

Fraser River Delta Spartina Project (2004)

Invasive Plant Management Proposal:
Spartina anglica—English cordgrass management in Boundary
Bay Wildlife Mgmt Area and surrounds,
Spartina Project (#15)

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The coordination of the main Spartina removal event (June 17 – 19th, 2004) required a significant amount of effort in addition to resources provided by the representatives of the committee: The Delta Heritage Air Park Management Committee for the use of their building during the removal. A multitude of individuals participating in the event including: Fisheries & Oceans Canada (Sandie Hollick-Kenyon, Scott Ducharme, Joan Bateman, Brian Naito), Canadian Wildlife Service (Ken Brock, Kathleen Moore, Steven Shisko, Sean Boyd), Ducks Unlimited Canada (Mike Jones, Dave Harper, Vince VanBeelen, Alycia Rugal, Kathleen Fry, Marianne Ceh), Vancouver Port Authority (Juergen Baumann, Ryan Wainwright, Carrie Brown, Alicia Blancarte), Whatcom County volunteer (Doug Stark), Whatcom County Noxious Weed Board (Monette Boswell, Laurel Shiner), The Nature Trust (Robin Rivers, Susan Paczek), Corporation of Delta (Verne Kucy, Mike Brotherston, Les Owen, David Moncur, Ela Lukowska, Cedric Lund), Ministry of Water Lands and Air Protection (Ron Goldstone, Oliver Busby), Vancouver Aquarium (Tasha Murray, Jade Shiller, Patricia Lesku, Laura Jordison, Rebecca Helsel, Erika Paradis, Tar Kavanagh, Kleanthis Korkodigos, Lex Kinast, Wayne Karakuc, Ginna Attal, Ann Sprogis), Renee Fisher – Volunteer, UBC Student (Lindsay Fisher, Julie Beer), Puget Sound Action Team (Kevin Anderson), G.L. Williams & Associates (Gary Williams), Northwest Wildlife (Michelle Nguyen, Becky Phillips, Paul Cashman).

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Finally, but key to the implementation were the agencies providing financial contributions that enabled the agencies on the Spartina committee to hire contractors. These contributions were Province of BC Inter-Ministry Invasive Plant Committee (\$30,000), Environment Canada - Canadian Wildlife Service (\$5,000), and Ministry of Water, Land and Air Protection (\$2,000).

Executive Summary

Spartina anglica was initially discovered on Roberts Bank in the Fraser Delta by Gary Williams during intertidal marsh surveys conducted for the Vancouver Port Authority in the summer of 2003. Upon discovery and notification to several agencies, the Vancouver Port Authority initiated a response for *Spartina* removal. Following the initial response, a committee consisting of government and non-government agencies were assembled to develop a plan to identify, monitor, remove and conduct outreach of *Spartina* in the Fraser River Delta. In 2004, over \$118,000 dollars was expended in direct and in-kind costs for *Spartina* control.

Using both ground and a hovercraft method, *Spartina* was estimated to affect over 220 ha of the 25,000 ha of intertidal habitat in the Fraser River Delta. An initial *Spartina* assessment was carried out in May and June in order to identify areas to begin *Spartina* removal. Throughout the summer and fall, additional surveys were completed in order to assess the locations of *Spartina* and direct removal crews. No *Spartina* was found in Burrard Inlet, Sturgeon Banks nor south of the Fraser River Delta in Point Roberts. A final fall assessment using a hovercraft identified a few *Spartina* clones as well as individual plants that were not removed during several *Spartina* removal events. The majority of *Spartina* infestations were individual plants and clones less than 1m in diameter and only one area was substantial in size (25m by 25m).

Only manual and mechanical *Spartina* removal methods were used in 2004, consisting of manually pulling and use of an excavator. Over 10 separate removal events were conducted in 2004 in Boundary Bay and Roberts Bank. The main manual removal event occurred between June 17 – 19th when approximately 88 person days were used to remove approximately 7,150 kg of *Spartina* and mud which were subsequently incinerated. An excavator was used to bury *Spartina* clones greater than 1m in diameter at a depth between 3m and 5m below the ground. It is estimated five times the amount that was manually pulled (7,150 kg) was buried using the excavator. Overall the combination of excavator and manual methods proved to be a cost efficient and effective methodology in the Fraser River Delta.

Spartina outreach consisted of many different mediums throughout the year. *Spartina* awareness was improved at several public events (World Oceans Day, eelgrass training seminars) as well as through many publications (press releases in the Delta Optimist newspaper, magazine articles in the Vancouver Natural History Society bulletin and Ducks Unlimited Canada Conservator). The Corporation of Delta prepared a website page for *Spartina* and Fisheries and Oceans Canada developed a *Spartina* Factsheet. The Fraser River Delta *Spartina* Project was presented at the 3rd International *Spartina* Conference in San Francisco (Nov 2004) where the methodology and response was recognized by several agencies, and the project will be presented at the 2nd Georgia Basin Puget Sound Research Conference in Seattle (March 2005).

The success of the 2004 *Spartina* Project could not have been completed with the commitment of the many agencies of the Fraser River Delta *Spartina* Committee nor the financial contribution of agencies such as the Province of BC Inter-Ministry Invasive Plant Committee, Canadian Wildlife Service and Ministry of Water, Land and Air Protection. The committee will meet in early 2005 to develop the 2005 action plan that will include re-assessment of Boundary Bay and Roberts Bank and the removal of the remaining clones (Boundary Bay), and individual plants that may be found in Roberts Bank and Boundary Bay.

Background

The intertidal areas of the Fraser River Delta, located in south western British Columbia, consist of more than 25,000 ha of tidal mud flat. These areas, Roberts Bank, Sturgeon Banks and Boundary Bay, (Figure 1) are key to the lifecycle of Pacific salmon and other marine fishes, numerous invertebrates, including Dungeness crab, and the millions of shorebirds and waterfowl that winter and migrate through the Fraser River Delta. In fact, the Fraser River Delta has the highest density of wintering waterfowl, shorebirds and raptors in all of Canada. Intertidal areas provide significant energetic sources for wildlife especially when adjacent agricultural sites become unavailable during snowfall.

In the summer of 2003, *Spartina anglica* was found in the Fraser River Delta by Gary Williams, a consultant for the Vancouver Port Authority, conducting habitat surveys of the intertidal areas. Once found, the Port Authority was contacted and a management initiative developed focusing on manual removal. Conservation agencies consulted with staff from Washington State agencies (Puget Sound Action Team, Whatcom County Noxious Weed Board) to build on the lessons learned from *Spartina* removal work.

The impacts of *Spartina* include: conversion of mudflats to monoculture stands, loss of habitat to waterbirds and fish, accretion of sediments, and modification of drainage patterns. Introduced on the Pacific Coast, *Spartina* over the years has spread northward from California, to Oregon and Washington. Intertidal areas in Washington when dominated by *Spartina* in the intertidal zone have exhibited significant declines in the abundance of shorebirds and waterfowl. Significant financial resources have been needed to control *Spartina* in Washington State costing of upwards of one million dollars a year. Even with this effort, *Spartina* continues to be a problem infesting more than 8,500 acres of shoreline habitat in Washington State. As with most invasive species, controlling the spread at the early stages of species expansion is the most cost effective approach. Therefore, it is critical to ensure *Spartina* is controlled in the Fraser River Delta, otherwise loss of intertidal habitats will have significant negative impacts on migratory birds and the people who visit the area for these migratory birds, and will require significant resources to control in the future.



Figure 1. Areas in the Fraser River Delta

Delivery Approach

COORDINATION

With the identification of *Spartina* in the Fraser River Delta, a coordination team was developed in December 2003 consisting of several agencies with a diversity of responsibilities including: environment, migratory birds, habitat, restoration, and public use. These agencies are: Fisheries and Oceans Canada, Environment Canada – Canadian Wildlife Service, BC Ministry of Water Lands and Air Protection, Greater Vancouver Regional District, Corporation of Delta, Vancouver Port Authority, Ducks Unlimited Canada, Vancouver Aquarium – River Works, Friends of Semiahmoo Bay, and G.L. Williams & Associates. In addition, several U.S. agencies were involved to provide information on strategies for removal as well as technical expertise: Puget Sound Action Team, Whatcom County Noxious Weed Board and Washington State Department of Agriculture.

Ducks Unlimited Canada (DUC) provided the project administration for monies received from Province of BC Inter-Ministry Invasive Plant Committee (\$30,000), Canadian Wildlife Service (\$5,000), and BC Ministry of Water, Land and Air Protection (\$2,000). Funds were expended to hire 1) an excavator (Concord Excavating), 2) consultant to coordinate monitoring and field work (G.L. Williams & Associates), 3) contribution to Vancouver Aquarium and Langley Environment Partnership Society who provided crews and 4) miscellaneous costs for food, supplies and port-potty rentals. DUC covered all administrative costs for the project administration of the above contracts. Contracts were awarded based on the expertise, cost control and timeliness for completion. No appeals were requested on the allocation of monies nor the awarding of contracts.

Over the next several months, the committee developed a *Spartina* removal plan based on the expertise and available resources of the agencies for the Fraser River Delta to inventory and remove *Spartina* as well as promote awareness. Each agency on the committee brought important expertise to the committee (Table 1).

Table 1. Agency Contribution to the Spartina Project

Agency	Contribution to Spartina Project
Fisheries and Oceans Canada	Meeting chair, access to Western Regional Panel funding, GPS crew, Spartina ID cards and factsheet, facilitation of permitting and map preparation.
Canadian Wildlife Service	Financial contribution, staff for Spartina removal, coordination, map preparation
BC Ministry of Water, Land and Air Protection	Financial contribution, tools, facilitation of permitting, on the ground coordination of resources
Greater Vancouver Regional District	Disposal of Spartina (incineration)
Corporation of Delta	Supplies, Spartina pickup and transportation to incineration, facilitation of permitting, staff for Spartina removal and press release including info on the website.
Vancouver Port Authority	Supplies, staff for Spartina removal, expertise from 2003 Spartina removal in Roberts Bank
Ducks Unlimited Canada	Financial contribution, project coordination (funds, contractors), staff for Spartina removal, map preparation and communications.
Vancouver Aquarium	Staff and crew for Spartina removal, tools
Friends of Semiahmoo Bay	Link to local events to promote awareness of Spartina
G.L. Williams & Associates	Expertise in estuary ecology/management, link to academic and other agencies to promote Spartina awareness.
Puget Sound Action Team, Whatcom County Noxious Weed Board and Washington State Department of Agriculture.	Link to Western Regional Panel funding, technical expertise to develop a strategy for Spartina removal, staff to remove Spartina, and provide lessons learned in Spartina removal efforts in Washington State.

SPARTINA INVENTORY

Several methods were used to identify the locations of Spartina plants. The main method was a manual method of walking the intertidal habitat with hand held Global Position System (GPS) units (Garmin Etrex & Marine Navigator Map 76) to identify the location of plants. Locations were denoted as single plant, clone <0.3m in diameter, 0.3m < clone 1.0m, and larger than 1.0m in diameter. Inventories were carried out throughout the duration of the project to identify locations for removal teams to work as well as identify new sites throughout the Spartina growing season. Agencies involved in the mapping included: DFO (104th to 112th, WLAP (Beach Grove to 64th), Corporation of Delta (72 St to 96th), and G.L. Williams (Boundary Bay and Roberts Bank), City of Surrey (Mud Bay). A map of the cumulative Spartina sites is provided in Figure 2 and 3 outlining the distribution of the plant in 2004.

Staff from the Whatcom County Noxious Weed Control Board conducted a survey for Spartina in May 2004 around the entire Point Roberts which is a peninsula in the United States that

separates Boundary Bay and Roberts Bank on the Canadian Side. No *Spartina* plants were found.

Other areas considered less susceptible to *Spartina* invasion were also inventory based on visual observations (second method) from the dyke during low tide. These areas were several mudflats in the Burrard Inlet area including Maplewood Flats, Port Moody mudflats and Spanish Banks, however no *Spartina* was observed in these areas. It is hypothesized that the limited amount of mudflats in Burrard Inlet as well as the output of the Fraser River creates a barrier for the movement of *Spartina* plants at this time.

The third approach was the evaluation of a hovercraft in Boundary Bay in November of 2004 during a low tide. The hovercraft was used to inventory the large extent of Boundary Bay and access areas that had not been checked for *Spartina*. While the hovercraft would be able to identify *Spartina* clones it was unknown whether the hovercraft method could identify individual plants. Based on the information from staff, individual plants were easily observed from the hovercraft, with dark green colour, remoteness from shore based vegetation, and distinctive leaf arrangements the main distinguishing features from other estuarine plants at that time of year.

Based on the accumulation of all inventory methods over 220 ha were impacted by *Spartina* in the Boundary Bay and Roberts Bank areas. The majority of locations were individual plants with several clones dispersed in amongst the individual plants. The largest area measured approximately 25m by 25m and would be considered one of the most concentrated areas however many native intertidal plants were evenly dispersed in the *Spartina* zone. No monoculture stands of *Spartina* were found in the Fraser Delta in 2004.

The hovercraft was an efficient rapid assessment identification of *Spartina* and was able to identify individual plants during the fall. Once rapid assessment is completed, the intertidal walking method should be used to identify working areas for *Spartina* removal. Based on repeating monitoring in Roberts Bank and comparing the 2003 distribution, *Spartina* increased it's distribution between June and October indicating it's ability to expand via seed or plant fragments throughout the summer.



Figure 2. Cumulative 2004 Spartina Distribution in eastern Boundary Bay



Figure 3. Cumulative 2004 Spartina Distribution in western Boundary Bay & Roberts Bank

SPARTINA REMOVAL

In 2004, only mechanical methods were used to remove Spartina from the intertidal zones. Using manual pulling and an excavator, Spartina plants were removed from an estimated 220 ha of the intertidal zone.

Manual Pulling

The first event in 2004 for manual pulling occurred over a three day period between June 17, and June 19. This was the main event in 2004 involving all agencies as well as involvement from the general public. A total of fifty-two volunteers attended on June 17 followed by eighteen volunteers on the two successive days. Using maps created from May and June monitoring, the event focussed manual removal efforts in Boundary Bay between 64 St and 112 St.

Participants dug individual plants and clones using long-handled garden shovels into large garbage bags. The roots were carefully washed in tidal pools to remove excess sediment. The entire plant (including roots) were placed into the bags. Bags were only partially filled to facilitate transporting without tearing. A small all-terrain vehicle gathered up the bags and transported them to strategic places on the Boundary Bay dyke. Following the event, a backhoe loaded the bags onto a truck that transported the bags to the Greater Vancouver Regional District incinerator. Approximately 7,150 kg (15,765 lbs) of Spartina and mud was incinerated over the three day event.



Figure 4. Spartina Removal Crew at Roberts Bank

Additional manual pulling events were coordinated between July and October 2004 at new sites identified during inventory surveys (Figure 4). The participants only involved staff from agencies and did not involve the general public. The events involved small areas throughout the Roberts Bank and Boundary Bay Area (Table 2).

Table 2. Spartina Removal Events

Date	Method and Staff involvement	Area
June 17-19, 2004	All agencies	Boundary Bay (104 – 112 St)
June 17-19, 2004	Excavator	Boundary Bay (104 – 112 St)
June 23, 2004	Excavator	Boundary Bay
July 24, 2004	Marcel Pepin (consultant)	Boundary Bay (west)
Aug 03 & 12, 2004	City of Surrey crews	Boundary Bay (Mud Bay)
Aug 05, 2004	Excavator	Roberts Bank
Sept 02, 2004	Excavator	Boundary Bay (12 – 64 th St)
Sept 25, 2004	Vancouver Aquarium, DUC	Roberts Bank
Oct 13, 2004	Vancouver Aquarium, DUC, LEPS	Boundary Bay (12 – 64 St & 104 th – 112 th St)
Oct 14, 2004	Vancouver Aquarium, DUC, LEPS	Boundary Bay (112 th St)

Excavator

Concord Excavating and Contracting Ltd. was contracted to supply a swamp excavator measuring 18' wide by 25' long with approximately 0.6 PSI of ground pressure (Figure 5). The machine was used to dig out Spartina clones that were larger than 1.0m in diameter. The machine attempted to break the Spartina clones into smaller pieces on a sheet of plywood, which could then be placed into bags, but the technique proved difficult and generated considerable plant fragments for tidal distribution. Pulling a sled behind the excavator was also deemed to be difficult and inefficient, therefore it was decided to bury the plants to a depth greater than three meters. The excavator dug large holes and buried Spartina up to five meters in depth. The native material was placed on top of the Spartina and the area contoured. It is estimated that Spartina removed through *in situ* burial was approximately five times the amount of manually removed or 7,150 kg.



Figure 5. Spartina Removal Methods (Excavator & Manual Removal)

Spartina was found growing successfully in all intertidal substrates from sand to heavy mud and in the intertidal zone as well as the high tideline. Spartina was found as single plants, as clones and with other marsh plants (*Triglochin maritimum*, *Salicornia virginica*, *Distichlis spicata*). Typically the substrate was muddier when Spartina grew with other marsh plants.

The most successful approach was to use the excavator for clones larger than 1.0 m and rely on manual labour for individual plants and small clones. This was a cost effective approach for the excavator (large amount of Spartina, little movement) as well as people who could cover large amounts of intertidal habitat faster than an excavator. In addition, allowing individuals to work on individual plants and small clones provided a sense of accomplishment as Spartina could be removed relatively quickly and the individuals could move onto new areas of infestation. In situations where individuals worked on larger clones, they become frustrated as the work was slow and tedious. For example, six volunteers worked 8 hours to remove only 50 % of a large 3 m diameter clone in 2003! When contacted for volunteering during the 2004 removal, they were less than enthusiastic about participating.

Using a combination of manual pulling and excavator burial, all visible Spartina plants in Roberts Bank were removed. In Boundary Bay the majority of plants were removed including all the larger clones and most of the individual plants. Some clones remained in Boundary Bay (west of 104th, approximately 8) as well as some around the 112th St. These areas will be priority for the 2005 removal plan and will require excavator work.

Outreach and Acknowledgments

Using the varied resources of the committee, a multitude of methods was used to improve the awareness of Spartina, communicate the Spartina work, and promote the partnership approach.

LOCATION PRESENTATIONS

1. Langley Field Naturalists: Presentation made at one of the regular meetings.
2. Vancouver Natural History birds night meeting.
3. Eelgrass Restoration & Shore Keepers (June – July 2004). As part of training seminars hosted by the Friends of Semiahmoo Bay, a Spartina awareness component was incorporated into the seminar to enable the participants to be able to identify Spartina if found during their respective projects.
4. Worlds Oceans Day (June 5th). Information on invasive species in general and specifically on Spartina anglica problem was available at three different booths at Blackie Spit. The information promoted awareness to the general public as well as a requirement opportunity for the removal period between June 17-19, 2004.
5. Presentations are scheduled for the Seagrass Conservation Working Group (Feb. 3, 2005, in Nanaimo) and White Rock/Surrey Naturalists (May 2005), and Friends of Semiahmoo (June 2005)

PRESS RELEASES

1. As part of the main Spartina removal in June 2004, press releases were issued to all print and news media in the Vancouver Lower mainland
2. CBC radio ran a feature on Spartina during a newscast
3. Poster boards were prepared during the June 17-19th public event displaying logo's of all agencies involved.
4. Port Vancouver Roberts Bank Container Expansion Project Newsletter (November 2003)

FACTSHEET:

Fisheries and Oceans staff prepared a factsheet (Appendix 1)

WEBSITE

The Corporation of Delta provided a website to display information on Spartina www.corp.delta.bc.ca including general information on the plant, environmental report as well as a 2003 report (Appendix 2).

PRINT MEDIA

A number of articles on Spartina were published in 2004 including:

1. The Delta Optimist November 12, 2003 and (June 23, 2004) (Appendix 3)
2. Vancouver Natural History Society March 2004 newsletter
3. Botanical Electronic News #324 (BC Native Plant Society)
4. Ducks Unlimited Canada Conservator Magazine (Appendix 4)

CONFERENCES

- 1) Gary Williams, on behalf of the Fraser River Delta Spartina Committee, presented a paper on the methods, results and experiences at the 3rd International Spartina Conference in San Francisco (November 8-10th 2004). Our approach was endorsed by several people at the Conference as supported by the following notes:
 - a) Dr. Don Strong (University of California) who is a senior scientist investigating Spartina in San Francisco Bay, commented that if we (Fraser Delta Spartina Committee) had been in the San Francisco Bay in the beginning and implemented our quick response to remove the Spartina, the problem in SFB would have been avoided.
 - b) Peggy Olofson (Director San Francisco Invasive Spartina Project): “We at the SF Spartina Project were extremely impressed by the efficient and effective rapid response that you implemented to control *S. anglica*. I think it is an excellent model that could be followed by others - and you did a great job of documenting it. I hope you will follow up with a paper for the proceedings (Cambridge Publications should be in touch with you soon in this regard).” (A paper has been submitted and will be included in the proceedings due out early 2005.)
- 2) An abstract on the Fraser Delta Spartina Project was also accepted at the Georgia Basin Puget Sound Research Conference to be presented at the end of March 2005 in Seattle.

Finances

The total cost to remove Spartina in 2004 is approximately \$118,000 (Table 3). The costs were based on direct costs (\$39,110) which were expenses for materials and contractors as well as in kind contributions (\$78,959) which were agency staff time involved in the preparation, coordination, administration and removal of Spartina. A significant amount of in-kind costs were provided which reduced the amount of cash that agencies had to pay for materials and contractors. The majority of the direct costs were covered through funding agreements totalling \$37,700 which were received from the Province of BC Inter-Ministry Invasive Plant Committee, Province of BC (\$30,000), Canadian Wildlife Service (\$5,000), Ministry of Water, Land and Air Protection (\$2,000) and Western Regional Panel (\$700).

Table 3. Financial Statement - Expenses (Spartina 2004)

Agency	Item	Direct Costs	In-Kind	Notes
Ducks Unlimited Canada	Staff Coordination/Project Admin		\$11,000	Meetings, reporting, PR, coordination
	Staff to manually remove Spartina		\$14,000	Vince, summer students
	Contractor - GL Williams	\$15,552		
	Contractor - Excavator	\$13,696		
	Misc materials	\$1,505		Portable washroom, water, snacks
	Contribution to Van Aquarium & LEPS	\$2,400		
Corporation of Delta	Staff to manually remove Spartina		\$3,033	
	Equipment Costs	\$1,611		
	Staff Coordination		\$2,000	Meetings, coordination
Greater Vancouver Regional District	Disposal fee		\$460	
BC Ministry Water, Land & Air Protection	Staff to manually remove Spartina		\$1,680	
	Materials	\$530		
	Staff Coordination		\$2,000	Meetings, coordination
Environment Canada- Canadian Wildlife Service	Staff to manually remove Spartina		\$1,450	7 staff days
	Contractor - GL Williams	\$3,000		
	Staff Coordination		\$3,500	Meetings, coordination
GL Williams & Associates	Staff Coordination		\$2,000	Meetings, coordination
	Staff for public relations & scientific research		\$4,800	Spartina Conf, Lit review, presentations,
	Staff for Fraser Delta Monitoring		\$800	Bbay and Rbank
Fisheries and Oceans Canada	Staff to manually remove Spartina		\$1,200	3 staff days
	Materials	\$700	\$545.44	US
	Hovercraft		\$5,320	\$1000/day for fuel, reg \$720/hr
	Staff Coordination		\$6,400	Meetings, factsheet, reporting. PR
City of Surrey	Staff to manually remove Spartina		\$3,000	15 crew days
Vancouver Port Authority	Staff to manually remove Spartina		\$1,200	
	Materials: bags	\$50		
	Staff Coordination		\$1,600	Meetings, coordination
Van Aquarium - River Works	Staff to manually remove Spartina		\$2,816	Crew (19 crew, 176 hrs @ \$16/hr)
	Staff Coordination		\$1,200	Meetings, coordination
Whatcom County Noxious Weed Control Board	Staff to manually remove Spartina		\$800	660 (US\$)
	Materials: bags	\$65	50	(US\$)
Langley Environmental Partnership Society	Staff to manually remove Spartina		\$3,200	Crew of 4 for 4 days
Delta Heritage Airpark	Building to coordinate June Spartina Event		\$500	
Concord Excavating	Reduction of excavator cost		\$5,000	
Total Expenses		\$39,110	\$78,959	

Concluding Remarks

The success of the 2004 Spartina Project could not have been completed with the commitment of the agencies of the Fraser River Delta Spartina Committee nor the financial contribution of agencies such as the Province of BC Inter-Ministry Invasive Plant Committee, Province of BC, Environment Canada - Canadian Wildlife Service and Ministry of Water, Land and Air Protection.

The committee will meet in early 2005 to develop the 2005 action plan. It is expected that the amount of Spartina in comparison to 2004 will be reduced but will need to be confirmed through 2005 inventory methods. Mapping will remain a priority for the Boundary Bay and Roberts Bank as well as Spartina removal in priority areas including the remaining clones in Boundary Bay, and new individual plants that may be found in Roberts Bank and Boundary Bay. Based on the 2004 results, it is anticipated that removal will involve an excavator for the larger clones and crews to remove individual plants and smaller clones.

If the goal of agencies in the Fraser River Delta is to maintain the habitat for the benefit of wildlife, then agencies will need to ensure Spartina is a priority for resources. Not responding adequately at this point in time will permit Spartina to spread which will require much larger financial expenditure in the future in order to control it. Outside of the Fraser Delta, there is no other monitoring being undertaken for Spartina. As Spartina has demonstrated its ability to spread along the Pacific Coast, other mudflats along the BC Coast (predominately the Gulf Islands and East Coast Vancouver Island) need to be monitored for potential Spartina invasion.

Appendices

APPENDIX 1 - SPARTINA FACTSHEET

Spartina anglica



Invasive aquatic plant found in B.C.

What is it?

Spartina anglica is a grass that is not native to the West Coast. It can grow rapidly in intertidal zones – such as mudflats and beaches – and disrupt saltwater ecosystems, threaten fish and bird habitat and increase the threat of floods. *Spartina anglica* was discovered in the summer of 2003 in Boundary Bay and Roberts Bank, near the Fraser River estuary.

What's the problem?

Four species of *Spartina*, commonly known as cordgrasses, have invaded coastal estuaries of the U.S. Pacific coast. As these species proliferate, they trap sediment with their large root masses, raise the elevation of the intertidal areas and replace natural mud and sand flats, native eelgrass and algae beds, and river channels. The plants can be brought to B.C. by birds, animals, humans, water currents, recreational boats and ships' ballast water. The results can be serious:

- A loss of critical rearing habitat for fish such as juvenile salmon, clams, oysters and crab.
- A loss of valuable habitat for migrating shorebirds and waterfowl. Boundary Bay is a major resting and feeding area for more than 320 bird species.
- An increase in the risk of flooding.
- A loss of water access from shoreline areas and beaches and for boats.

What does it look like?

Spartina anglica is a grass, with round, hollow stems that grow in roundish clumps up to 2 m in height. The leaf blades, up to 12 mm wide, are flat, rough and green-gray in colour, and branch out from the stem at almost perpendicular angles. It sprouts in the spring, and blooms from July through November. The seeds resemble wheat and are found on one side of the stem.

What is being done?

The best way to control *Spartina anglica* is to catch it early, before infestations become established. Fisheries and Oceans Canada is working with the Vancouver Port Authority, Ducks Unlimited, Canadian Wildlife Service, Corporation of Delta and B.C. Ministry of Water, Land and Air Protection to control the plant's spread. The partners are consulting with Washington State, which has been aggressively battling the noxious weed since 1999. For the summer of 2004, comprehensive surveys of Boundary Bay and Roberts Bank are planned. Work crews will be digging up the identified *Spartina anglica* plants and disposing of them.

What can you do?

Volunteers are needed to raise awareness of *Spartina anglica*, to watch shoreline areas for its spread and to participate in removal efforts.



For further information,
please contact:

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limp@pac.dfo-mpo.gc.ca



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APPENDIX 2 - CORPORATION OF DELTA SPARTINA WEBSITE PAGE

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English Cordgrass (*Spartina anglica*)

What is it?
 English Cordgrass (*Spartina anglica*) is a grass that is not native to the West Coast. It can grow readily in wetland areas – such as mudflats and beaches – and other saltwater ecosystems, whether salt and brackish and increase the threat of floods. *Spartina anglica* was discovered in the summer of 2000 in Boundary Bay and Kelsey Bay, near the Fraser River estuary.

What is the problem?
 In a species of *Spartina*, commonly known as cordgrass, have spread coastal wetlands of the U.S. Pacific coast. As these species proliferate, they displace wetland vegetation, reduce the diversity of the intertidal zones and reduce natural mud and sand flats, native cordgrass and other beds, and their benefits. The species can be brought on B.C. by birds, animals, humans, water currents, recreational boats, and other human vectors. The results can be serious:

- A loss of critical nesting habitat for fish such as juvenile salmon, clams, oysters and crabs.
- A loss of valuable habitat for migrating shorebirds and waterfowl. Boundary Bay is a major nesting and feeding area for more than 200 bird species.
- An increase in the risk of flooding.
- A loss of water access from restricted views and beaches and fish harvest.

What does it look like?



Spartina anglica is a grass, with 10-20, hollow stems that grow in rounded clumps, up to 2 m in height. The leaf blades, up to 12 mm wide, are flat, rough and green-grey in colour, and branch out from the



Quintin Fife

Overview of *Spartina anglica*
 Environmental Services Division, May 7, 2004. Report
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Delta Environmental Services Division, May 7, 2004




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stem is almost vertical in the spring, it arches in the summer, and blooms from July through November. The seeds reach the water and are fed on by one side of the stem.

What is being done?
 The best way to control *Spartina anglica* is to catch it early, before infestations become established. Fisheries and Oceans Canada is working with the Vancouver Port Authority, Delta Island, Canadian Wildlife Service, Corporation of Delta and B.C. Ministry of Water, Land and Air Protection to control the plant's spread. The workers are working with Washington State, which has been aggressively battling the non-native species since 1999. For the summer of 2004, control and surveys of Boundary Bay and Kelsey Bay are planned. Work crews will be digging up the identified *Spartina anglica* plants and burning of them.

What can you do?
 Volunteers are needed to help with removal of *Spartina anglica*, to watch restricted areas for its spread and to participate in removal efforts.

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Invasive plant spreads to Boundary Bay

Three-day work party aims to rid area of cordgrass, which can wreak havoc on natural marine habitat

BY MAUREEN GULYAS
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Dozens of volunteers from environmental groups and government agencies have removed hundreds of kilograms of cordgrass, an insidious plant that has the potential to wreak havoc on the natural marine environment.

The plant, first discovered during a Vancouver Port Authority environmental review of Roberts Bank last year, has now spread to Boundary Bay.

It was first brought to North America decades ago by British citizens shoring up ditches and dikes in Washington state.

Over a three-day period last week, employees from government agencies in Washington state, and the Department of Fisheries and Oceans, Delta and Ducks Unlimited, to name a few, removed the cordgrass, also known by its Latin

name, *Spartina Anglica*, in the bay between 104th and 112th streets.

A giant swamp excavator was also used to dig up patches of the invasive plant species that were hard for volunteers to reach.



Cordgrass was first spotted in Delta at Roberts Bank.

"He scraped it off and then buried it," said municipal environmental manager Verne Kucy.

Canadian officials have worked closely with their counterparts in Washington state, who have been battling the plant for a number of years.

"The Americans said they buried it as little as a foot and it didn't come up. We buried it down eight feet," Kucy explained, adding most of the plant material was taken by brute force, dug up by volunteers and placed in garbage bags.

Most of it will be incinerated for free by the Greater Vancouver regional district.

Pat Lim, a senior program biologist in DFO's habitat and enforcement branch, was also out digging up the plant last week.

"We found some at Boundary Bay Regional Park," she noted.

Lim and a volunteer spent more than an hour digging up a patch of the grass-like plant that had popped up on a gravel path next to the park's parking lot.

"We had 10 bags full of the stuff," she said, adding a couple of young kids nearby helped them pile the



PHOTO BY MAUREEN GULYAS

A giant swamp excavator was used to extract cordgrass from Boundary Bay last week.

bags in the back of a truck for removal.

It's that kind of help that is key to the eradication of the plant, Lim said.

"It's been a remarkable effort," she said of the three days in which people worked for hours to remove the nasty plant.

Lim said at first DFO thought the plant was con-

finied to Delta, but has now discovered a few patches in Surrey.

"As we kept looking, we just kept finding more," Lim said.

Dan Buffett, a biologist with Ducks Unlimited, said the public needs to be vigilant because the plant, if allowed to grow, will destroy the marine environ-

ment which is used by wildlife as a food source.

"What it does is it essentially consolidates the sediment, converting the productive mud flat that provides organisms, invertebrates, productive eel grass to a concentrated *Spartina*. As a result, it modifies the habitat, which effects wildlife," he explained.

APPENDIX 4 - DUC CONSERVATOR - THE DOUBLE LIFE OF SPARTINA

Depending on which coast of North America you live, Cordgrass (Spartina) elicits differing responses. On the Atlantic coast, which is a high energetic coastline, Spartina is a native plant and is intentionally planted for its ability to trap sediment to protect the coastline and restore marshes. The Pacific Coast however, is an entirely different story. The sediment trapping function of Spartina is detrimental to the ecology of marshes. Over a relatively short period of time measured in years, the naturally gradual sloping tidal mudflats are transformed into elevated Spartina meadows with a steep seaward edge. As a result, water circulation patterns are modified, and there is a loss of invertebrates and plants such as eelgrass that are naturally part of mudflats.

Since the turn of the century, Spartina has slowly moved north along the Pacific Coast from California to Washington. While Spartina can establish through seed and root fragment transport in the ocean, it's distribution in Washington State was accelerated through intentional planting for grazing cattle, shoreline stabilization and as packing material for oysters which were planted in bays. In the Pacific Northwest of Washington State, Spartina has affected over 10,000 ha of habitat and state agencies are spending over one million dollars annually to control Spartina.

In the fall of 2003, Spartina was found in the Fraser Delta by a consultant for the Vancouver Port Authority conducting habitat surveys of the intertidal areas. Once found, G.L. Williams contacted the Port Authority and conservation agencies began to develop a removal plan. Conservation agencies consulted with staff from Washington State agencies (Puget Sound Action Team, Whatcom County Noxious Weed Board) to build on the lessons learned from Spartina removal work. Further Spartina assessments in the spring of 2004, identified multiple sites where Spartina had condensed into monotypic stands of 1 meter diameter and larger as well as individual plants located throughout Roberts Bank and Boundary Bay of the Fraser Delta.

The intertidal areas of the Fraser Delta (Roberts Bank, Sturgeon Banks and Boundary Bay) consist of more than 25,000 ha of tidal mud flat. These areas are key to the millions of shorebirds and waterfowl that winter and migrate through the Fraser Delta. Intertidal areas provide significant energetic sources for wildlife especially when adjacent agricultural sites become unavailable during snowfall. Loss of these areas would have significant negative impacts on migratory birds. Intertidal areas in Washington exhibited significant declines in the abundance of shorebirds and waterfowl when Spartina dominated the intertidal zone.

Since the fall of 2003, many agencies have cooperated in a coordinate approach to remove Spartina. In 2004, excavators were used to remove Spartina plants when the stands were 1 meter or larger in diameter while smaller stands and individual plants were removed manually on multiple occasions between June and October of 2004. Funding agencies were the Canadian Wildlife Service (CWS), Fisheries and Oceans Canada (DFO), Ministry of Agriculture, Food and Fish, BC Ministry of Water, Land and Air Protection, Vancouver Port Authority and Ducks Unlimited Canada who combined spent over \$50,000 on the removal of Spartina. Ducks Unlimited Canada coordinated the funds and worked with CWS and DFO to coordinate the removal work. Significant in-kind expertise, equipment and man time was provided by the Corporation of Delta, and the Greater Vancouver Regional District. The above agencies as well as The Nature Trust of BC, Vancouver Aquarium, Langley Environmental Partners, Friends of Semiahmoo Bay and many individuals, provided labour for manual removal.

With such a coordinated response from the partners in 2004, we were able to shift from a reactive position to a proactive position. The majority of the Spartina infestations were removed in 2004 that the outlook for 2005 is to reduce the effort needed for removal in the Fraser Delta and focus resources on monitoring. With a quick response time, DUC and partners have significantly reduced the extent of Spartina which will mean better control over Spartina in the future and working towards the eradication of this plant in the Fraser Delta.