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# The Alkali (*Scirpus maritimus* L.) and Saltmarsh (*S. robustus* Pursh) Bulrushes: A Literature Review

by

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## Abstract

Alkali (*Scirpus maritimus* L.) and saltmarsh (*S. robustus* Pursh) bulrushes are closely related, emergent hydrophytes that are important as foods of waterfowl and other wildlife. Water depth, water level fluctuations, exposure, sediment and water salinity, and shading by taller emergents strongly affect growth and reproduction. Important management problems are inconsistent achene germination, difficulties with maintenance and timing of water level and salinity cycles, and acidification of sediments. Other serious problems are competition from other hydrophytes and the largely unpredictable effects of grazing, burning, tilling, and other land use practices. Recent management efforts have focused on thinning stands of the two bulrushes or intermixing them with stands of shorter emergents and submersed plants in order to increase the variety of food plants available to waterfowl and other birds. Information needed for more effective management includes the optimum size and vegetation interspersion of treated areas, treatment response, and the combined effects of natural disturbances such as grazing and burning. Control of a few salt-tolerant plants requires closure of some impoundments to the open sea for long periods. Such closures are of concern to fisheries managers, especially in areas where coastal marshes are disappearing. Conversely, in other managed wetlands, freshwater diverted from rivers pushes estuarine water seaward, making it difficult to obtain waters of sufficient salinity to control undesirable freshwater plants. Research and conservation thus need to be combined in many areas to improve management of these bulrushes.

**Key words:** Emergent hydrophytes, *Scirpus maritimus*, *Scirpus robustus*, autecology, management, sedges, taxonomy, wetlands, wildlife.

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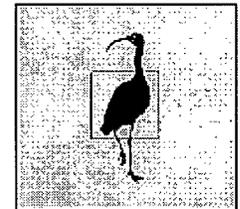
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# The Alkali (*Scirpus Maritimus* L.) and Saltmarsh (*S. Robustus* Pursh) Bulrushes: A Literature Review

## *Habitat and Associated Abiotic Limiting Factors*

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### Coastal Wetland Types

The principal natural habitat of *Scirpus maritimus* and *S. robustus* is estuarine intertidal emergent wetland as classified by Cowardin et al. (1979). Communities where *S. maritimus* is dominant or relatively important usually are between 1.8 m below the mean low low water (MLLW) and 2.6 m above MLLW (Jefferson 1974; Eilers 1975; Riley and McKay 1980; Frenkel and Boss 1988). In the Pacific Northwest, Karagatzides and Hutchinson (1991) found much larger peak standing crops in the higher parts of the intertidal zone than in the low parts that are submerged for longer periods. In the Puget Trough, communities dominated by *S. maritimus* are a distinguishing feature of the fluvially influenced portions of coastal wetlands (Hutchinson 1988). These communities also occur in saline areas in unconsolidated, anoxic muck (Ewing 1983). Ewing and Kershaw (1986) noted the most well-developed stands of *S. maritimus* around the mean high water (MHW) mark on James Bay, where salinities are higher than in the lower marsh. Stands there are restricted to narrow areas on recently prograded (exposed by a rebounding land surface) backshores where upward groundwater flows create brackish conditions (Price et al. 1988). Along the Dutch coast, *S. maritimus* grows in reed swamps, dune slacks, and higher-elevation salt marshes (Haeck et al. 1985). Where tidal fluctuations are small, such as in southeastern Norway, stands usually occur from about 75 cm above to just below mean sea level (MSL; Vevle 1985).

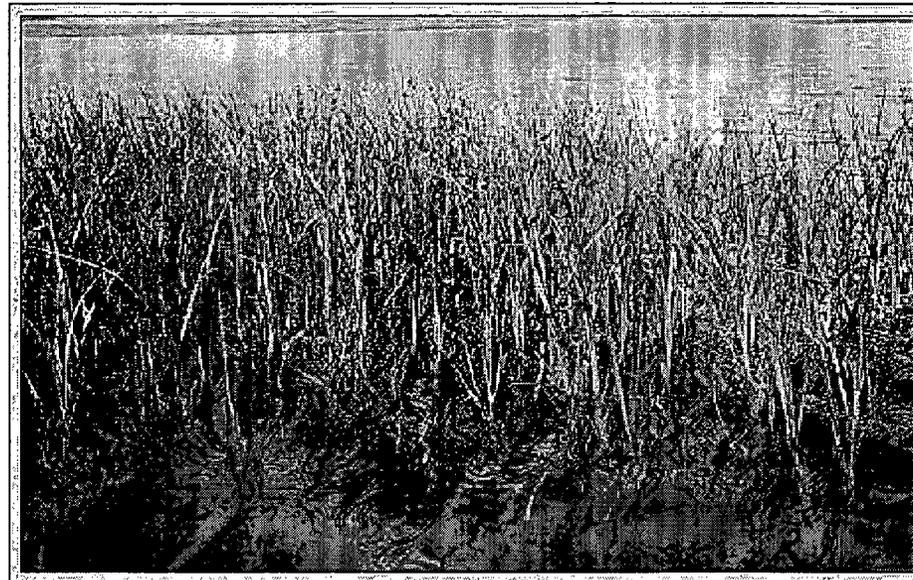
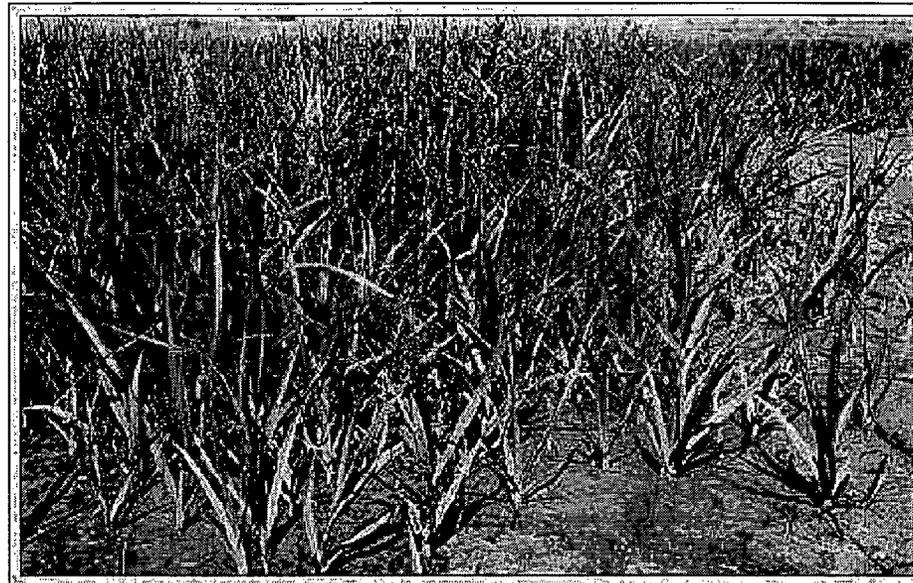
Water regimes of wetlands that support *S. maritimus* are variously described as irregularly exposed; irregularly, temporarily, seasonally, and permanently flooded; and saturated (Bassett 1978; Britton and Podlejski 1981; Ferren 1985; Grillas and Duncan 1986). In tidal Oregon wetlands, monotypic stands of *S. maritimus* occur in areas continuously submerged for a maximum of 6-9 h/24-h period annually. These stands are never continuously exposed for a full day (Eilers 1975). Similarly, stands in British Columbia estuaries occur where sediments are always saturated (Kennedy 1982). In France, populations occur in coastal wetlands that usually dry up in July or August and refill in October or December; the most well-developed stands grow at sites protected from strong wave action (Podlejski 1981). Stands in Spain occur on the banks of saline lagoons flooded more than 3 months/year (Garcia et al. 1993). Haslam (1987) associated this species with turbid and semiturbid waters where macrophytes are not visible more than 75 cm below the water surface.

Habitats of coastal populations of *S. robustus* are similar. Along the South Atlantic and gulf coasts, the best habitat is irregularly flooded salt marshes whose bottoms are covered by wind tides at irregular intervals (Uhler and Hotchkiss 1968). In North Carolina, this bulrush is most common in the transitional area between the lower zones of the irregularly flooded marsh and the upper zones of the regularly flooded marsh as well as in openings in the irregularly flooded high marsh that flood several times a month (Waits 1967; Heitzman 1978). These areas flood to very shallow depths, but water recedes slowly. *Scirpus robustus* stands occur at mean elevations of about 60 cm above MSL in North Carolina (Waits 1967) and 67-84 cm above MSL in Delaware (Bourn and Cottam 1950). Linthurst and Seneca (1980) found stands at elevations near 13 cm above MHW in North Carolina, whereas most plants occur near 40 cm below MHW in the nearby Chesapeake Bay (Flowers 1973). In Louisiana, Sasser (1977) found this bulrush mostly in areas at or slightly below mean water level. There, and in California, *S. robustus* is mostly found in the brackish marshes between saline and fresh marshes (Palmisano and Newsom 1968; Atwater and Hedel 1976). However, some Louisiana populations border the Gulf of Mexico or occur more than 80 km inland (Palmisano 1970; Brewer and Grace 1990).

### Interior Wetland Types

Populations of *S. maritimus* in the interior grasslands of central North America mostly occur in palustrine mixosaline wetlands (Cowardin et al. 1979) or in semipermanent brackish and subsaline wetlands (Fig. 2; Stewart and Kantrud 1971). These wetlands tend to be shallower and contain surface water for shorter periods than semipermanent fresh or slightly brackish wetlands (Millar 1976). In North Dakota, Metcalf (1931) differentiated between saline lakes dominated by *S. maritimus* and other saline lakes that dried out earlier or later and had less emergent vegetation. Plants sometimes occur in seasonally flooded basins but may disappear with higher water levels (Millar 1973). *Scirpus maritimus* also occurs in lacustrine wetlands (Ungar 1965, 1968, 1970; Stewart and Kantrud 1971; Lieffers and Shay 1982b) and in oxbows (Lieffers 1984). In the Great Basin, plants expand slowly into continually flooded areas but quickly colonize barren salt flats when shallow water flows are maintained for 2-3 years (Nelson 1954; Kadlec 1982). Inland populations also occur worldwide in a wide variety of natural and impounded wetlands (Dykyjova 1986) and in rice fields (Bassett 1978; Podlejski 1981, 1982; Ferren 1985; Bernasor and DeDatta 1986). *Scirpus maritimus* and putative *S. glaucus* × *maritimus* hybrids also grow in rice fields in California (Browning et al. 1995; see the taxonomy and distribution section).

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**Figure 2.** Natural stands of *Scirpus maritimus* in the same mesosaline, semipermanently flooded wetland in North Dakota. Upper photograph, taken 3 August 1961 where surface water had been absent for about 1 month, shows short plants with large numbers

of robust inflorescences. Lower photograph, taken 3 August 1962 where surface water had been present throughout the growing season, shows taller plants with fewer, smaller inflorescences. Photographs by R. E. Stewart.

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In summary, both bulrushes characterize estuarine wetlands at elevations near mean sea level where wave action is not severe. Stands also occur in slightly higher areas where groundwater-derived salts accumulate. In the continental interiors, *S. maritimus* occurs in palustrine wetlands with a wide variety of water regimes. Both species flourish in impoundments and rice fields.

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