline. Thus fisheries staff in Canada began looking for Spartina species and initially were kept very busy in the lower mainland, but then they noticed Baynes Sound!

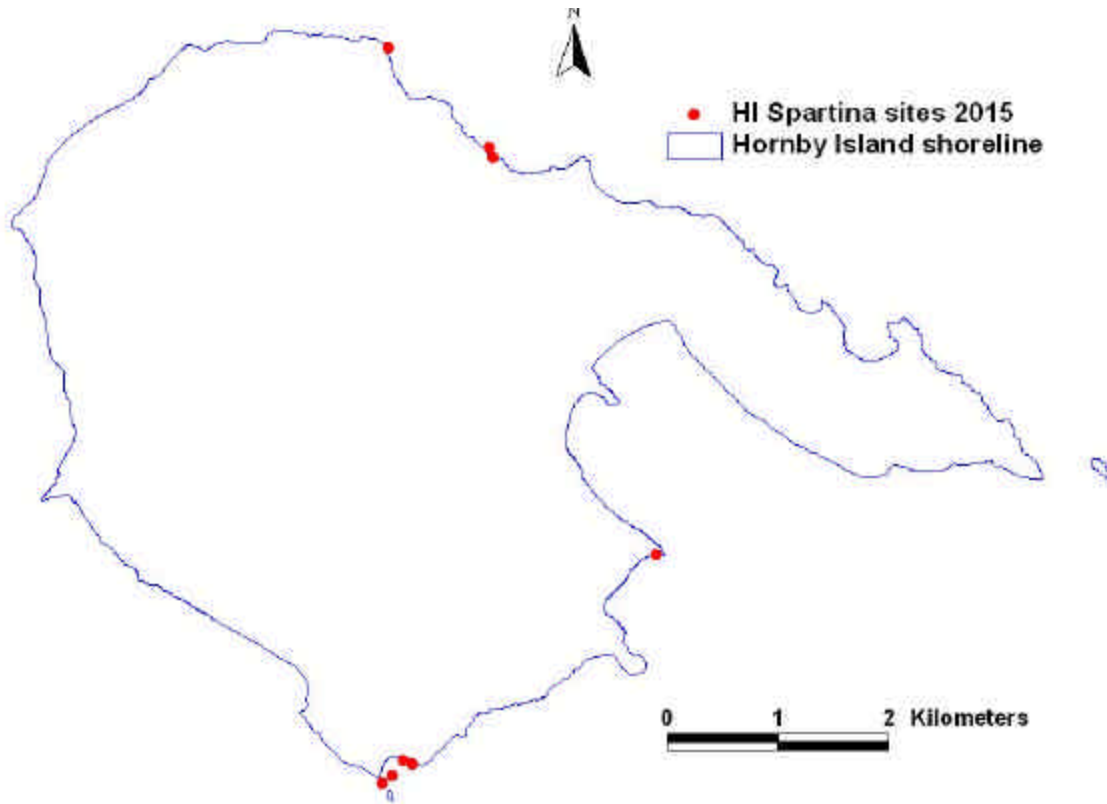
In the initial years, chemical treatment of the “infestation” of Spartina densiflora on Denman was insisted on. But later, after the Denman public's reaction to using the herbicide “Imazapyr” was registered, a manual removal program for Spartina began on Denman's shores. All of the Denman Spartina, except one massive area, was dug by hand and many islanders got great muscles participating. A volunteer “Spartina Day” was also very successful.

In the spring of 2015, the last mature plant of Spartina densiflora was removed from Denman's shoreline. That same year S. densiflora was found at three sites on Hornby, as shown on the map below. The number and size of plants on Hornby was not excessive and all were easily removed. Fortunately one site that had a large number of very tiny plants, was caught in time. Other Spartina species have not been found here, although Spartina patens is on Tree Island and in Courtenay. S. patens is quite a different looking small plant and digging it is much more difficult..

The next few fall/winter seasons will involve the “weeding of the salt marshes”....checking for small Spartina seedlings and removing them. These seedlings regenerate from the many years of deposited seeds. They are easily pulled by hand, especially if a small pick is used to loosen the beach so that all those little tillers come out smoothly. Careful attention should be paid to not losing any tillers. The manual digging of S. densiflora has been very successful on Denman. Where extensive areas of Spartina were removed, the native salt marsh plants, particularly American glasswort and seashore saltgrass are coming back prolifically.

Regular monitoring of the Hornby shoreline in the winter, when almost the only green thing in the saltmarsh is *Spartina*, will keep tabs on any new plants. Monitoring new areas together with weeding the original sites will help the saltmarshes around Hornby recover from the *Spartina* incursion.

Many many thanks to everyone who has assisted the *Spartina* program!



Also attached pictures of Spartina on Hornby

Denman Conservancy Newsletter

UPDATE on Denman's Infestation of Invasive Marine Grass Dense-flowered cord-grass *Spartina densiflora*

February 2015 saw the removal of the last large plant of Denman's internationally-significant invasive marine grass *Spartina densiflora*. Once again, many thanks to all the digging crew and the valiant operator of the tiny backhoe for their dedicated efforts.

Photo

Continuing this winter 2015-2016, the Denman sites were re-checked. All the little regenerating bunch-grass seedlings were removed and composted. In sites where these seedlings have been

removed for two seasons, the number has declined rapidly. Thus the successful removal without herbicides looks feasible, although it may take a number of years.

This summer the

**Dig It Denman
Non-herbicide Spartina Removal Project**

will begin.

Kits will be given to volunteers interested in monitoring sections of Denman's beaches. Sign up and training will be advertised closer to the start-up date. Please stay tuned!