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Bulletin No. 40: Salt Marsh Plants of Long Island Sound

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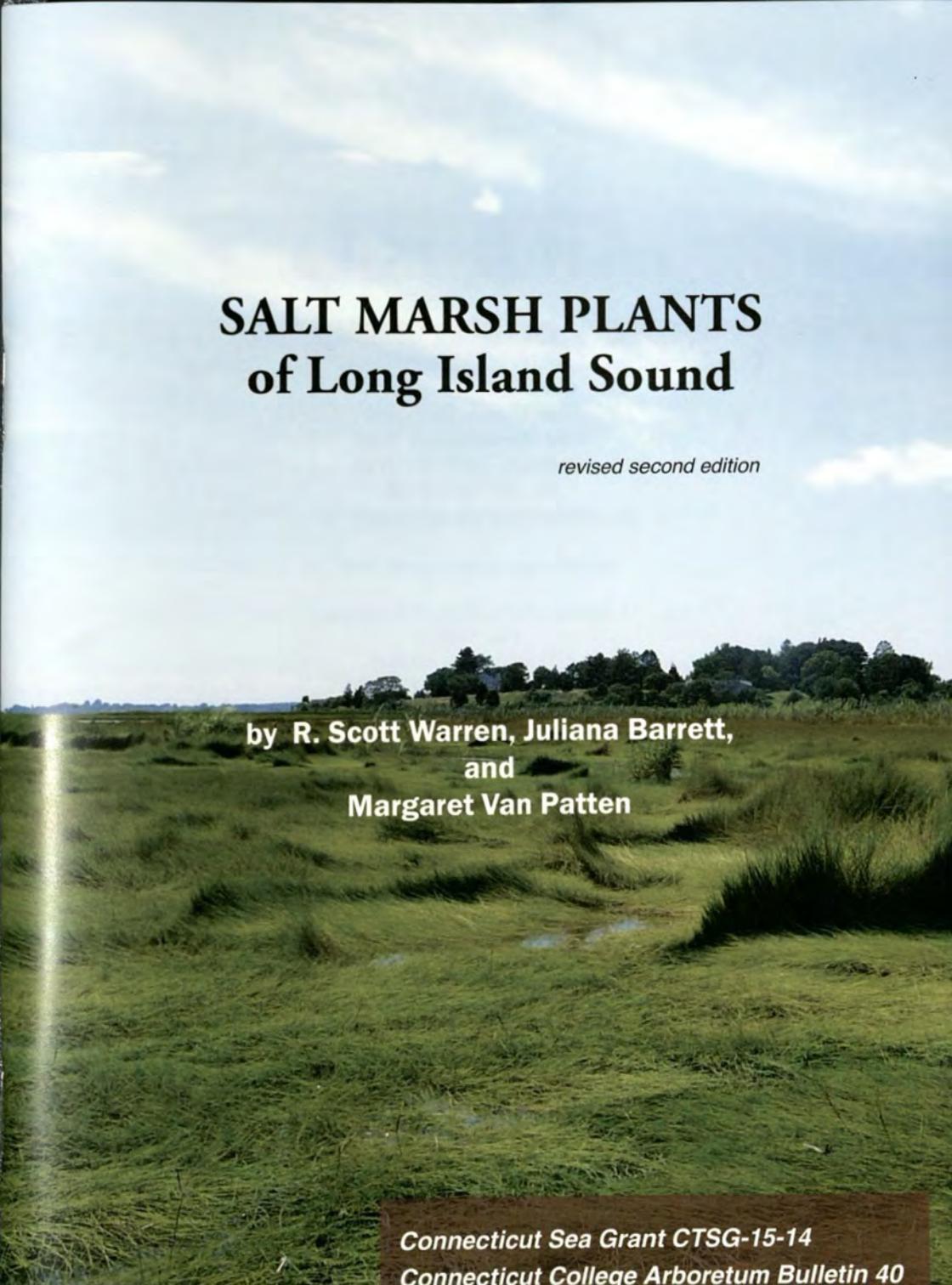
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SALT MARSH PLANTS of Long Island Sound

revised second edition

**by R. Scott Warren, Juliana Barrett,
and
Margaret Van Patten**

**Connecticut Sea Grant CTSG-15-14
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Salt Marsh Plants of Long Island Sound

by

R. Scott Warren, Juliana Barrett,
and Margaret S. Van Patten

Second edition

Revised 2015





About the Authors

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Preface

This field guide is intended to excite and assist students, teachers, and outdoor enthusiasts discovering the plant life of the earth's most productive ecosystems, the tidal marshes. Long Island Sound boasts many such treasures along its coastline that we hope will be understood and appreciated by generations to come, particularly in the struggle that marshes face against sea level rise and rapid development. Thus, in addition to passing on knowledge about plants and ecology, we also aspire to encourage a sense of stewardship in our readers to promote the conservation, protection, and restoration of these critical ecosystems. In her 1962 book *Silent Spring*, Rachel Carson said, "The human race is challenged more than ever before to demonstrate our mastery—not over nature, but of ourselves" and her words still ring true today.

A brief history of this publication and its predecessors: the first version of this guide to tidal wetland plants common along the shores of Long Island Sound was published by the Old Lyme Conservation Commission in 1968, as the Connecticut legislature was considering a Tidal Wetlands Protection Act. With growing public interest in these vital resources the booklet was reprinted, with more species, by the Connecticut College Arboretum in 1971. In 1980 the Arboretum published an expanded version. The development and printing of the first edition of this publication, produced by University of Connecticut Sea Grant Program and the Connecticut College Arboretum, was initially funded in 2009 by the U.S. E.P.A. Long Island Sound Study. This second edition has been revised with new plant descriptions, photographic illustrations, and updated scientific names. We kept the Arboretum's original fine line drawings, added more, and added photos. Artist Edward Henrey learned of our project and immediately agreed to do the artwork for the show-stopping center fold-out section, our final enhancement. We also took pains in the production process to select a splash-resistant environmentally friendly paper that is 100% recyclable and contains no ozone-depleting chemicals.

NOTE: We have used the terms salt marsh and tidal marsh interchangeably in the text, as we include a few brackish marsh species but no primarily fresh water ones. We welcome feedback from users, and hope we leave readers with an abiding appreciation for Long Island Sound's tidal marshes.

Introduction

SALT MARSH PLANTS OF LONG ISLAND SOUND

Salt marshes are the green belts and meadows we see between the upland and the tidal waters of Long Island Sound's bays, coves, and estuaries. Once viewed largely as mosquito breeding wastelands, good only for dredging, filling, or other development, by the middle of the last century scientists began to appreciate that these grasslands are critical components of the larger Long Island Sound ecosystem. They play key roles in providing habitat and nutrients for finfish, shellfish, birds and other wildlife, while performing many other important ecological services such as improving water quality that directly and indirectly benefit us all. Recognizing their multiple values, in 1969 the Connecticut legislature passed the original Tidal Wetlands Protection Act. By that time, Connecticut had lost about $\frac{1}{3}$ of the tidelands mapped in the 1880s, and in the decade before the act, losses were averaging about 250 acres per year. The rate is now about $\frac{1}{4}$ acre per year, and these permitted losses usually require restoration of degraded marshes as compensation.

The situation is even more serious for the New York marshes along the Sound. New York passed its Tidal Wetlands Act in 1973, to recognize the importance of this unique habitat and to protect it from the human activities such as dredging and filling that had already destroyed much of the original marshes. Despite this law, New York Department of Environmental Conservation estimates that about 1,395 acres (8%) have been lost since then. Although dredging and filling are restricted now, the causes of recent marsh loss are varied or in many cases, unknown.

Marshes are wetlands vegetated by soft-stemmed or herbaceous plants, as opposed to swamps, where woody trees or shrubs dominate. Along coast lines, where water comes from the action of tides, marshlands are termed tidal marshes. On the Atlantic shore of North America tidal marshes are dominated by grasses, rushes, and sedges, collectively termed graminoids. Ocean salinity off the New England coast is about 35 grams of salt per liter or parts per thousand (ppt). In estuaries such as Long Island Sound and its coves and rivers, ocean salt water mixes with and is diluted by freshwater from rivers and uplands. If the average salinity of flooding tidal waters is above 18-20 ppt the environment is termed **polyhaline**; tidal marsh vegetation that thrives at such salinities is characterized by a small number of highly salt tolerant plant species (halophytes); these tidelands

are true salt marsh. At lower salinities the environment is termed **brackish**; salinities between 18 and 5 ppt are called **mesohaline** and many more plant species are found here than in salt marshes. **Oligohaline** marshes have very low salinities, from 5 down to just $\frac{1}{2}$ ppt. There are a few places up some of the major rivers that empty into the Sound where tides are present, although reduced, but salinity is essentially diluted away (less than $\frac{1}{2}$ ppt); tidelands here are **tidal fresh** and support a great variety of plant species.

Tides are the critical physical (abiotic) factor organizing the plant and animal communities in tidal wetlands and tidal action provides the critical link between marshes and estuarine waters to form the tidal marsh-estuary ecosystem. A basic understanding of tides is important! Tides are driven by the gravitational pull of the moon and the sun on the earth's ocean waters. Over a lunar month (new moon to new moon, about $29\frac{1}{2}$ days) there are two periods when the earth, moon and sun are in alignment and two when they form a right angle. When sun and moon are aligned, during new and full moons, their gravitational pulls are added and tide range (difference between high and low tide) is greatest; these are called **spring tides**. During half-moon periods the sun and moon cancel each other to a degree and tide ranges are the least; these are called **neap tides**. The average water level (measured over a month, year, or more) is mean sea level (MSL) while the average height of all high tides is termed mean high water (MHW) and of all low tides mean low water (MLW); the difference between MHW and MLW is the mean tide range. In addition to the sun and moon, tide range is influenced by factors such as the shape of the shoreline and sub-surface topography. Long Island Sound provides an excellent example of this: In the eastern Sound, at New London, the mean tide range is less than three feet; as the tide moves west and the Sound narrows, the range increases to seven feet and more by the time it reaches Greenwich and Westchester County, New York. MSL, MHW and MLW are called tidal datums; other tidal datums important to salt marshes and estuaries are the average height of high and low spring tides, mean spring high and mean spring low water (MSHW and MSLW), and extreme spring high water, the highest of the spring tides.

Tidal datums define three ecologically distinct vegetation zones within tidal marshes, while at the same time movement of tidal water ties these zones together. The three zones or belts include:

Low Marsh is the area below approximately MHW. In polyhaline (salt) and mesohaline (brackish) marshes, low marsh is vegetated by an essentially pure stand of tall (90-180 cm or 36 to 72 in) smooth cordgrass (*Spartina alterniflora*) and can extend down vertically to a bit below MSL.

High Marsh, sometimes called the marsh platform, exists in a relatively narrow elevation range, from MHW at the edge of low marsh up to about the elevation of MSHW, where there is a transition to less flood and salt tolerant plants. In contrast to smooth cordgrass, most high salt marsh plants are less than two feet tall. This zone is dominated by saltmeadow cordgrass (*Spartina patens*), spike grass (*Distichlis spicata*), a stunted form of smooth cordgrass, and black grass, or more correctly, black rush (*Juncus gerardii*). These often occur in almost pure, single species, stands with relatively abrupt transitions between species in a pattern sometimes described as "a mosaic of pure types." Within this mosaic, stunted smooth cordgrass commonly occupies slight, wet depressions called pannes while black rush, the first to green up in the spring, is usually limited to slightly higher elevations near the upland and on creek bank levees, slightly elevated bands along creeks and bayfronts created as flooding tidal water slows and sediments settle onto the marsh surface. High marsh also supports a variety of **forbs**, a term borrowed from prairie ecology for non-woody or herbaceous flowering plants. Several forbs are described in this bulletin, such as sea lavender and salt marsh goldenrod, which add lovely color to the marsh in late summer and fall.

Upper Border marks the transition to upland, beginning at about MSHW and continuing to the upper limits of non-storm tides or, extreme spring high water. Plants found here are less tolerant of salt and flooding than those of the high marsh. In addition to black rush, which can extend into the upper border from the high marsh, the most common plants here include the woody shrub high tide bush or marsh elder (*Iva frutescens*), switch grass (*Panicum virgatum*) and a few different species of brackish marsh sedges. On most Long Island Sound tidal marshes, however, the most common upper border plant is a strain of common reed grass (*Phragmites australis*) that was introduced from Europe. This tall grass grows in dense stands, where competing plants become shaded out.

Moving up-river, tidal marshes become more brackish and many more plant species can be found. Saltmarsh bulrush (*Schoenoplectus robustus*) and smooth cordgrass can mix with other grasses in the low marsh. In this

transition from salt to mesohaline marsh, stunted cordgrass and then spike grass disappear but overall high marsh graminoids and forbs become much more diverse.

With even lower salinities (oligohaline) quite pure stands of narrowleaf cattail (*Typha angustifolia*) and sedges dominate. Some key brackish marsh species are also included in this bulletin. Fresh tidal marshes support a most wild and wonderful diversity of plants, including some ferns and horsetails; these are fascinating and little studied places, but are not included here.²

DEVELOPMENT AND FUTURE OF LONG ISLAND SOUND TIDAL MARSHES

Long Island Sound tidal marshes are relatively recent land forms; the oldest have developed over just the past 3000 or so years.³ They formed and are sustained through the interaction of marsh vegetation and gradually rising sea levels. Post-glacial sea level rise slowed from several mm per year down to about 1 mm (0.039") per year between 4000 and 3000 years before present. At the higher rates, smooth cordgrass stands could develop, but over the long term were drowned by rising sea levels. As sea level rise slowed, sedimentation within cordgrass stands, coupled with the volume produced by the grass roots and rhizomes, could keep up with sea level and grass grew out over developing tide flats and our oldest tidal marshes we find on the Sound today began to develop. As sedimentation and below ground growth continued, the marshes encroached landward over low-lying upland and freshwater marshes, and seaward over facing tidal flats. The landward side of these newly developing marshes also gained enough elevation, just above MHW, to allow the less flood-tolerant high marsh species to become established⁴. Figure 1 illustrates this process.

As sea level rose over centuries this process continued, with marshes moving landward over submerging uplands and seaward over mud flats. The accumulated and well preserved roots, rhizomes, and sediments form peat, up to ten feet deep in the oldest marshes, over both upland soils and one-time mud and sand flats. Roots and rhizomes decompose so little that they can be identified to species, and the vegetation history of a marsh reconstructed through analysis of **peat** cores⁵. As shoreline shapes change through natural and human induced forces, marsh faces also can erode, producing bare peat faces topped with just a narrow fringe of smooth cordgrass.

Over the last three thousand years or so sea levels on Long Island

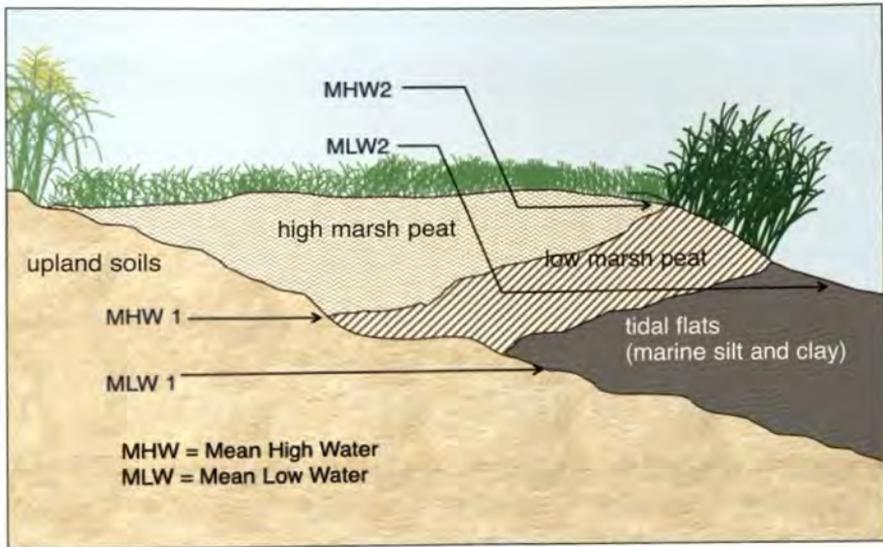


Figure 1. Bisect showing marsh development seaward with intertidal smooth cordgrass peat being replaced by high marsh peat as the marsh grows vertically, landward over submerging uplands, and seaward over tide flats with rising sea levels. MHW1 and MLW1 = MHW and MLW as the marsh began to develop; MHW2 and MLW2 = MHW and MLW today (after Redfield, 1965).

Sound have risen at an average rate of about 1 mm per year. Beginning in the mid 1800s this rate increased to 2.0–2.5 mm (about 0.1 inch) per year and over the last three decades the average has been close to 5 mm per year. With global warming, over the next several decades sea levels are predicted to increase even more rapidly, rising one to three feet by the end of this century. Will our marshes be able to keep up with rapid sea level rise? If not, they will drown and erode away, and their ecological functions and values will be lost. The vast salt and brackish marshes along Louisiana's Gulf coast provide a case in point. For a variety of reasons, sea level there is rising much faster than in New England, 8–10 mm (about 0.4 in) per year or more. Sediments that help build these marshes come principally from the Mississippi River and for several thousand years the river's natural flooding has distributed sediments across the Louisiana coast, allowing marshes to form and to keep pace with rising seas. Today constructed levees keep the lower Mississippi from flooding; its sediment load is carried directly into the Gulf of Mexico and is largely unavailable for marsh building. The result has been the rapid death and erosion of great areas of Louisiana's marshlands; it is estimated that over the past few decades an area the size of the Manhattan Island has been lost every year! We know

from recent research that our Long Island Sound marshes can usually keep up with sea levels when the rate is 2.0–2.5 mm (about 0.1 in) per year, but over the past two decades at least some marshes have not been able to match the more rapid 4–5 mm (0.15–0.2 in) per year that they have experienced. Also, since our marshes began to form they have had room to move landward as sea levels rose, often eroding at the front while expanding at the upper border side. In most places along Long Island Sound today, we have developed down to the upland edge of our marshes and as sea levels rise, marshes will have no place to go. Protecting undeveloped upland for tidal marsh expansion will be an essential part of any plan to preserve these vital ecological systems.

ECOLOGICAL FUNCTIONS AND VALUES OF TIDAL MARSHES

Tidal marsh-estuary ecosystems are recognized as among the most biologically rich and productive in the world. **Ecological functions** are what marshes “do” as part of these marsh-estuary ecosystems⁶. For example the marsh plants are important primary producers, providing energy for higher trophic levels while their stems, roots and rhizomes provide the physical structure that makes these places vital “nursery habitat” for so many different marine animals and both foraging and nesting habitat for a number of different birds. These include herons and egrets, osprey, rails, and the salt-marsh sharp-tailed sparrow (considered a species of national conservation concern by the U. S. Fish and Wildlife Service), as well as migrating waterfowl and shorebirds of the Atlantic Flyway⁷. Plants, along with the complex microbial communities of marshes and estuaries, also remove and transform pollutants such as nitrogen and phosphorus from estuarine waters, and, as noted above, marshes also trap and remove sediments from flooding waters. **Ecological values** are the worth we humans place on these functions. The nursery function of marshes, for example, is highly valued because it directly or indirectly supports most of the commercial and recreational finfish and shellfish caught along our shores. We also value clean water, and the functions that remove and transform nutrients and capture sediments contribute greatly to maintaining water quality in estuaries and the coastal ocean. Bird watchers and naturalists value bird habitat functions, and for different birds, so do those who hunt waterfowl. As storm surge waves cross marshes, their energy is dissipated; this produces another value to humans, protection of our developed upland from storm damage. The marshes are also able to absorb and slowly release floodwaters. The loss of such protection was seen most dramatically in 2005 when Hurricane Katrina hit the Louisiana coast and the city of New

"Tidal marshes are also of aesthetic and artistic value. Over the years they have inspired such poets as Sidney Lanier, as reflected in his beautiful *Marshes of Glynn*. Artists such as Martin Johnson Heade and William M. Chase have painted tidal marshes at Newburyport, Massachusetts and the Hackensack Meadows of New Jersey. More and more people are being attracted to these coastal systems for hiking and nature photography. Tidal marshes will also provide an unlimited outdoor educational resource for future generations concerned with preserving biotic diversity.⁸"

—William A. Niering (1924-1999)

Lucretia L. Allyn Professor of Botany, Connecticut College

Orleans. Loss of marshland between New Orleans and the Gulf of Mexico was an important factor contributing to the destructive power of the storm when it reached our human-built environment.

INVERTEBRATES AND DETRITUS: CRITICAL BUT SELDOM SEEN PARTS OF TIDAL MARSH-ESTUARINE ECOSYSTEMS

Primary productivity is the ability of plants to convert sunlight and carbon dioxide into living matter; secondary productivity is the transfer of that production to higher trophic levels. Not many animals graze directly on salt marsh plants, and those that do rarely consume more than 5–10% of what the plants produce in a season. One of the big questions in marsh ecology has been, "What happens to the rest of that energy trapped by plant photosynthesis?" It turns out that much of the plant production supports the decomposer community, invertebrates, fungi and bacteria that break the large, dead stems and leaves of marsh plants into small bits and pieces of plant material called **detritus**. Detritus particles become covered with bacteria and fungi and become a valuable nutritional resource that is an important part of the diet of a wide range of invertebrates and small fish. Detritus can also be carried off the marsh by tides, out into open estuarine water and the coastal ocean, where it can help support animals far from the marsh itself. The importance of detritus is so great that tidal marsh-estuary ecosystems are, in fact, often characterized as "detritus based ecosystems".

Standing in the middle of a tidal marsh you might see a few shore birds foraging in the low marsh or marsh wrens in reed grass along the upper

border, and you might not think that these systems support much animal life. Get down on your hands and knees, however, and start searching within the dense grass stems and you will find a great number and diversity of tiny animals. At first, you may disturb a lot of leaf hoppers and plant hoppers, and you'll surely find a number of their major predators, such as wolf spiders. In fact, salt marshes support some seven orders and 40 families of insects, most of them herbivorous grazers. Dig a bit deeper down the grass shoots to the marsh surface to find the snails and arthropods that are the dominant animals of tidal wetlands⁹. In salt marshes you will most certainly see the coffee bean snail (*Melampus bidentatus*), about the size, shape and color of its namesake. These graze algae and detritus from the marsh surface and can occur in densities of tens to hundreds per square meter. Comparably sized snails, but different species, replace the coffee bean snails in brackish marshes. Much quicker and more difficult to catch are amphipods (relatives of common "beach fleas") and isopods (related to "pill bugs" of old wood piles). The same species are found in both salt and brackish marshes and, while not quite as abundant as coffee bean snails, populations of 100 or more per square meter are not uncommon. Like the snails, amphipods and isopods forage on detritus and single celled algae.

In the low marsh the dominant invertebrates are a bit larger. Dense populations of ribbed mussels can be found in the mud among stems of cordgrass. These animals filter algae and detritus out of sea water, so they can only feed when flooded by the tides. Fiddler crabs are another low marsh invertebrate that is easy to see at low tide. High tide will find blue crabs, marsh crabs and green crabs also foraging among the submerged stems of cordgrass. Fiddlers are herbivores, sorting through surface mud to select algae and detritus. The marsh crab is an omnivore and one of the few animals to directly graze on cordgrass while green crabs and blue crabs are predators. Both rough and smooth periwinkles can also be found in the low marsh, along with different species of amphipods.

The most abundant fish in estuarine tidal creeks is the common mummichog (*Fundulus heteroclitus*) and when tides flood the marsh they follow the water up and prey on invertebrates. Fish coming onto the marsh from a tide creek tend to have relatively empty guts; as the tide falls and they return to the creek they will have food in their guts. Mummichogs are particularly fond of amphipods, but they are generalists and seem to eat just about any invertebrate that can fit in their mouths, along with algae and detritus. Mummichogs are in turn important prey for shore birds, crabs, and larger fish. As these higher predators move into open estuarine and off shore waters they are in turn prey for larger fish, thus the energy

captured by marsh plants and algae is moved from the marsh to the estuary to the coastal ocean in a "trophic relay".

TIDAL MARSH RESTORATION

Human activities have degraded the ecological functioning of tidal wetlands along the length of Long Island Sound. The most common impact has been the restriction of tidal action by undersized bridges and culverts that cross tidal water courses and by tide gates, initially installed for mosquito control or flood protection. These artificial reductions in tide range lead to a number of ecological changes; among others these include:

- Peat salinities drop and peat acidity rises, and fewer nutrients are delivered by the tides. These soil changes favor establishment and spread of the invasive, European strain of common reed grass and the loss of native plant species.
- Acid leaches from the peat into creeks, degrading estuarine water quality.
- Tall, dense reed grass creates a different habitat than the lower growing native grasses, resulting in the loss of many marsh birds.
- Larvae of many invertebrates are dispersed by tidal waters; when tides are reduced, populations of these species decline or disappear.
- Fish and crabs lose access to resources on the marsh and estuarine nursery habitat is lost.
- The water filtration and purification values of marshes are lost, lowering water quality.

The State of Connecticut has been a leader in restoring salt marshes degraded by tidal restrictions. Undersized culverts have been replaced and tide gates removed or opened at dozens of sites along the coast, returning tides and restoring ecological functions to over 2000 acres of salt marsh. New York is currently mapping the extent of its marshes and monitoring trends. For example, loss of smooth cordgrass along perimeters and shifts in species have been documented.

In brackish marshes, common reed can invade and spread rapidly even without human disturbance and since the 1960s large areas of high diversity brackish tidelands have been converted to nearly pure stands of common reed. While not as harmful as restricted tides, loss of the complex native mix of species degrades a range of ecological functions and values in these invaded marshes, including habitat for several bird species. Restoring the complex natural brackish tideland vegetation on reed invaded marshes

"To stand at the edge of the sea, to sense the ebb and flow of the tides, to feel the breath of a mist moving over a great salt marsh, to watch the flight of shore birds that have swept up and down the surf lines of the continents for untold thousands of year, to see the running of the old eels and the young shad to the sea, is to have knowledge of things that are as nearly eternal as any earthly life can be."

—*Rachel Carson (1907-1964)*¹⁰

is a difficult challenge; in these situations there are no tide gates to open or small culverts to replace. If common reed grass is killed with herbicide, native plants can become re-established, but it takes several years for complete restoration, and during this time the invasive strain can easily become re-established. Common reed grass control projects by the State of Connecticut, The Nature Conservancy, and private land owners have been started at a number of sites along the Sound, most notably in the lower Connecticut and Housatonic Rivers. This work has made it clear that we will never eradicate common reed from brackish marshes, but reed can be reduced and its negative ecological impacts minimized with careful management.

HOW TO USE THIS GUIDE

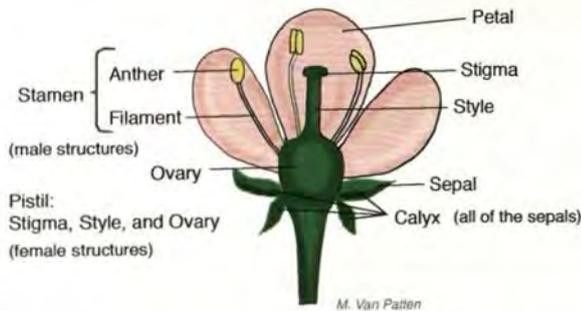
This field guide is printed on water-resistant paper so it can be carried into the marsh with you. The authors have tried to avoid technical botanical terminology as much as possible in plant descriptions, and included a flower diagram on the next page. The measurements for plant structures are given using the metric system, and abbreviated as "cm" (centimeters). Equivalent measurements in inches, abbreviated as "in", are also provided for your convenience. If you find yourself lacking a ruler, use the one printed on the inside back cover. Each plant is categorized according to "What it Looks Like" "Where to Find It" and "When to Look". Interesting notes or ways to tell species apart are added at the bottom. Some terms for very basic floral parts are used; the diagram on this page should help with those. Ways to tell grasses, sedges, and rushes apart are also included here.

The species are not listed alphabetically or by frequency; rather, they are grouped by habitat within the marsh and whether salt marsh species or brackish. Salt marsh species appear first, and brackish ones towards the end, although there is overlap. Therefore, the best thing to do is to use the Index to find a particular species, or flip through until you spot a photo that resembles your specimen. Then read through the description and examine the line drawings to see if you have the right one. There are two

key things to check: structure and location or habitat. Next, check the centerfold to see if your specimen is depicted in the same location and habitat shown in the labelled diagram. Alternatively, you can use the centerfold to help you find the location of a particular species that you're interested in.

Finally, it should be noted that not every plant species ever found in a salt marsh appears here. The authors have selected these typically encountered species.

Parts of a Flower



How to differentiate between grasses, sedges, and rushes

It can be quite difficult for the novice to tell grasses, sedges, and rushes apart at first glance, even though they are not in the same plant families. Once again, examine the structure. The shape of a cross section of the stem is very helpful. In cross section, grass and rush stems are typically round or flat, while sedge stems are usually triangular. In addition, The stems of sedges and rushes are generally solid, while those of grasses are hollow. Grass stems also contain swollen nodes or joints, whereas sedges and rushes do not. In addition, grasses often produce both vegetative and floral stems, whereas sedges and rushes only develop floral stems.¹¹



J. Barrett

Smooth Cordgrass, Saltwater Cordgrass

Spartina alterniflora

Grass Family
Poaceae

What it Looks Like

This important grass has two growth forms. The first is a tall, slender form, 100 to 200 cm (39-78 in) high. Color is green to tan, depending on age and season. Leaf blades are 30 - 50 cm (12-19 in) long, tapering to a point. In bloom, flowers and fruits grow along just one side of the spikes in the terminal stalk. Yellowish flowers are inconspicuous. The short form grows from a few to 50 cm (1-20 in) tall, with shorter leaves, and flowers less extensively.

Where to Find It

The tall form is restricted to the low elevations in the marsh intertidal zone. Along banks of bays, creeks, and estuaries, it forms a belt of varying width. The short, stunted form occurs in depressions or pannes in the high marsh and disturbed areas.

When to Look

Blooms in mid-summer to August. Visible year-round.

Notes

The most productive marsh grass, it's able to tolerate a broad range of salinities. Tiny glands excrete excess salt. The tall form provides food and shelter for many marsh birds and other animals. Detritus from decaying plants is consumed by many small estuarine animals. Extensive roots bind the sediment.



M. Van Patten

Saltmeadow Cordgrass

Spartina patens

Grass Family
Poaceae

What it Looks Like

This green grass with slender leaves grows from 30-50 cm (12 to 20 in) high. It's easy to spot since it is generally the most abundant grass. Stands sometimes form cowlick-shaped tufts. Spikes flower on only one side of the stem. Medium to dark green color in spring and summer.

Where to Find It

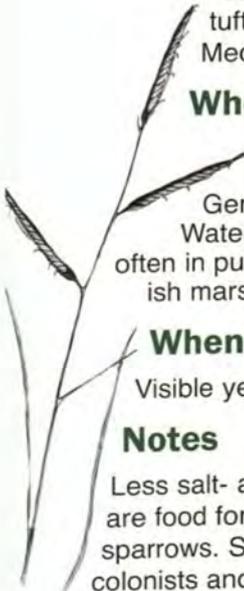
Restricted to the high marsh, usually in areas that are flooded only during higher than average tides. Generally dominates the high marsh above Mean High Water, between smooth cordgrass and the upland shrubs, often in pure stands (monocultures). Commonly found in brackish marshes too.

When to Look

Visible year-round; blooms in mid-to-late summer.

Notes

Less salt- and flood-tolerant than smooth cordgrass; its seeds are food for black ducks and both seaside and sharp-tailed sparrows. Saltmeadow cordgrass was harvested for hay by early colonists and is still mowed and sold as mulch. The name *Spartina* comes from a Greek word for "cord."





J. Barrett

Spikegrass
Distichlis spicata

Grass Family
Poaceae

What it Looks Like

Tall green grass, usually 20-50 cm (8 to 20 in) tall. Stems and leaves are thicker than saltmeadow cordgrass and leaves tend to be shorter. Blades are stiff, light green, sometimes silvery. There is a wider leaf angle than with saltmeadow cordgrass. Terminal flowering spikes appear in August and spikegrass that had been hidden within saltmeadow cordgrass suddenly becomes obvious.

Where to Find It

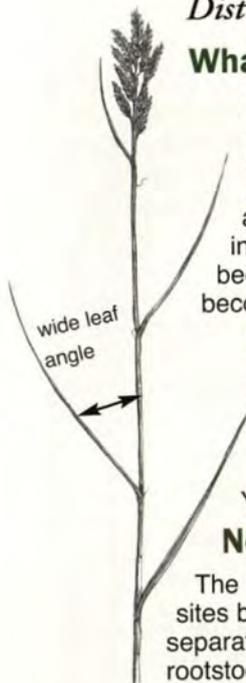
Spikegrass grows on the high marsh, in pure stands or mixed with saltmeadow cordgrass and black rush.

When to Look

Year-round, flowers August to October.

Notes

The most salt-tolerant marsh grass, it readily invades open sites by underground runners. Male and female flowers are on separate plants ("dioecious"). Geese eat the young plants and rootstocks. Spikegrass is also an important species in Pacific coast salt marshes and can be found in alkaline or salt deserts worldwide.





J. Barrett

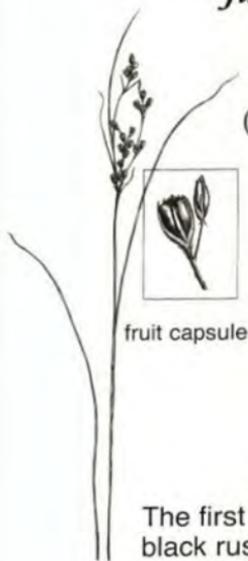
Black rush, Blackgrass

Juncus gerardii

Rush Family
Juncaceae

What it Looks Like

Wiry-stemmed, grass-like, grows from 20-50 cm (8 to 20 in) tall. It has tiny, dark brown to black fruit capsules. Stems are round in cross section; long, narrow, rounded leaves. Tiny flowers grow in spikelets, and look similar to a lily but with scale-like floral parts.



fruit capsule

Where to Find It

Black rush grows near the highest edges of the marsh, often as a relatively pure stand; or at higher elevations on natural creek banks and bay front levees.

When to Look

The first marsh species to turn green in the late spring, black rush becomes brown relatively early in the growing season. In early summer, the fruits (capsules) turn dark brown.

Notes

Black rush is not a grass, but a member of the rush family. It is less salt tolerant than other marsh species possibly because it lacks the salt glands found in the leaves of other salt marsh plants allowing them to eliminate excess salts.



J. Barrett

Salt Sandspurry
Spergularia salina

Pink Family
Caryophyllaceae

What it Looks Like

Small, delicate annual that grows to only 7-15 cm (4 to 6 in) high and has small, fleshy, linear leaves. Leaves range in length from 1.5 to 4 cm (0.6 to 1.6 in). Flower color ranges from white to pink. Capsules are greenish to tan.



USDA-NRCS PLANTS Database

Where to Find It

This plant grows in higher elevations of the low marsh. It prefers open sites but sometimes is found growing in the understory of the smooth cordgrass. It may also be found along coastal shorelines.

When to Look

Flowers from June to August.

Notes

This species is native in many coastal areas and in some inland saline sites. However, there are reports from the Great Lakes that populations have been introduced where runoff from salted pavements has created favorable growing conditions.



J. Barrett

Perennial Saltmarsh Aster

Symphyotrichum tenuifolium
(formerly *Aster tenuifolius*)

Aster Family
Asteraceae

What it Looks Like

This straggly looking aster grows from 30-60 cm (12-24 in) tall with whitish to pale purple flower heads that are 1.5-2.5 cm (0.5-1 in) wide. Leaves are fleshy and narrow, growing from zigzag stems.

Where to Find It

Scattered in the saltmeadow cordgrass or in openings on the marsh where it often grows with sea lavender and purple gerardia.

When to Look

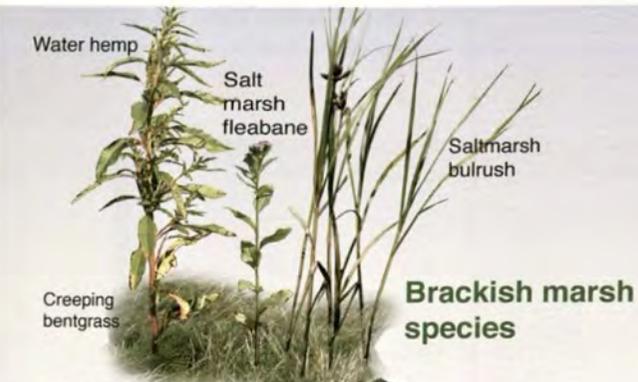
Perennial; flowers in late August into the fall with fruits ripening in September to late October.

Notes

The closely related annual saltmarsh aster (*Symphyotrichum subulatum*) has much smaller flower heads, ranging from 0.6-1.3 cm (¼ to ½ in) wide, with more leaves and branching.



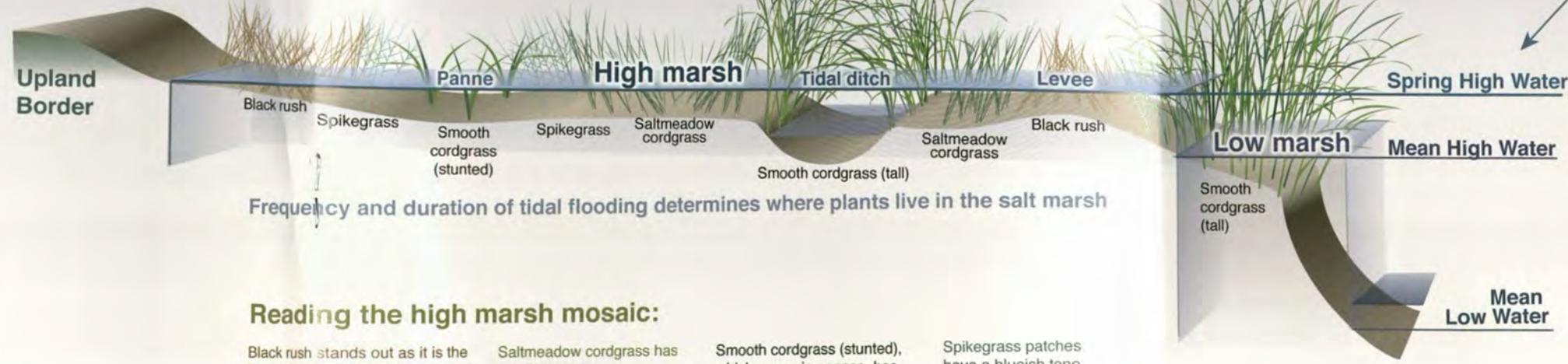
Salt Marsh Plants



Brackish marsh species



Upland border



Frequency and duration of tidal flooding determines where plants live in the salt marsh

Reading the high marsh mosaic:

- Black rush stands out as it is the first to turn brown in summer and the first to turn green in spring.
- Saltmeadow cordgrass has a yellowish tone.
- Smooth cordgrass (stunted), which grows in pannes, has broader leaves and is often taller than the other grasses.
- Spikegrass patches have a blueish tone.

When the sun, moon and earth are in alignment twice a month they produce very high (spring) tides that cover the upper marsh.



Upland Edge - Black rush and spikegrass

Panne - a waterlogged salty depression where high marsh grasses cannot survive resulting in bare spots where many other plants live.

Saltmeadow cordgrass mix



Low marsh
smooth cordgrass bordering tidal creek

Black rush (on creek levee)

Spikegrass

Orach

Saltmeadow cordgrass mixed in with aster, orach, and spikegrass

Saltmarsh aster

Orach

Saltmeadow cordgrass

Salt Marsh Plants in their Habitats

This centerfold, created by artist Edward Henrey, allows you to see where the marsh plants are in relation to the environment and to each other. It can be used to help locate species that you are seeking. This habitat drawing reinforces the concept that elevation is the key element in marsh plant distribution, as well as the fact that the solar and lunar cycles control the tides that drive the marsh.

Educators may want to gently remove this piece from the staples and post on a bulletin board.



J. Barrett

Beaked Spikerush

Eleocharis rostellata

Sedge Family
Cyperaceae

What it Looks Like

This perennial sedge is easily mistaken for a grass. The thin stems (0.1-0.2 cm wide) are clustered on a rootstalk, and are 40 to 100 cm (15-39 in) long. The inflorescence is a small, light brown spikelet that is only 1 to 2 cm (0.4-0.8 in) long.



Where to Find It

This species occurs in brackish meadows and tidal marshes.

When to Look

This sedge blooms during the summer months into the fall, but the culms (stems) are visible from late spring throughout the growing season.

Notes

Waterfowl eat the stems, roots and achenes (very small fruits) of this plant. A smaller relative known as dwarf spikerush, *Eleocharis parvula*, can also be found in brackish marshes and mudflats.



Herbaceous Seepweed
Suaeda maritima

Goosefoot Family
Chenopodiaceae

What it Looks Like

Generally between 7.5 to 30 cm (3 to 12 in) tall, prostrate or erect.

The leaves are fleshy and small, 1-5 cm (0.4-2 in) long, 0.1-0.2 cm (0.04-0.08 in) wide. Flowers are very small (0.2-0.3cm or 0.8-0.11 in in diameter) with no petals, usually five green sepals, and yellow stamens.



USDA-NRCS PLANTS Database

Where to Find It

Can be found on the beach growing in rocks or sand, as well as open sites within the salt marsh.

When to Look

This species flowers in the late summer to early fall.

Notes

This plant has a worldwide distribution with many sub species and varieties.



J. Barrett, M. Van Patten

Glasswort

Salicornia depressa

Goosefoot Family
Chenopodiaceae

What it Looks Like

Small, erect plant, usually 10-30 cm (4 to 12 in) high by the end of the summer. Fleshy stems are about 0.3 cm (0.1 in) in diameter, smooth, jointed, fleshy and succulent, like a cactus; appears leafless but leaves are tiny scales on the stems. Many erect branches can develop over the growing season. Color is bright green in early summer and bright red in late summer or fall.

Where to Find It

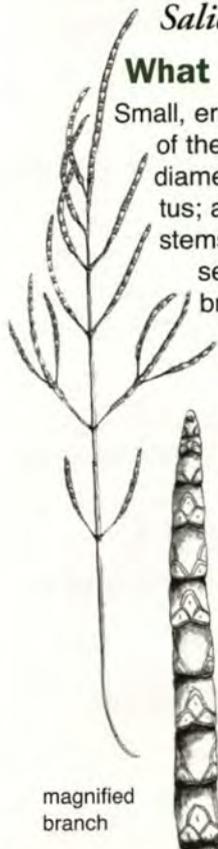
Bare spots or pannes.

When to Look

Easy to find from early summer to first frost.

Notes

This glasswort, our most common one, is an annual, often mistakenly called *Salicornia europaea*. A similar species, *Sarcocornia perennis*, is a bushy perennial with woody rhizomes. A third glasswort, *Salicornia bigelovii*, is also an annual but is shorter (usually not more than 10 cm (12 in) tall).



magnified
branch



C. Janiak



N. Balcom

Sea Lavender

Limonium carolinianum

Leadwort Family
Plumbaginaceae

What it Looks Like

A highly branched flowering stalk makes sea lavender easy to find. The plant has a basal rosette of leaves shaped like narrow spoons, which are 5-25 cm (2-10 in) long. The flowering stalk growing out of the rosette is covered with tiny, pale purple, funnel-shaped flowers, about 0.3 cm (0.1 in) wide. This stalk usually grows to 15-47 cm (6 to 18 in) high. Flowers are in one-sided clusters.

Where to Find It

Occupies a broad range of high marsh habitats; often with other forbs such as gerardia, arrow grass, or seaside plantain; in these forb patches or pannes, plant growth is usually stunted and sea lavender's flowering stalk may be just a few inches tall.

When to Look

Flowering stalks can appear in July and flowering is heavy by mid August.

Notes

Often appears as a purple haze in the marsh; Susceptible to over-harvesting for wreaths and flower arrangements.





N. Balcom

Seaside Plantain

Plantain Family
Plantaginaceae

Plantago maritima

What it Looks Like

This plantain has narrow leaves that are somewhat triangular or V-shaped in cross section. Leaves are arranged in a rosette at the base of the plant and have a single prominent rib. Individual flowers are white and inconspicuous and are closely arranged on a stiff, elongate stalk. Plants range in height from 5 to 20 cm (2 to 8 in).

Where to Find It

Found on the high marsh with saltmeadow cordgrass, particularly along ditch edges. Also found in pannes, where its growth is usually stunted, reaching just a few centimeters in height.

When to Look

Plants flower from June to September, but the rosette of leaves is distinctive throughout the growing season.

Notes

This plantain is related to those often found in lawns. Many of the species in the Plantain Family are known for their medicinal and herbal uses.



magnified fruit



N. Balcom



magnified fruit



Arrow Grass

Triglochin maritima

What it Looks Like

Tall plant with long, sword-like leaves which can reach over 30 cm (11 in) in length. In the high marsh, can have lush growth, up to 45 cm (18 in). The small flowers are on a spike-like stalk rising above the leaves. The tiny fruits, about 6mm (¼ in) long, have conspicuous ridges. At first glance, this species may look similar to seaside plantain, but can be distinguished from it by its greater height, round leaf cross section (as opposed to the V-shaped leaf cross section of seaside plantain), and its distinctive fruit.

Where to Find It

Scattered in the high marsh with grasses; noticeable due to its height. Also grows in depressions with other species such as seaside plantain and sea lavender.

When to Look

Plants may bloom from early summer into mid-August.

Notes

Leaves of this plant are poisonous to livestock. The species name, "maritima" means "of the seashore."

Arrow Grass Family
Juncaginaceae



close-up of flower

N. Balcom

Purple or Pink Gerardia
Agalinis maritima

Figwort Family
Scrophulariaceae

What it Looks Like

This small annual has narrow, opposite branches and leaves. The plant is usually less than 20 cm or 8 in tall. Leaves are succulent with blunt tips. The flowers are small (0.6 to 1.3 cm; ¼ to ½ in long), tubular, and pink to lavender in color.

Where to Find It

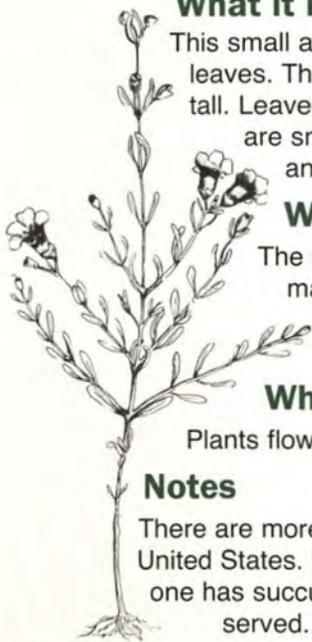
The species grows in open areas of the salt marsh, including pannes and depressions with plants such as glasswort, sea lavender, arrow grass, and seaside plantain.

When to Look

Plants flower from mid-July to September.

Notes

There are more than 15 species of *Agalinis* in the eastern United States. Like many other plants in this booklet, this one has succulent leaves that allow water to be conserved.





J. Barrett

Orach
Atriplex patula

Goosefoot Family
Chenopodiaceae

What it Looks Like

Erect or slightly prostrate form. Leaves are light green, wedge-shaped, smooth, often scurfy (covered by a white, scale-like coating). Flowers are small, greenish, and clustered on slender spikes along the stems. Stem is generally 30-100 cm (12-39 in) long.

Where to Find It

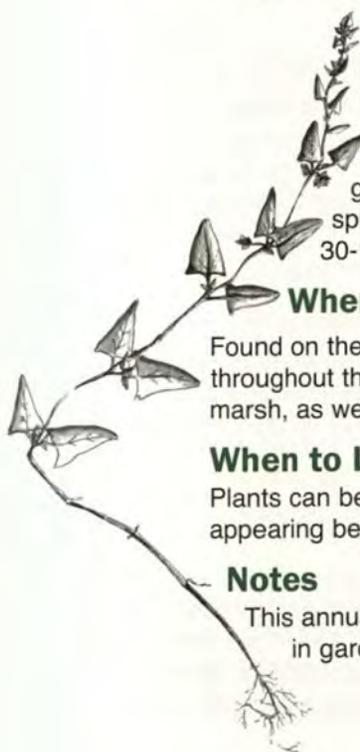
Found on the less saline marshes, scattered throughout the saltmeadow cordgrass on the high marsh, as well as along the upper marsh border.

When to Look

Plants can be found in late spring with flowers appearing beginning in mid-summer.

Notes

This annual species is often considered a weed in gardens, fields, and roadsides.





J. Barrett

Seaside Goldenrod
Solidago sempervirens

Aster Family
Asteraceae

What it Looks Like

Plant can be from 30 -100 cm (12 to 39 in) tall, with showy bright yellow flowering heads in one-sided clusters that may form a pyramid shape at the top of the stem. The flowerhead clusters can be 5-13 cm (2-5 in) across. Leaves are "lance-shaped", thick and waxy, bright to dark green and sometimes purplish.



Where to Find It

Found in higher, drier, less saline parts of salt marshes, often along upland borders. It can become abundant in brackish tidelands; also found on beach dunes.

When to Look

Flowers bloom from August to November.

Notes

If you've seen the related terrestrial goldenrods, this plant will look very familiar. You'll find that it has larger flower clusters and fleshy, succulent leaves compared to its terrestrial "cousin". The waxy coating on leaves protects it from salt spray.



J. Barrett

Salt Marsh Fleabane, Sweetscent

Pluchea odorata var. *succulenta*
(formerly *P. purpurascens*)

Aster Family
Asteraceae



What it Looks Like

This species ranges in height from 15-50 cm (6 to 20 in). The flowers are pink to purple in color and grow in small, flat-topped clusters at the end of the stems. Leaves are variable in shape—ovate to lanceolate, with slightly toothed, scalloped, or smooth edges.

Where to Find It

This annual species may occur in large patches on open sites; in salt marshes it is limited to the upper border areas but can be common in brackish tidal marshes.

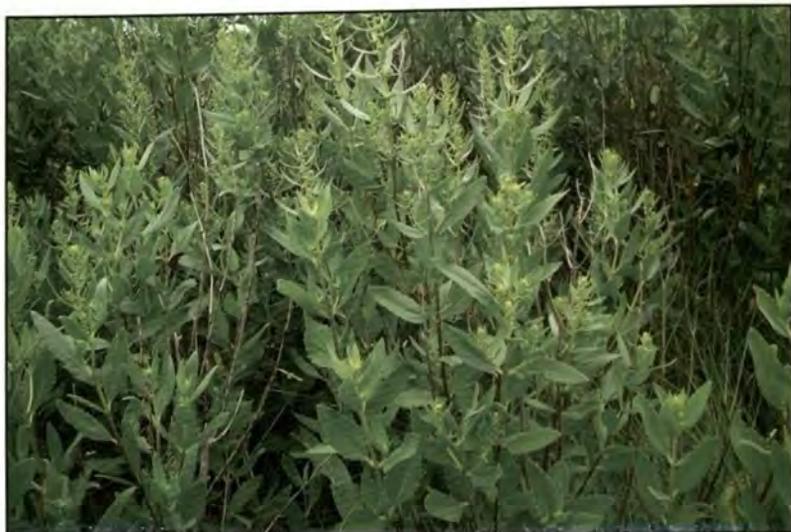


When to Look

This annual plant blooms from July to September.

Notes

Flowers are fragrant, hence "odorata".



J. Barrett

Marsh Elder, High-tide Bush

Aster Family
Asteraceae

Iva frutescens

What it Looks Like



Grows to about 60-180 cm (23 to 70 in) tall. This shrub has fleshy, sharply toothed, oppositely arranged leaves, approximately 7-13 cm (3 to 5 in) long. The flowers heads are greenish-white and are very small and inconspicuous.

Where to Find It

High water border of the marsh, also growing in the high marsh on the dredged material lining ditches dug for mosquito control. Like black rush, it also can be found at higher elevations on naturally occurring creek bank and bay front levees.

When to Look

New leaves appear each spring. Flowers bloom in late summer, on nodding flower heads.

Notes

Often confused with groundsel tree. The key to differentiating the species is that groundsel tree leaves are arranged alternately on the stems. Marsh elder provides nesting habitat for birds such as the red-winged blackbird and marsh wren.



N. Barrett

Goundsel tree
Baccharis halimifolia

Aster Family
Asteraceae

What it Looks Like

This shrub is usually between 100-240 cm (39 to 94 in) tall but can grow even taller. Stems remain slightly green during the winter, while marsh elder stems do not. Leaves are alternately arranged on the branches and are roughly wedge-shaped and coarsely toothed. Plants can be either male or female; male flowers produce stamens and female flowers produce pistils. The female flowers are white, silky, and very showy as they mature into fruit in the fall.



Where to Find It

Uppermost border of the marsh.

When to Look

Each spring, new leaves appear. The female fruits are very showy in the fall.

Notes

Marsh wrens and other small birds nest in the branches. This deciduous species is considered a good landscape plant in exposed coastal areas as it is highly resistant to salt spray and flooding.



N. Balcom

Saltmarsh Bulrush
Schoenoplectus robustus

Sedge Family
Cyperaceae

What it Looks Like

Tall, grows up to 110 cm (43 in) high with long, narrow, grasslike leaves. Stems are triangular in cross section. The cluster of brown spikelets has several short leaves (the involucre) extending beyond it.

Where to Find It

Brackish tidal wetlands and wetter, low salinity areas within salt marshes, particularly along the upper border.

When to Look

Blooms and fruits from late June to October.

Notes

This perennial species is valuable to wildlife as both food and cover. The seeds are eaten by waterfowl and muskrats. The rootstocks are eaten by muskrats and geese. There are many other native rushes. Rushes, as well as cattails and reeds, were used by Native Americans and colonists for weaving mats, chair seats, baskets, and thatch roofs.





J. Barrett

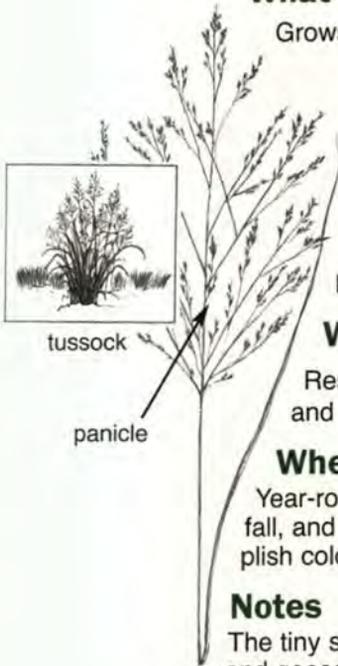
Switchgrass

Panicum virgatum

Grass Family
Poaceae

What it Looks Like

Grows in discrete "tussocks" (clumps) 20-30 cm (8-12 in) or more in diameter. Switchgrass plants are 90-150 cm (35-60 in) tall; tussocks may form a distinct, conspicuous belt at the highest elevations of salt marshes. Flowering heads branch openly into loose clusters ("panicles") from 15-50 cm (6-20 in) long with clusters of tiny inconspicuous flowers. In the fall plants are light tan.



Where to Find It

Restricted to uppermost border of tidal marshes and occasional brackish marsh levees.

When to Look

Year-round. This grass turns a yellowish color in the fall, and is tan in the winter. Flower heads turn a purplish color in the fall.

Notes

The tiny seeds and young leaves are eaten by rails, teal, and geese. It's sometimes found along New England roadsides, in abandoned agricultural fields and in mid-western prairies, too. Often used as an ornamental grass, this species is now being considered for use as biomass fuel.



J. Barrett

Common Reed
Phragmites australis

Grass Family
Poaceae

What it Looks Like

Found around the world, this tall, perennial grass has a native strain, but the one seen most commonly is an invasive strain that can grow up to 450 cm (177 in) high. Growth is often from long, horizontal runners that can root. Through runner growth, this species forms dense, almost impenetrable stands. Large flower clusters are feathery in appearance, 15-30 cm (6 to 12 in) long, and change in color from reddish, to silver and finally tan in the winter months.



Where to Find It

Along the upper borders of salt marshes where there is fresh-water input or disturbance. It is also found in salt marshes in which tidal flow has been restricted or impeded. Common reed can also dominate brackish tidelands and inland fresh wetlands.

When to Look

Blooms during the summer months: visible year round.

Notes

The stalks contain silica, which may play an important role in silica cycling in the estuarine environment. However, invasive monocultures have a negative impact on biodiversity. The native strain is shorter and does not form dense stands.



N. Barrett

Waterhemp

Amaranthus cannabinus

Amaranth Family
Amaranthaceae

What it Looks Like

This annual plant can grow from 100-200 cm (39-78 in) tall. It has lance-shaped, alternate leaves on long petioles (the slender stems that support leaves).

Where to Find It

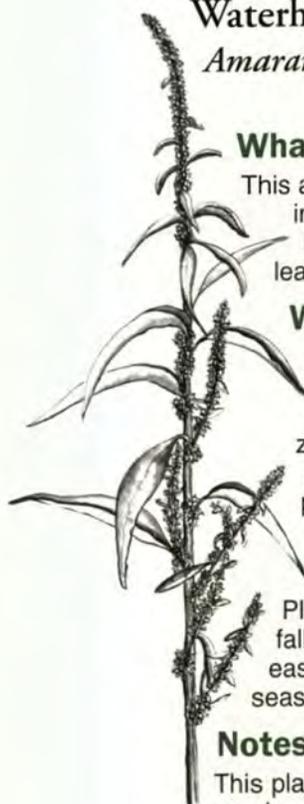
This species is more common in brackish tidal marshes, where it generally occurs in the upper intertidal zone. It also can be found in the upland border of salt marshes, particularly where there is fresh-water discharge.

When to Look

Plants bloom from summer into fall, but the conspicuous stems are easily visible throughout the growing season.

Notes

This plant produces large quantities of seeds which are important food for waterfowl, particularly black ducks.



J. Barrett



J. Barrett

Narrowleaf Cattail

Typha angustifolia

Cattail Family
Typhaceae

stamens
(male)

pistil
(female)

What it Looks Like

Long, narrow, sword-like leaves, and a cigar shaped fruit. The plant ranges in height from 100-200 cm (39-78 in). Leaves are only about 1.3 cm (0.5 in) wide, narrower than the common cattail. The flowering structure has a distinct separation of 2.5-7.6 cm (1-3 in) between the female flowers (pistils) on the bottom of the flowering structure and the male flowers (stamens) on the upper portion of the spike. When the plants are mature, only the fruits persist and the male flowers fade. This leaves the cigar shaped, brown fruit cluster with a bare stalk above it.

Where to Find It

Brackish tidal marshes

When to Look

Blooms from May to July

Notes

Native Americans and early colonists ground the starchy rootstocks into flour. Leaves and stems were used to make matting, thatch, baskets, and ropes.



J. Barrett

Creeping Bentgrass

Agrostis stolonifera

Grass Family
Poaceae

What it Looks Like

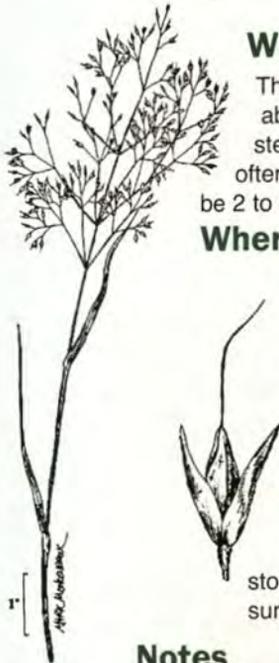
This perennial grass is stoloniferous (a stolon is an aboveground stem or runner that can root). Grass stems or culms are 40 to 100 cm long (15-39 in) and often prostrate. Individual blades along the culm can be 2 to 10 cm long (0.8 to 4 in).

Where to Find It

This grass occurs in brackish meadows subject to irregular flooding. Also an important colonizer in landward marsh migration and in upper border areas wet from upland runoff. Creeping bentgrass is often mixed with other species such as salt-meadow cordgrass, and arrowgrass, as well as other grasses and sedges.

When to Look

This grass can reproduce both from seeds and stoloniferous growth. Flowers are produced during the summer months.



USDA-NRCS PLANTS Database

Notes

There are more than 100 species of the genus *Agrostis*; this one is often cultivated for lawns and golf courses.



Rosemallow
Hibiscus moscheutos

Mallow Family
Malvaceae

What it Looks Like

Large slightly-toothed leaves have pointed tips and are pale green or gray-green with downy white hairs on the undersides. Grows from 90 cm-150 cm (36 to 60 in) high. Showy pink flowers with five petals that may be several inches in diameter. Numerous yellow stamens form a column around the style; there is a ring of narrow, green leaf-like bracts under the calyx. The fruit is a capsule with 5 segments and remains on the plant in the fall.

Where to Find It

Upland edge of salt marshes and in brackish marshes, scattered within stands of cattails and sedges.

When to Look

Blooms from late July to September.

Notes

This species has two color variations, pink or white, often with a red center. Also known as *Hibiscus palustris*.



References

- 1 "Salt Marsh Plants of Connecticut". Connecticut College Arboretum Bulletin # 25.
- 2 Much more information on brackish and fresh tidelands can be found in "Living Resources and Habitats of the Lower Connecticut River", Connecticut College Arboretum Bulletin #37.
- 3 See "Geologic History of Long Island Sound" and "Evolution and Development of Tidal Marshes" in Tidal Marshes of Long Island Sound, Connecticut College Arboretum Bulletin # 34.
- 4 From Connecticut College Arboretum Bulletin # 25, Figure 1.
- 5 See Connecticut College Arboretum Bulletin #22, Our Dynamic Tidal Marshes: Vegetation Changes as Revealed by Peat Analysis.
- 6 For a more detailed discussion of tidal marsh ecological functions and values see the chapter "Tidal Wetland Ecology of Long Island Sound" in Connecticut College Arboretum Bulletin # 34.
- 7 For more information of tidal wetland birds see "Birds of Connecticut Salt Marshes", Connecticut College Arboretum Bulletin # 27.
- 8 Quoted from William Niering in Connecticut College Arboretum Bulletin #25.
- 9 For more information on the invertebrates and fish found in Long Island Sound marshes and estuaries see "Tidal Marsh Invertebrates of Connecticut" and "Plants and Animals of the Estuary", Connecticut College Arboretum Bulletins # 20 and #22.
- 10 Quoted from *Under the Sea-Wind* by Rachel Carson, Oxford University Press, published in 1941.
- 11 Mark Brand, Professor of Horticulture, UConn (pers. comm.)

Credits:

Line art page 5, R.S. Warren; page 11, M. Van Patten; on pages 16, 19, 35, 36, and 37, USDA-NRCS PLANTS Database and Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. All other line art by Christine Ameele, Conn. College Arboretum Bulletin #25.

Inset photo on page 36: Robert H. Mohlenbrock @USDA-NRCS PLANTS Database/USDA SCS. 1991. *Southern wetland flora: Field office guide to plant species*. South National Technical Center, Fort Worth.

Centerfold salt marsh: ©Edward Henrey.

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About the Long Island Sound Study

The Environmental Protection Agency's Long Island Sound Study (LISS) is a cooperative effort involving researchers, regulators, user groups and other concerned organizations and individuals. These people are working together to protect and improve the health of the Sound by implementing the Sound's Comprehensive Conservation and Management Plan completed in 1994. For more information, please visit this web site:

<http://www.longislandsoundstudy.net/>

About the Connecticut Sea Grant College Program

Connecticut Sea Grant, based at the University of Connecticut, is a partnership between the university and the National Oceanic and Atmospheric Administration (NOAA). It is Connecticut's component of the National Sea Grant College Program, a network of 32 university-based programs. The program's mission is to work towards achieving healthy coastal and marine ecosystems and consequent public benefits by supporting integrated locally and nationally relevant research, outreach and education programs in partnership with stakeholders. The University of Connecticut is the State's flagship research university. For more information, visit this web site: <http://www.seagrant.uconn.edu>.

About the Connecticut College Arboretum

Connecticut College exists in a singular environment known as the Connecticut College Arboretum, which offers a quality of life and an ecological classroom unique among liberal arts institutions. Established in 1931, the Arboretum's diverse 750 acres include the landscaped grounds of the College campus as well as the surrounding plant collections, natural areas and managed landscapes. The Arboretum is distinguished by a long-standing commitment to conservation and to supporting research and teaching in ecological and environmental studies. For more information, please visit this web site: <http://www.conncoll.edu/the-arboretum>

DOES THE SOUND MEASURE UP?
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