

WHAT IS *SPARTINA*?

Spartina refers to four species of non-native perennial, salt-tolerant cordgrasses invasive to the Pacific Northwest: *Spartina anglica* (English cordgrass), *S. densiflora* (dense-flowered cordgrass), *S. patens* (salt meadow cordgrass) and *S. alterniflora* (smooth cordgrass). All except *S. alterniflora* have been found in British Columbia.

WHY IS *SPARTINA* A PROBLEM?

If permitted to expand along B.C.'s coast, *Spartina* infestations are likely to:

- Significantly decrease habitat for shorebirds, waterfowl, fish, and shellfish;
- Eliminate important intertidal nursery grounds for juvenile fish, clams, mussels, Dungeness crab and other invertebrates;
- Cause sediment accumulation;
- Disrupt tidal drainage patterns;
- Impact coastal based industries, such as shellfish growers, fisheries and tourism (significant risk of losing rearing habitat for clams, mussels and oysters);
- Disrupt the ecology, structure, and function of mudflats, salt marshes, and other intertidal habitats that provide the basis for a complex food web, and;
- Alter estuary hydrology resulting in elevation changes that can affect navigation and cause coastal flooding.

HOW WIDESPREAD IS *SPARTINA* IN B.C.?

These invasive grasses are capable of forming massive single species stands in ecologically critical habitat in the intertidal and low marsh communities of estuaries, outlets, and shoreline. They are invading thousands of hectares (ha) of intertidal mudflat along the west coast of the US and rapidly spreading into the Strait of Georgia.

B.C. *Spartina* infestations are limited to 50 hectares (124 acres); consisting of over a thousand plants dispersed over 17,000 coastal hectares. Multiple small sites along B.C.'s coastline create unique challenges in detecting, accessing, and eradicating. Impacted areas include the Fraser River Delta (Boundary Bay, Robert's Bank, and Burrard Inlet), the east coast of Vancouver Island (Baynes Sound and Comox Harbour), and the North Gulf Islands (Denman, Hornby, Sandy Island, and the Seal Islets).

Left uncontrolled, *Spartina* will likely spread in distribution and density across tens of thousands of hectares, leading to loss of migratory bird habitat as observed in estuaries in Washington and California.

	<i>S. ANGLICA</i>	<i>S. DENSIFLORA</i>	<i>S. PATENS</i>	<i>S. ALTERNIFLORA</i>
B.C. LOCATIONS	Fraser River Delta mudflats (Boundary Bay and Robert's Bank).	Vancouver Island (Baynes Sound, Comox Harbour), and Gulf Islands (Denman, Hornby, Sandy Islands and the Seal Islets).	Burrard Inlet, Vancouver Island (Baynes Sound, Comox Harbour), Sandy Island and the Seal Islets.	None known. (Present in WA State)

HOW DOES *SPARTINA* REPRODUCE?

Spartina reproduces by root fragments (rhizomes) and viable seeds. In early spring, new seedlings germinate and rhizomes sprout new shoots. Rapid growth occurs from May to August, with the majority of plants flowering in July and seed setting in September.

	<i>S. ANGLICA</i>	<i>S. DENSIFLORA</i>	<i>S. PATENS</i>	<i>S. ALTERNIFLORA</i>
FLOWERING TIME	June-Sept.	April-July	Late summer.	July –Nov.

HOW DOES *SPARTINA* SPREAD?

Spartina forms thick mats of reproductive roots, rhizomes, and seeds. Root fragments and seeds are spread mainly by tidal currents, but also by water birds, ballast water, dredging, aquaculture and intentional plantings for erosion control.

HOW MUCH OF B.C. IS AT RISK OF BEING INVADED BY *SPARTINA*?

A drift card study concluded in 2008 found that ocean currents could carry *Spartina* seeds and root fragments to the full extent of B.C.'s coastline, much of it possessing suitable habitat for *Spartina* establishment.

B.C. has over 27,000 km of coastline, including 59,300 ha (146,500 acres) of tidal flats and marsh in over 440 estuaries. Approximately 25,000 ha of B.C. tidal mud flats in the Fraser River delta are internationally recognized as important habitat for fish and migratory birds and support Canada's highest density of wintering waterfowl, shorebirds, and raptors.

WHAT DOES *SPARTINA* LOOK LIKE?

In B.C., *Spartina* is an erect perennial grass, growing up to 1.5 m tall. It has large, smooth, often in-rolled leaves, angularly orientated along the stems. Flower clusters (inflorescences) occur at the top of the stem and are 2-24 cm long. A single *Spartina* plant, grown from seed, spreads into a circular clone. The clone spreads outward by rhizome, eventually combining with other clones to form a dense meadow mat.

	<i>S. ANGLICA</i>	<i>S. DENSIFLORA</i>	<i>S. PATENS</i>	<i>S. ALTERNIFLORA</i>
LEAVES	Alternate; bright green blades grow at distinctive 45-90° angle to stems; 5-40 cm long; 5-12 mm wide.	Alternate; rolled inwards; greyish-green, narrow leaves; 12-43 cm long; 4-8 mm wide.	Alternate; rolled inward; 10-50 cm long; 1-4 mm wide.	Alternate; robust, green-grey; 20-55 cm long; 4-25 mm wide.
STEMS	5 mm diameter at base; 1 m tall; reddish colour.	3-16 mm diameter at base; 1.5 m tall.	Thin and pliant; 1.5-4 mm diameter at base; 1.2 m tall.	5-14 mm wide at base; up to 3 m tall.
INFLORESCENCES (FLOWERHEADS)	Erect 2-12 "spikes" along one side only (resemble wheat).	2-13 "spikes" grow 60° from central axis.	Droopy, reddish colour.	Many spikes grow tightly together; 10-40 cm long.

WHERE DOES *SPARTINA* GROW?

Spartina grows in intertidal salt marshes and mudflats:

	<i>S. ANGLICA</i>	<i>S. DENSIFLORA</i>	<i>S. PATENS</i>	<i>S. ALTERNIFLORA</i>
HABITAT	High marsh zone to intertidal mudflats, where native plant species will not grow.	Cobble beach to high marsh zone to upper mudflats.	High marsh zone.	High to low marsh zones, incl. mudflats where beneficial species will grow.

HOW CAN I TELL *SPARTINA* APART FROM NATIVE PLANTS?

It can be difficult to differentiate between *Spartina* and beneficial plants growing in cobble beach and coastal marsh zones. The best time to locate *Spartina* is in mid to late fall, as it remains green longer than most native intertidal plants. *Spartina anglica* is the only plant that will grow in inter-tidal mudflats. Here is a key to common native plant look-alikes:

DON'T MISTAKE THESE BENEFICIAL PLANTS FOR INVASIVE *SPARTINA*!

	<i>SPARTINA</i> (INVASIVE CORDGRASS)	<i>DISTICHLIS</i> <i>SPICATA</i> (SEASHORE SALTGRASS)	<i>TRIGLOCHIN</i> <i>MARITIMUM</i> (SEASIDE ARROW- GRASS)	<i>LEYMUS MOLLIS</i> (AMERICAN DUNEGRASS)	<i>PLANTAGO</i> <i>MARITIME</i> (SEASIDE PLANTAIN)
HABITAT	Cobble beach to marsh zone to intertidal mudflats.	Salt marsh zone.	High intertidal zone only.	Coastal sand dunes, above stranded log line on beaches.	Marsh zone on beaches and rocky areas.
LEAVES	Large, smooth, often in-rolled; branch at 45-90° angle from stem.	Yellowish-green, 2-4 mm wide; finer than <i>S. anglica</i> .	Dark green; narrow, fleshy and vertical (2-120 cm long); do not branch like <i>S. anglica</i> .	Greyish-green; 6-15 mm wide.	Bright, green, fleshy; only 5-25 cm long.
STEM	Up to 1.5 m tall.	Solid, short (10-40 cm); much smaller than mature <i>S. anglica</i> .	Round (it is a rush, not a grass); flowering stem often taller than leaves.	Grows up to 1.8 m tall; smaller plants can be mistaken for <i>S. anglica</i> or <i>S. alterniflora</i> .	Leaves protrude from base of plant rather than branching out from vertical stem as in <i>S. anglica</i> .
LIGULE (JOINT BETWEEN LEAF BLADE AND STEM)	Fine straight hairs.	Ridge with small, dense bristles.	No ligule.	No fine hairs or bristles.	No ligule (it is a herb, not a grass).

ARE THERE ANY NATIVE *SPARTINAS* IN B.C.?

Spartina gracilis (alkali cordgrass) is a native perennial grass known to occur in wet ditches and meadows to dry (often alkaline) areas in the steppe and montane zones; infrequent in south central and southeast B.C., rare in northeast B.C.

WHERE DO THE INVASIVE *SPARTINAS* COME FROM?

Along the Pacific Coast, there are several species of invasive cordgrass that have invaded thousands of hectares of intertidal mudflat along the west coast of the United States (Washington, Oregon and California) and are currently spreading in the Strait of Georgia mainly by tidal currents.

	<i>S. ANGLICA</i>	<i>S. DENSIFLORA</i>	<i>S. PATENS</i>	<i>S. ALTERNIFLORA</i>
ORIGIN	Fertile hybrid species of <i>S. maritima</i> (native to England) and <i>S. alterniflora</i> (native to eastern US and introduced to England)	South America.	Atlantic Coast of North America.	Atlantic Coast of North America.

HOW LONG HAS *SPARTINA* BEEN IN B.C. AND HOW DID IT GET HERE?

Anecdotal evidence suggests *S. patens* has been present in B.C. since the 1980's, while *S. anglica* was detected more recently in 2003. Historically in other jurisdictions, *Spartina* has established through unintentional planting with other plants during ecosystem restoration, intentionally planted as a grazing crop for animals, as packing for shellfish, and range expansion (rhizome and seedlings).

WHAT IS THE MOST EFFECTIVE WAY TO CONTROL *SPARTINA*?

Rhizomatous plants, such as *Spartina*, may develop new plants by the dispersal of seed or a single root fragment. It is extremely difficult to ensure all root fragments are removed when hand digging *Spartina*. For this reason, manual control is difficult, labour intensive and often ineffective. Digging and burying with an excavator is a more thorough method of removing all root fragments; however, using an excavator in sensitive tidal areas can have unintentional impacts.

The most targeted, effective method of containing and eradicating *Spartina* is systemic herbicide treatment. Systemic herbicides are absorbed by the target plant through the leaves and/or roots and transported throughout the internal system of the plant. These herbicides travel through the plant's vascular system and, depending on the mode of action, inhibit and/or eliminate plant growth.

WHAT IS THE COST OF DOING NOTHING?

Delay in addressing the *Spartina* invasion will increase the eradication costs to B.C. several fold. The current eradication plan estimates an annual cost of \$350,000 for 5 years to eradicate *Spartina* from B.C. Washington State initiated an eradication program once infestations had already reached several thousand hectares in area. This has required spending of over \$1 million annually since 2003 to control *Spartina*.

WHAT IS THE PROVINCE DOING ABOUT *SPARTINA*?

Building on the *West Coast Governor's Agreement on Ocean Health* and the *Pacific Coast Collaborative Agreement* – cross border partnerships with the States of Washington, Oregon, and California that aim to reduce the ecological and economic impacts of invasive species and promote ocean health – B.C. has committed to the containment, reduction, and eventual eradication of *Spartina* from the province. With success in the first stage (containment), B.C. is now pushing towards reduction and eradication.

Since 2004, the B.C. *Spartina* Working Group has mapped infestations, removed plants by machine and by hand, conducted evaluations on effectiveness and undertaken public education and training, including development of the www.spartina.ca website. In 2010, a *Spartina* Response Plan outlined the issues, treatment options, required funding and recommended next steps. Since its beginning, the Working Group has developed a strong, cooperative relationship with the Washington State Department of Agriculture – the leading manager of *Spartina* for Washington State.

Since 2013, the Province has acquired Pesticide Use Permits (PUPs) and Emergency Use Registrations (EUR) for the use of Habitat (active ingredient imazapyr) herbicide to treat infestations of *S. anglica*, *S. densiflora* and *S. patens* along the Lower Mainland infested coastal areas. This work was expanded to include the east coast of Vancouver Island (Baynes Sound and Comox Harbour) and the North Gulf Islands (Denman, Hornby, Sandy Island, and the Seal Islets) in 2019. Aquatic herbicide Habitat Aqua (active ingredient imazapyr) was registered by Health Canada in winter 2021, eliminating the need for further Emergency Use Registrations. Habitat Aqua is the preferred herbicide for treating invasive *Spartina spp* in B.C.

SPARTINA PROGRESS IN B.C.

From 2003 to 2012, mechanical removal (digging by hand and with machinery) was the only method used to control *Spartina* in B.C. Detailed monitoring indicated that this approach alone was not containing or reducing *Spartina*, with only 10% being removed annually due to limited funds and remaining infestations continuing to expand.

In 2013, based on the recommendations of the *Spartina* Response Plan, the B.C. *Spartina* Working Group, with the support of the Province of BC, incorporated herbicide into the integrated pest management approach in the Fraser Delta. Since 2016, the first year of herbicide use, this adapted approach has resulted in a 65% decrease to the total area impacted by *Spartina anglica* and a total plant density reduction of 90% in the Lower Mainland. Similar approaches in Washington, Oregon and California have resulted in *Spartina* reductions of up to 85%. In Willapa Bay, Washington, the removal of *Spartina* from mudflats by either mechanical or chemical means resulted in dramatic increases in shorebird and waterfowl use within several years of treatment.

In areas of Burrard Inlet, the east coast of Vancouver Island and the Northern Gulf Islands, several trials of various treatment methods were tested on *S. patens* to determine the most efficacious and cost-effective treatment for this species. These methods include manual and mechanical digging, shading plots, mowing and, the use of herbicide. To date, only herbicide treatments have been shown to reduce the spread and distribution of *S. patens* and has been the main form of treatment since 2018. Treatment of several *S. patens* sites occurred between 2019-2021 which showed effective results. Most notably, Jáji7em and Kw'ulh Marine Park (a.k.a. Sandy Island Marine Park) was treated in 2019 using herbicide and saw an 80% reduction in plant area when surveyed in 2020. Similar results were found after two successive years of herbicide treatment in the Maplewood Flats Conservation Area, reducing the *S. patens* population by 85%. For this reason, the BC *Spartina* Working Group plans to treat all *S. patens* in BC with herbicide, including the east coast of Vancouver Island Hornby Island, Sandy Island and the Seal Islets, as infestations in these areas continue to expand despite the various mechanical treatment efforts used to date.

Since 2015, the Vancouver Island *Spartina densiflora* infestations have been reduced from an estimated 3.0 ha to 0.01 ha (99.7%) using manual removal methods. The BC Spartina Working Group will therefore continue using manual removal methods as the primary treatment method for this species and will incorporate herbicide treatments only if necessary. From 2013 to 2021, this integrated pest management approach, which includes herbicide where necessary, has resulted in an overall decreasing trend in the size and density of invasive *Spartina*. This trend is expected to continue with the consistent application of integrated pest management principles. The BC Spartina Working Group and Province of BC is now seeking to further this work and establish new three-year Pesticide Use Permits to replace the existing ones, which expire May 31, 2022.

WHAT IS THE PURPOSE & SCOPE OF THE PESTICIDE USE PERMIT

Support for the use of integrated pest management principles for the purpose of eradicating invasive intertidal cordgrasses (*Spartina anglica*, *S. patens*, *S. densiflora*) from the coast of B.C.

The Pesticide Use Permit (PUP) public consultation will be completed as required by the B.C. Ministry of Environment & Climate Change Strategy, and will include First Nations, stakeholders and the public in the geographic area of Metro Vancouver (including Boundary Bay, Robert's Bank and Burrard Inlet), and the east coast of Vancouver Island and the Gulf Islands (including Comox, Courtenay, Deep Bay, Denman Island, Hornby Island, and Sandy Island). The geographical area may expand over time to include sites located in Sturgeon Bank. Specific locations are refined following annual mapping of individual plants and clones.

Mapping occurs each year and will identify the specific treatment locations in each area.

The total herbicide treatment area is less than 50 hectares, dispersed across more than 17,000 coastal hectares. Treatments will occur in summer and fall between June 1, 2022, and May 31, 2025. Beyond the scope of the PUP consultation, general *Spartina* management information will be communicated to impacted land occupiers and stakeholders province wide.

WHO IS THE B.C. SPARTINA WORKING GROUP?

The B.C. *Spartina* Working Group formed in 2004 and is a partnership of different governments, non- government organizations and industry collaborating to eradicate invasive *Spartina* species from B.C.'s shores. The team represents a diversity of responsibilities including: environment, migratory birds, habitat restoration and public use. Ducks Unlimited Canada (DUC) has been leading the B.C. *Spartina* Working Group in its provincial eradication efforts since the group's formation. Members of the group include, but are not limited to:

- Ducks Unlimited Canada
- Canada Wildlife Service
- Fisheries and Oceans Canada
- B.C. Ministry of Environment & Climate Change Strategy
- Metro Vancouver
- City of Surrey
- Corporation of Delta
- City of Port Moody
- British Columbia Conservation Foundation
- Port Metro Vancouver
- B.C. Ministry of Forests, Lands, Natural Resource Operations & Rural Development
- Vancouver Island Conservation Land Management Program
- Community Mapping Network
- Friends of Semiahmoo Bay Society
- Invasive Species Council of Metro Vancouver
- Coastal Invasive Species Committee
- Tsawwassen First Nation
- Tsleil-Waututh Nation

HOW DO I GET INVOLVED IN *SPARTINA* MAPPING OR ERADICATION EFFORTS?

To get involved in *Spartina* mapping or eradication efforts in your community, contact:

Ducks Unlimited Canada
Email: r_topp@ducks.ca

HOW DO I REPORT A *SPARTINA* SIGHTING?



Free online smartphone applications or desktop reporting form: www.gov.bc.ca/invasive-species



FrontCounter BC (toll free) **1-877-855-3222**, ask for a provincial invasive plant specialist