



Dynamics of the Salt Marsh

Features and Locations of Salt Marshes

Salt marshes occur along much of the Southeastern coast where the twice-daily tides alternately flood and drain vast low-lying areas just inland from the ocean. South Carolina has about a half-million acres of salt marsh, more marsh than any other Atlantic coast state.

Marshes provide highly productive nursery grounds for numerous commercially and recreationally important species, and serve as filters to remove sediments and toxins from the water. Marshes also buffer the mainland by slowing and absorbing storm surges, thereby reducing erosion of the coastline.

The twice-daily ebb and flow of the tides greatly influence life in the salt marsh. Variation in flooding

and elevation divides the marsh into two zones, high marsh and low marsh. The low marsh floods daily while high marsh is flooded only during twice-monthly "spring" tides and during storms. Salinity in the marsh varies widely from very salty to virtually fresh depending on the height of the tide and on runoff from rainfall. This rapid and regular transition from wet to dry, salty to fresh water, cold to hot greatly limits the types of plants and animals that can survive in salt marshes. However, the rich soil and abundant sunlight make salt marshes very productive, allowing those animals and plants adapted to the marsh to develop extensive populations.

A variety of algae inhabits the salt marsh and serve as primary producers of food. Most rooted

plants cannot tolerate any exposure to salt. However, smooth cord grass, often called by its generic name, spartina, has evolved the ability to withstand regular inundation by saltwater. Spartina dominates the low marsh to the exclusion of almost all other plants, creating a very unusual habitat. Spartina stalks are thick, very tough and well anchored by a root system. The plant's narrow, tough blades and special glands that secrete excess salt, making it ideal to withstand the high heat and daily exposure to salt water. The soft marsh substrate, referred to as "pluff mud," prevents large grazing animals from consuming living spartina stalks. Instead, the grass dies back each fall and bacteria decompose it into a rich soup known as detritus that along with algae serves as the basis of the productive salt marsh food web.



Aerial photo showing a vast amount of saltmarsh and associated estuary.



Smooth cordgrass (Spartina)

Spartina grows best in the low marsh and along the meandering creeks where currents constantly replenish soil nutrients. Spartina also grows in the high marsh, but often reaches not much over a foot in

height. The high marsh also contains a mixture of several somewhat salt tolerant species including black needlerush and salt meadow cordgrass. At the edge of the high marsh a narrow transitional zone develops between the salt marsh and the maritime shrub community which consists of wax myrtle, yaupon, groundsel tree and red cedar.

Salt Marsh Ecology: What Lives in the Salt Marsh?

Salt marshes rank among the most productive ecosystems on earth. In late fall, the green *Spartina* begins to turn brown as leaves die and decomposition begins. Water, waves, wind and storms dislodge and break up decaying leaves, and transport them to mud flats and other locations around the marsh. This dead plant matter (detritus), forms an attachment site for microscopic organisms such as bacteria, fungi and small algae. These organisms colonize the broken bits of plant material and break down portions of the detritus that are not digestible by animals.

Fiddler crabs and marsh snails shred dead plant material during feeding, aiding the decomposition process. Oysters and mussels filter these particles from the water. When low tide exposes the marsh, these animals either burrow into the mud or close up into their shells.

The young of many species such as blue crabs, white shrimp and red drum utilize the salt marsh as a nursery. Some of these aquatic organisms stay within the creeks throughout the tidal cycle, but many others move on and off the marsh surface with the tide. Once they leave the protection of the marsh surface to enter the adjacent tidal creeks, they become more susceptible to large predators.

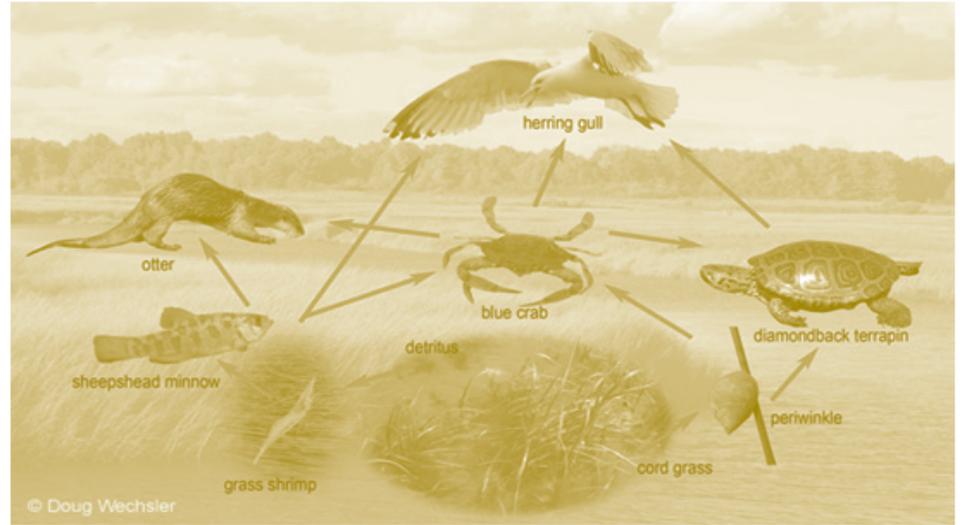
One of the few reptiles that lives in the salt marsh, the diamond back terrapin, forages during high tide but moves to high ground to lay their eggs above the high tide mark. Alligators pass through brackish marshes but usually avoid high salinity marshes.

Many species of birds feed on the abundance of small fishes and

invertebrates that live in the salt marsh. Herons, egrets, and ibises feed on fishes, shrimp and fiddler crabs. Terns and ospreys dive on fish easily visible in the shallow water, while sandpipers and their relatives probe exposed mud flats for small snails and marine worms. Only two birds nest in South Carolina's salt marshes. Clapper rails, often heard but seldom seen, hunt for fiddler

marshes. Eventually, people realized the importance of these habitats, and now federal and state laws protect salt marshes from any type of alternation.

The salt marsh is extremely valuable to South Carolina's economy. Three-quarters of the animals harvested as seafood in South Carolina, even offshore species such as some groupers, spend all or



The saltmarsh food web.

crabs among the stalks of spartina and black needle rush, where they build their nests above the reach of the tides. Marsh wren, prolific singers during the spring breeding season, weave tall spartina stems into messy nests along the creek banks.

A few mammals, such as raccoons, enter the marsh to forage, while the much smaller mink, an excellent swimmer, searches the high marsh and small creeks for fish, shrimp and other aquatic prey. Bottlenose dolphins sometimes leave the deeper water of the bays and sounds to find prey in even the smallest of creeks.

Ecosystem Services: What does the marsh do for you?

Before the complex salt marsh food web and its value to marine life became known, over half the original salt marshes in the United States vanished due to filling to create land for homes, industry and agriculture. Ditching for mosquito control and diking to create waterfowl impoundments also destroyed

part of their lives in estuarine waters around salt marshes, making this unique habitat critical to the coastal environment. If you enjoy eating clams, oysters, blue crabs, shrimp or just about any fish you can name, then you derive a direct benefit from the marsh. The harvesting of these resources supports an important commercial and recreational industry in this state, contributing millions of dollars a year into our state's economy. The use of salt marshes and estuaries as recreational sites for boating and kayaking is becoming increasingly important economically to our state as the ecotourism industry grows.

The salt marsh provides not only a habitat to many resident species but serves as a critical stop over point for migrating birds. The complex food web of the salt marsh influences many inshore and offshore fishes. On the rising tide, many species of fish and aquatic invertebrates invade small creeks and tidal flats to prey on resident animals and each

other. As the tide recedes, predators at the top of the food chain enter the marsh to feed in shallow creeks and exposed flats. Predators at the top of the food chain include such birds as clapper rails, oystercatchers, pelicans, herons and egrets, and adults of many species of fish, notably red drum, spotted seatrout and flounder. Since many species of fish and invertebrates move freely from estuarine waters into nearshore waters, the food web which originates in the salt marsh provides energy even to animals living farther offshore.

The salt marsh also filters pollutants and silt from coastal water and buffers adjacent uplands from wind and waves. Run-off from farms and homes carries pollutants into marshes where they are absorbed and broken down by bacteria. During a storm surge the marsh acts like a giant sponge to soak up and hold a large volume of water that would otherwise flood homes and communities along the coast.

THREATS TO THE SALT MARSH

Outright destruction of salt marshes has been greatly minimized due to federal and state laws. Yet, a number of threats to salt marsh habitats still exist. Over half of the nation's people now live and work within coastal counties. The cumulative impact through water flow modifications and pollution within the watershed surrounding salt marshes can be significant. Ditching to control mosquitoes can cause streams, with their vital load of nutrients, to bypass marshes. Canals for flood control increase surface water on marshes, stressing and killing marsh grass.

Pollution may disrupt the marsh food web killing off some species and prompting others less desirable to greatly increase. Pollution can come from a direct source, such as a factory pipe into a river or from a smoke stack into the air, but it can also come from many smaller, less obvious sources. South Carolina residents unknowingly contribute every day to this type of pollution. Runoff from roads, farms and lawns introduces deadly

petroleum products, transported by rainwater into local streams. Farms and yards contribute large amounts of fertilizers and pesticides which degrade local waters. Permits regulate point-source pollution but nonpoint source pollution is more difficult to control, due to its multiple sources, and is becoming increasingly destructive to the marsh and its residents. All of the anonymous sources of non-point source pollution are slowly accumulating, killing our marshes, poisoning our seafood and threatening the future of our coastal resources.

Solutions include major changes in land use by minimizing runoff with porous pavement, plant buffer strips and water detention basins to contain road and agricultural runoff. Every South Carolina resident can take part in combating non-point source pollution through changes in their everyday actions.

WHAT YOU CAN DO

- Use fertilizer and lawn care products sparingly, only as directed, or not at all. When it rains, water falling on your yard picks up these toxins and carries them to streams and waterways, affecting wildlife far from your home.
- Never litter. Trash along roadways may enter storm drains leading to a river or stream along the marsh. Animals can be entangled or ingest trash. Plastic degrades and pollutes the water, poisoning animals. When boating, always secure loose items.
- Clean up after your pet. Pet waste enters waterways and can lead to dangerous, unhealthy water conditions.
- Share your knowledge about the importance of the salt marsh with friends, family and neighbors.

There are a number of federal and state agencies and nonprofit groups that produce informational materials on regulations and conservation pertaining to salt marshes and other wetlands. It is important that citizens take a personal interest in conservation of marshes because of the benefits and values they provide for all of us now and for future generations.

Saltwater Fishing Conservation & Ethics

Ocean resources, once thought to be unlimited, have declined rapidly in recent decades, due in part to the overharvest of many commercial and recreational species of fish and shellfish.

To reduce overfishing, all anglers should practice wise conservation practices and adopt an ethical approach to fishing.

Size and catch limits, seasons and gear restrictions should be adhered to strictly. These regulations change from time to time as managers learn more about fish life histories and how to provide angling opportunities without depleting fish populations.

The challenge of catching, not killing, fish should provide anglers with the excitement and the reward of fishing. Undersized fish or fish over the limit should be released to ensure the future of fish populations.

More and more South Carolina fishermen now practice tag and release, which not only conserves resources but also provides information on growth and movement of fish.

Saltwater fishermen can further contribute to conservation by purchasing a Saltwater Recreational Fishing License, which is required to fish from a private boat or gather shellfish in South Carolina's salt waters. Funds from the sale of licenses must be spent on programs that directly benefit saltwater fish, shellfish and fishermen.

Help ensure the outdoor enjoyment of future generations by strictly adhering to all rules, regulations, seasons, catch limits and size limits, and through the catch and release of saltwater game fish.

This publication was made possible in part with funds from the sale of the [South Carolina Saltwater Recreational Fishing License](#). The South Carolina Department of Natural Resources publishes an annual [Rules and Regulations](#) booklet that lists all saltwater fishing regulations. Have an enjoyable fishing trip by reading these requirements before you fish.

Acknowledgement: Salt marsh food web image courtesy of D. Weschler, from the book *Marvels in the Muck: Life in the Salt Marsh*.

Total cost: \$1666.50
Total copies: 13,000
Cost per copy: \$0.13



The S.C. Department of Natural Resources prohibits discrimination on the basis of race, color, gender, national origin, disability, religion, or age. Direct all inquiries to the Office of Human Resources, P.O. Box 167, Columbia, South Carolina 29202.



DNR

15-10453

printed on recycled paper

Glossary

Low Marsh Zone: area of low elevation near the water's edge submerged in salt water at high tide, dominated by smooth cordgrass (*Spartina alterniflora*)

High Marsh Zone: area where elevation increases enough that vegetation is not submerged at high tide, often occupied by black needle rush and salt hay

Salinity: the amount of salt in the water, as you travel up river from the Atlantic Ocean salinity gradually decreases and water becomes more fresh. Ocean water has a salinity of around 35 parts per thousand (ppt) and fresh water has a salinity of 0 – 0.5 ppt

Brackish: a mixture of salt and fresh water

***Spartina alterniflora*:** smooth cordgrass, the dominant grass found in the salt marsh specially adapted to handle daily tides and salt water. Smooth cordgrass is broken down to form the base of the salt marsh food chain.

Adaptations: features or behaviors of an organism that help it better survive in its environment

Detritus: dead plant matter broken down by microscopic organisms

Food web: the complex feeding connections in an ecosystem comprised of many food chains, where one plant or animal is eaten by another and then that animal is eaten by another through a connected web of predator prey interactions

Ecosystems: community of organisms and their environment

Invertebrates: animals lacking a vertebral column, back bones

Impoundments: enclosed areas of coastal marsh usually managed for waterfowl, historically built for rice culture marsh is today enclosed using earthen dikes with water control structures called trunks

Watershed: area of land that water drains from into river or river system

Non-point source pollution: water pollution from indistinct sources

Point source pollution: water pollution coming from identifiable, localized source

Runoff: water from precipitation on land that drains into surrounding water carrying the pollution from land

South Carolina Department of Natural Resources

Alvin A. Taylor, Director

D. Carmichael, Jr., Special Assistant to the Director

Ken Rentiers, Deputy Director for Land, Water and Conservation Division

COL Chisolm Frampton, Deputy Director for Law Enforcement Division

Robert Boyles, Deputy Director for Marine Resources Division

Don Winslow, Deputy Director for Outreach and Support Services

Emily Cope, Deputy Director for Wildlife and Freshwater Fisheries Division

Board Members

John P. Evans, Chairman

Cary L. Chastain, Vice Chairman

Caroline C. Rhodes

Michael E. Hutchins

Larry L. Yonce

Norman F. Pulliam

D. Glenn McFadden

Robert R. Lowe