

Glossary

Accuminate - tapering to a sharp tip and having concave sides just before the tip.

Caespitose - growing in tufts.

Glabrous - having a smooth, shiny surface.

Internode - the region of a stem between adjacent nodes.

Ligule - a collar of tissue between the sheath and the stem of a grass.

Node - the point of origin on a stem of a leaf or branch.

Rank - arrangement of the leaves in vertical rows around the floral axis.

Rhizome - an underground stem, typically having small, scale-like leaves and rooting from the nodes.

Sheath - lowermost portion of the leaf which surrounds the stem. Sheaths may be open, i.e. not fused at the edges, as in grasses; or they may be closed, i.e. fused at the edges, as in sedges.

Terete - round in cross section.

Additional References

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Mumford, T.F., P. Peyton, J.R. Sayce, and S. Harbell (eds.). 1991. *Spartina Workshop Record*. Washington Sea Grant Program. University of Washington. 73 pg.

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Key to West Coast *Spartina* Species

Based on Vegetative Characters

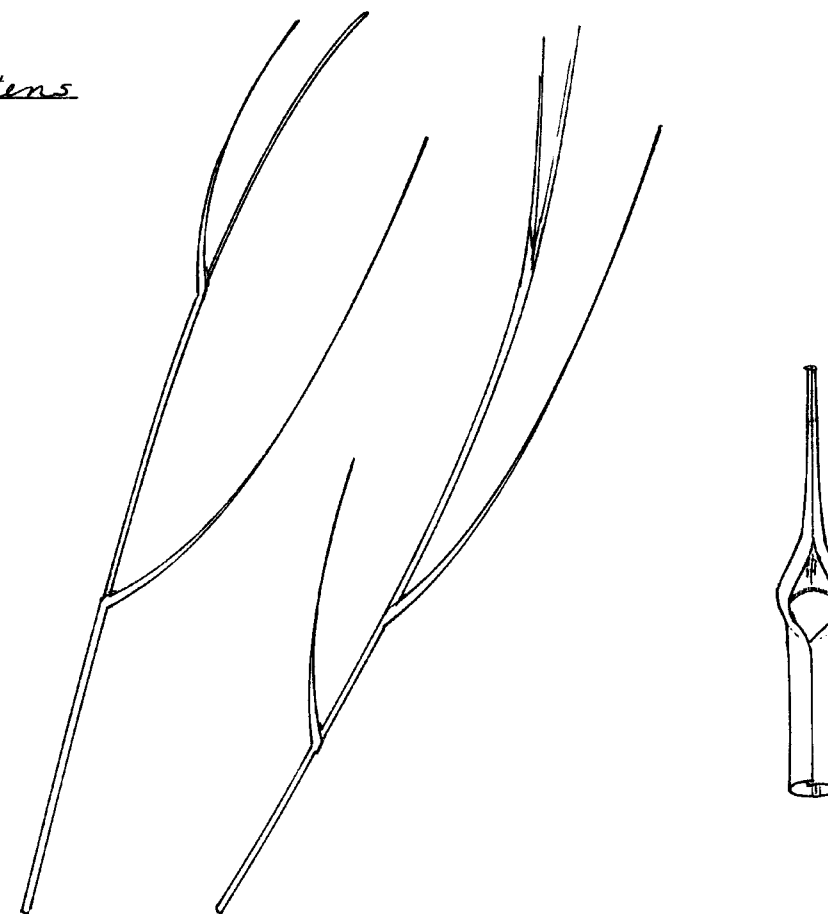


Spartina: A Threat to Pacific Estuaries

Acknowledgements

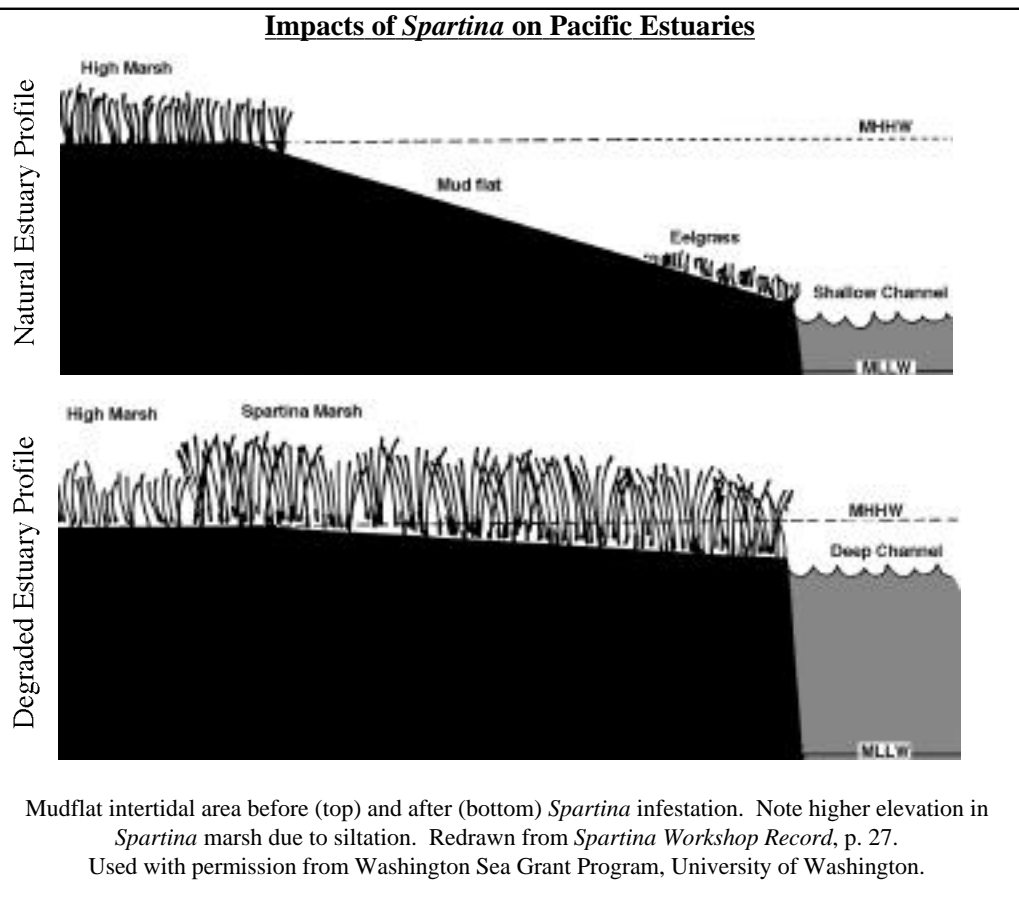
We thank those people who assisted in collecting specimens, especially Curtis Daehler (University of Hawai'i) who was a guide to *Spartina* sites in San Francisco Bay; to Lisa Lantz (WA State Noxious Weed Control Board), for a tour of sites in the Puget Sound area; and to Debbie Pickering (The Nature Conservancy) who sent specimens of *Spartina patens*. Thanks also to all who have made comments and suggestions on the key in its various stages, especially Curtis Daehler, Kathleen Sayce, and Dennis Isaacson. Funding for this project was provided by the Oregon Department of Agriculture and the State Weed Board. Cover illustration by V.M.J. Sytsma.

S. patens



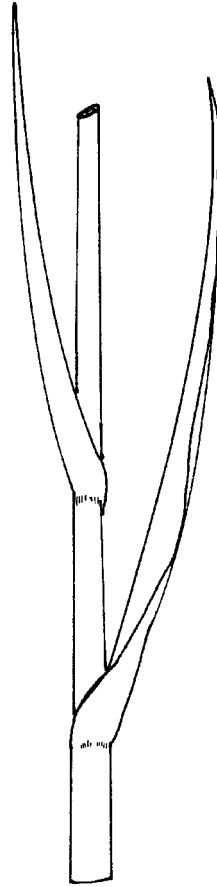
Spartina patens (Aiton) Muhlenb. - Stems: dia. at base 1.5-4 mm; up to 1.2 m tall; internodes firm; ± 6 ridges per mm around stem; stems glabrous, terete. Leaves: generally inrolled when fresh; 1-4 mm wide at base; 10-50 cm long; ± 3 nerves per mm on upper leaf surface; tips acuminate; leaf surfaces glabrous; ligule length 0.5 mm. Rhizomes: thin, wiry, whitish. Growth habit: dense, matted perennial forming monospecific stands. Habitat: restricted to upper salt marsh. Status: invasive *Spartina* species introduced from eastern U.S. Common name: Saltmeadow cordgrass

Impacts of *Spartina* on Pacific Estuaries



Mudflat intertidal area before (top) and after (bottom) *Spartina* infestation. Note higher elevation in *Spartina* marsh due to siltation. Redrawn from *Spartina Workshop Record*, p. 27. Used with permission from Washington Sea Grant Program, University of Washington.

S. foliosa



mcp

Key to West Coast *Spartina* Species

Based on Vegetative Characters

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Spartina foliosa Trin. - Stems: dia. at base 7-12 mm; up to 1.5 m tall; internodes fleshy; 3 ridges per mm around stem; stems glabrous, terete; young, healthy shoots always green or white all the way to base. Leaves: generally flat when fresh; 5-17 mm wide at base; 15-45 cm long; \pm 5 nerves per mm on upper leaf surface; tips acuminate; upper and lower leaf surfaces glabrous; ligule 1-2 mm long. angle between leaf and stem 15° - 18° . Rhizomes: fleshy, whitish. Growth habit: spreading by rhizomes to form large dense stands, though not as dense as those of *S. alterniflora*. Habitat: intertidal mud flats and lower salt marsh. Status: native to coastal salt marshes, northernmost limit Bodega Bay, CA. Common name: California cordgrass

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Introduction

In their natural condition, Pacific Coast estuaries have extensive open mudflats in the intertidal area that are important shorebird feeding habitat and are used for oystering and recreational fishing. Several non-native cordgrass species are invading Pacific estuaries and damaging these functions and uses. Early detection is critical to effective management of cordgrass invasion. This key is intended to provide an easy-to-use reference for quick identification of *Spartina* species on the West coast. Correct identification of these invaders is difficult because flowers are frequently not present when a population is found. Some clones never produce flowers. Since floral characters are often not available for use in the identification of *Spartina* species, a key using only vegetative characters was needed. This key includes use of vegetative characters noted by previous authors as well as some new characters.

Fresh plant material was collected for all species in this key except for *S. patens*. Specimens collected for development of this key were deposited at Portland State University Herbarium and Oregon State University Herbarium.

Determining Family and Genus

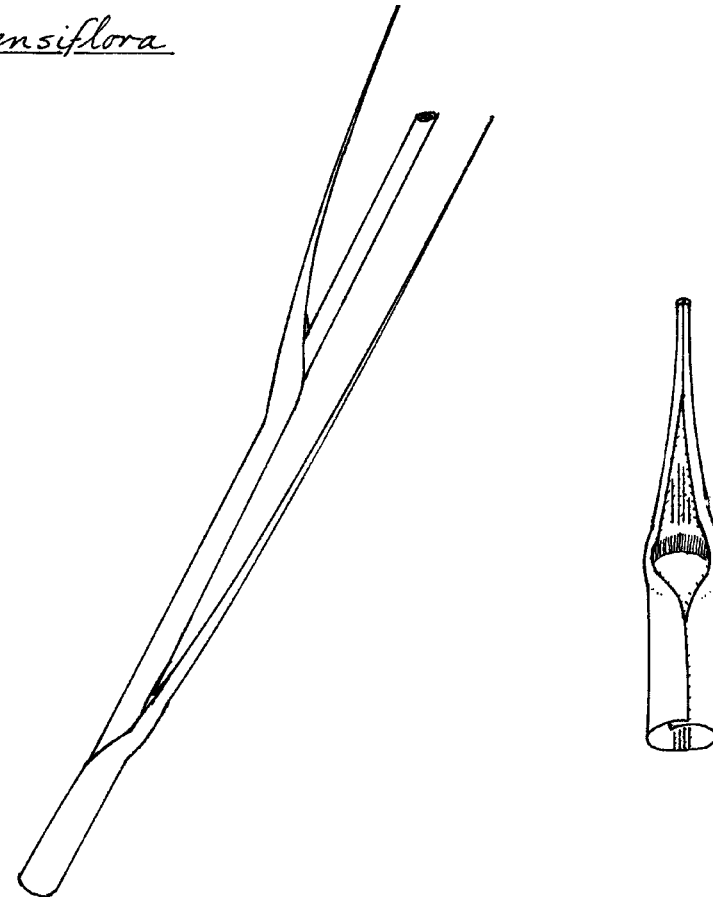
1. Is it a grass?

Three families of monocots are often mistaken for one another - the grasses (Poaceae), the sedges (Cyperaceae), and the rushes (Juncaceae). The table below summarizes several vegetative characters for these families. These characters are typical of most members of the families but are not without exceptions.

<u>Character</u>	<u>Poaceae</u>	<u>Cyperaceae</u>	<u>Juncaceae</u>
Shape of stem in cross-section	Round	Triangular	Round
Jointed stems	Yes	No	No
Center of stem (between nodes)	Hollow	Solid	Solid
Rank of leaves	Two	Three	Two or leafless
Leaf sheath	Open	Closed	Open or closed
Ligule	Present	Absent	Absent

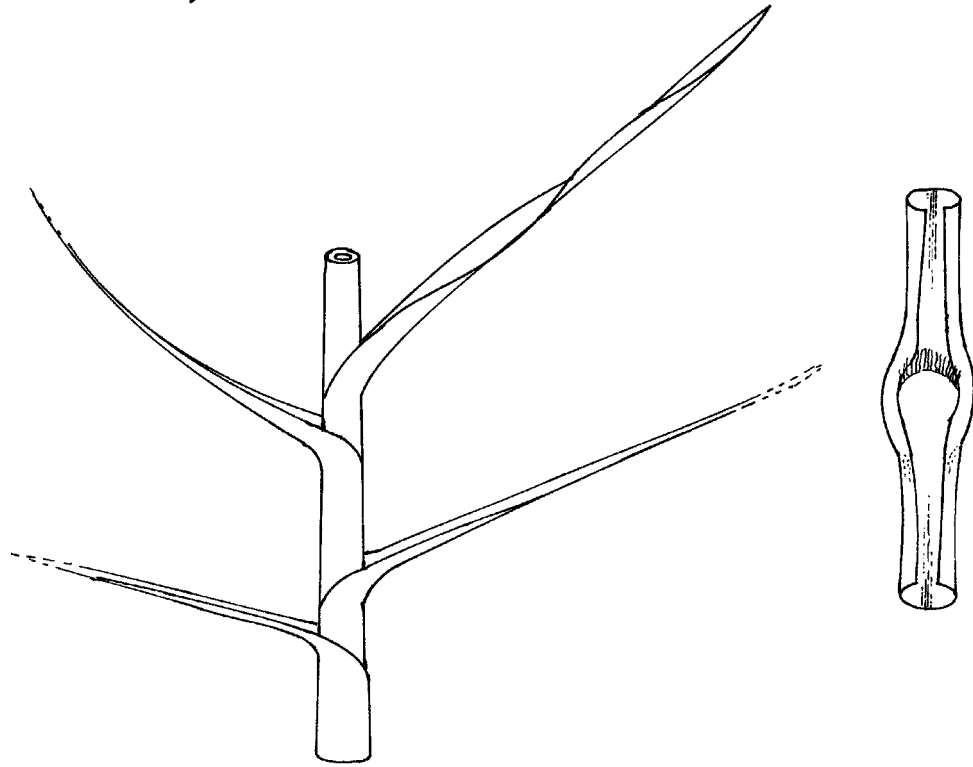
Adapted from Harrington (1987) and Pohl (1968)

S. densiflora



Spartina densiflora Brongn. - Stems: dia. at base 3-16 mm; up to 1.5 m tall; 2 ridges per mm around stem; internodes firm; stems glabrous, terete. Leaves: inrolled when fresh; 4-8 mm wide at base; 12- 43 cm long; \pm 2 ridges per mm on upper leaf surface; tips acuminate; upper and lower leaf surfaces glabrous; upper surface having pronounced nerves or ridges, the ridges (and the leaf margins) minutely ciliate; ligule 1-2 mm long. Rhizomes: none. Growth habit: caespitose. Habitat: lower salt marsh. Status: invasive *Spartina* species introduced from South America. Common name: none

S. anglica



Spartina anglica C.E. Hubbard - Stems: dia. at base >5 mm; height up to 1 m; 3 ridges per mm around stem; stems glabrous, terete. Leaves: 5-12 mm wide at base; 5-40 cm long; \pm 6 nerves per mm on upper leaf surface; tips acuminate; upper and lower leaf surfaces glabrous; ligule 2-3 mm long; angle between leaf and stem at least 30°, often almost 90°. Rhizomes: fleshy, whitish; rhizome scales also showing pronounced angle between leaf and stem. Growth habit: forms dense monospecific stands, though isolated, small plants are clumpy and may appear caespitose. Habitat: tolerates a range of substrates, from tidal mud flats to sand; occurs in lower to upper salt marsh. Status: invasive species of *Spartina* introduced from Great Britain; originally introduced in Puget Sound, WA. Common name: none

2. Is it a *Spartina*?

Once you have determined that the plant is a grass (family Poaceae), it is necessary to key it to genus. There are only a limited number of grasses which grow in the coastal salt marshes of the West coast of the U.S. Of those, *Spartina* is the only genus whose species have ligules consisting only of a row of hairs. Length of the ligule varies from \pm 0.5 mm to 2-3 mm, depending on the species. Members of this genus do NOT have prominent midribs on their leaves.

3. Which species of *Spartina* is it?

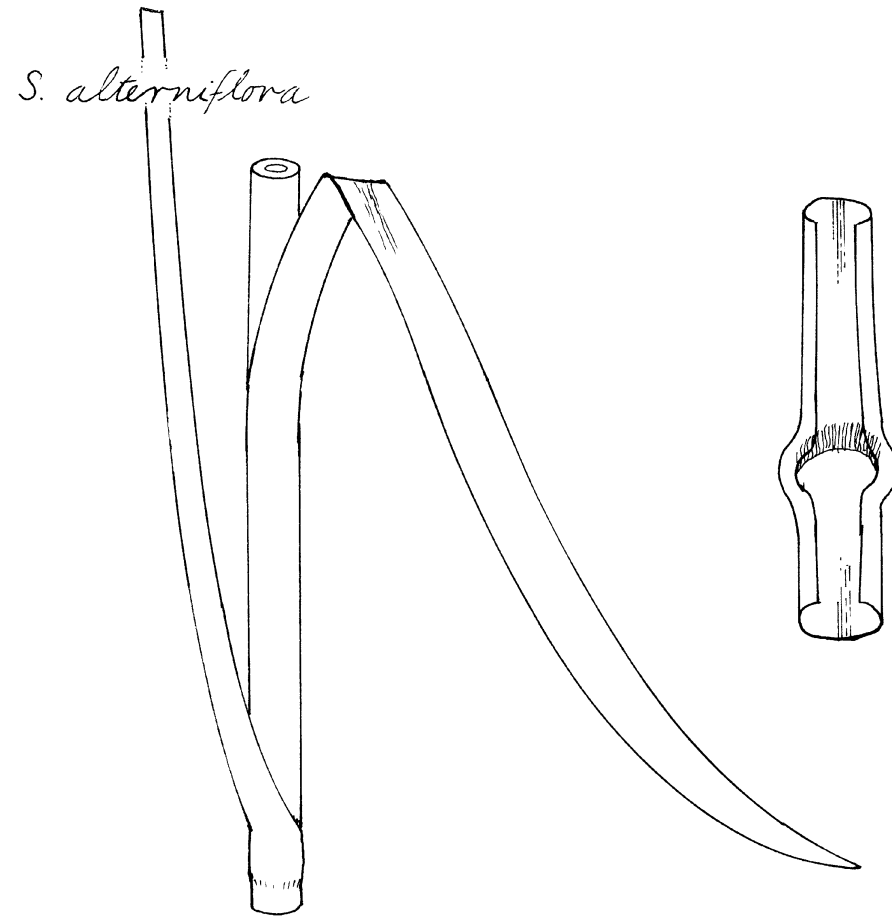
The following key uses vegetative characters to identify *Spartina* species. Confirmation of species identification based upon vegetative characters should be made by referencing herbarium specimens and by using other keys. When flowers are present, keys based upon floral characters provide the most definitive identification of *Spartina* species.

A KEY TO WEST COAST *SPARTINA* SPECIES BASED ON VEGETATIVE CHARACTERS

- 1a. Leaf blades flat when fresh..... 3
- 1b. Leaf blades inrolled when fresh 2
- 2a. Rhizomes present; rhizomes thin & wiry *S. patens*
- 2b. Rhizomes not present; plants caespitose *S. densiflora*
- 3a. Internodes firm..... *S. anglica*
- 3b. Internodes fleshy 4
- 4a. Leaf width at most 25 mm; reddish streaks or red pigment often present at base of young, healthy shoots..... *S. alterniflora*
- 4b. Leaf width at most 17 mm; young, healthy shoots always green or white all the way to base of stem *S. foliosa*

COMPARATIVE TABLE OF VEGETATIVE CHARACTERS

	<i>S. alterniflora</i>	<i>S. anglica</i>	<i>S. densiflora</i>	<i>S. foliosa</i>	<i>S. patens</i>
Stems					
Diameter at base	5-14 mm	5 mm	3-16 mm	7-12 mm	1.5-4 mm
Height	up to 3 m	up to 1 m	up to 1.5 m	up to 1.5 m	up to 1.2 m
Ridges around stem	2 per mm	3 per mm	2 per mm	3 per mm	6 per mm
Internodes	fleshy	fleshy	firm	fleshy	firm
Surface	glabrous	glabrous	glabrous	glabrous	glabrous
Shape	terete	terete	terete	terete	terete
Color	often red at base of young healthy shoots			young, healthy shoots always green or white all the way to base	
Leaves					
Fresh condition	flat	flat	inrolled	flat	inrolled
Width at base	4-25 mm	5-12 mm	4-8 mm	5-17 mm	1-4 mm
Length	20-55 cm	5-40 cm	12-43 cm	15-45 cm	10-50 cm
Nerves on upper surface	±6 per mm	±6 per mm	±2 per mm	±5 per mm	±3 per mm
Tip shape	accuminate	accuminate	accuminate	accuminate	accuminate
Upper surface	glabrous	glabrous	glabrous, with pronounced ridges, ridges and leaf margins minutely ciliate	glabrous	glabrous
Lower surface	glabrous	glabrous	glabrous	glabrous	glabrous
Ligule length	0.7-2 mm	2-3 mm	1-2 mm	1-2 mm	0.5 mm
Angle between leaf and stem	15° - 18°	30° - 90°		15° - 18°	
Rhizomes					
Texture	fleshy	fleshy	none	fleshy	thin, wiry
Color	whitish	whitish	-	whitish	whitish
Growth habit	dense stands	dense stands	caespitose	dense stands	dense stands
Habitat	intertidal mud flats	lower to upper salt marsh	lower salt marsh	intertidal mud flats and lower	upper salt marsh
Status	invasive, non-native	invasive, non-native	invasive, non-native	native to CA	invasive, non-native



MCP

Spartina alterniflora Loisel. - Stems: dia. at base 5-14 mm; up to 3 m tall; 2 ridges per mm around stem; stems glabrous, terete; reddish streaks or red pigment often present at base of young, healthy shoots. Leaves: 4-25 mm wide at base; 20-55 cm long; ±6 nerves per mm on upper leaf surface; tips acuminate; upper and lower leaf surfaces glabrous; ligule 0.7-2 mm long; angle between leaf and stem 15° -18°. Rhizomes: fleshy, whitish. Growth habit: dense monospecific stands, though isolated small plants are clumpy and may appear caespitose. Habitat: intertidal mud flats. Status: Vigorous and invasive *Spartina* species introduced from the eastern coast of North America. Common name: Smooth cordgrass