



DEERING ESTATE



SHARK
RESEARCH &
CONSERVATION
PROGRAM



Marine Conservation Science and Policy: Salt Marshes

Grade Level:

4th – 12th

Subject Area

Science

Biology

Duration

1.5 Hrs

Benchmarks:

Body of Knowledge

Life Science

Nature of Science

Big Idea

Organization and Development of Living Organisms.

The Practice of Science

Standards

SC.K.N.1.1

Collaborate with a partner to collect information.

SC.K.N.1.4

Observe and create a visual representation of an object.

SC.8. G.5.2

Describe the impact of human modifications on the environment and ecosystems.

SC.912L.17.16

Discuss the large-scale environmental impacts resulting from human activity.

Focus Question

What is a salt marsh? What animals live in this environment and why is it important? How can we better protect this habitat?

Objectives

Students will explore the salt marsh and the animals that inhabit this important ecosystem.

Students will learn to:

- Identify the four zones of a salt marsh.
- Recognize threats to this habitat and elaborate ways to protect it.
- Work with a partner to demonstrate knowledge by creating an educational poster.

This will be a project-based activity where students will work together to design an educational poster on the importance of the salt marsh.

Background

Salt marshes are coastal wetlands that are flooded and drained daily by salt water washed in by the tides. These saltwater feature grasses, rushes and other non-woody plants, while trees and shrubs are not found here. Their sediment may be composed of mud and **peat**, a spongy material made of decomposing plant matter that often causes the rotten-egg smell usually associated with marshes. These intertidal zones are usually divided into several areas that demonstrate distinct habitat conditions, including tidal creeks, mudflats, low marsh, and high marsh, with a border of uplands that is just outside of the tide's reach.

The tidal creeks and pools are bodies of water that are affected by the ebb and flow of the ocean tides, forming an estuary with variable salinity. Some of these bodies of water may be full all year while others may be filled and emptied with the tides, depending on depth. This zone also features **salt pannes**, shallow depressions that evaporating seawater leaves so salty that only glasswort and a few other organisms can tolerate these areas. Tidal creeks are an essential nursery for shrimp, crabs, and fish including flounder, bluefish and bass. Diamondback terrapins, saltmarsh watersnakes and even river otters can also be found here.

As tides retreat, they often expose long, low areas of mud composed of silt and clay. These expanses are called **mudflats** and host many creatures including oysters, fiddler crabs, sand shrimp, mussels and clams that burrow in the sediment during low-tide to avoid exposure to the sun and to predators.

As the land rises slightly, salt-loving plants called halophytes are able to take root and form the **low marsh**. These species most commonly include smooth cordgrass, saltwort, and others, which are able to withstand the high salinity, brought in daily by high tide. Although the **high marsh** is only elevated a few centimeters above the low marsh, the slight height makes all the difference in salinity, so that this zone is usually only inundated by the highest tides twice a month rather than daily. Plants of the high marsh usually include salt hay, spike grass and black

Vocabulary:

Salt Marsh:

Coastal wetlands that are flooded and drained daily by the ocean tide.

Peat:

A spongy material made of decaying plant matter that often forms part of the root-filled and waterlogged substrate of salt marshes.

Salt Pannes:

Shallow water-retaining depressions in tidal creeks that have increasing levels of salinity as water evaporates.

Mudflats:

A low-lying expanse of mud in the salt marsh intertidal zone that is exposed and flooded with the ebb and flow of the ocean tide.

Low Marsh:

Low-lying levels of the marsh covered by salt-loving plants that can withstand the daily influx of the tide.

High Marsh:

Slightly higher levels of the marsh that are only affected by the highest tides twice a month rather than daily, resulting in slightly lower soil salinity.

Uplands:

The higher ground bordering the marsh or sometimes isolated on islands that are above the intertidal zone and are only flooded during extreme events such as storm surges.

Environmental Stewardship

The responsible use and protection of the natural environment through conservation and sustainable practices.

Background

rush. Beyond the intertidal zone, just clear of the salty tide line, the **uplands** form the marsh border and some higher isolated islands. These areas are only flooded during storm surges and extreme astronomical tides, so organisms here do not experience the severe salt stress of the intertidal zone. This area hosts a high diversity of trees, shrubs and herbs including seaside goldenrod, marsh elder, switchgrass, sweet gale and many more.

Because the waters of salt marshes are constantly being flooded with fresh nutrients and minerals, they provide a rich environment for a myriad of organisms, including 75% of important fisheries species like blue crab, shrimp and finfish. The salt marsh provides feeding and nesting grounds for crocodiles, turtles, marsh rabbits, raccoons, manatees, muskrats, and marsh deer, as well as vital bird habitat, hosting herons, egrets, osprey, songbirds, eagles and shorebirds. While salt marshes offer crucial habitat for millions of organisms, they also offer essential services to humans. Salt marshes protect shorelines from erosion by buffering wave action and trapping sediments. They also reduce flooding by slowing and absorbing rainwater, and protect water quality by filtering runoff and by absorbing excess nutrients. An estimated 75% of seafood harvested in coastal waters is spawned in the salt marsh, contributing millions of dollars to the economy and providing an important protein source.

Though awareness of this important habitat is growing, salt marshes still face several threats. Most salt marshes were filled in and destroyed by real estate developments before their significance was understood. Dredging and diking can dramatically increase or decrease the water flow through the marsh, stressing or drowning marsh plants and increasing erosion. Fertilizer and pesticide runoff from roads, farms and mosquito control can overload the marshes ability to regulate pollution, causing toxins to accumulate, poisoning and killing the marsh, seafood, and coastal habitats. Overfishing and indiscriminate trapping prohibit population regeneration: if the small shrimp, crabs and fish aren't allowed to grow big enough to produce offspring, then there won't be any for future generations to enjoy. The salt marsh is also threatened by climate change, sea level rise, and storms, as this fragile ecosystem is vulnerable to salinity changes, water flow alterations, and erosion.

Although these threats may seem daunting, there are many actions we can all take to ensure the future of the salt marsh through **environmental stewardship**. Reducing fertilizer and pesticide use on lawns can help reduce non-point source pollution, as these products are washed downstream in the rain and can affect ecosystems far from home. Always put depositing trash in the trashcan is important, but recycling or reducing waste in the first place is even better as trash doesn't just disappear when it's placed in the bin. Adhering to catch and size regulations, season limitations and licensing rules is a vital practice that will help ensure future species populations. Additionally, educating others by taking them out on a marsh hike or joining a local volunteer group to replant marsh grass are great examples of responsible environmental stewardship.

Supplemental Resources

Listen to "What good is a salt marsh?" by George W. Frame. Highlights for Kids.

<https://www.highlightskids.com/audio-story/what-good-salt-marsh>

National Oceanic and Atmospheric Administration (NOAA)

http://oceanservice.noaa.gov/education/kits/estuaries/media/supp_estuar06a_saltmarsh.

"Dynamics of the Salt Marsh." Sea Science. South Carolina Department of Natural Resources.

<http://www.dnr.sc.gov/marine/pub/seascience/dynamic.html>

Vocabulary:

Salt Marsh:

Coastal wetlands that are flooded and drained daily by the ocean tide, essential habitat for many birds, fish, crustaceans and mollusks. This habitat is divided into levels of tidal creeks, mudflats, low marsh, high marsh and uplands, each with distinct environmental conditions.

Environmental Stewardship

The responsible use and protection of the natural environment through conservation and sustainable practices.

Extension Activity:

Have students research one of their favorite salt marsh animals or plants. The students will investigate the habitat, necessities, threats and importance of their chosen subject and write a summary.

Assessment:

Students will complete the Salt Marsh worksheet after class, and will write a reflective entry in their science journals responding to the following prompt:

The salt marsh is being negatively impacted by coastal development, overfishing, water pollution, jet skis and others human activities. Choose one of these issues and write a paragraph arguing how you would correct this problem if you were in charge.

Project Partners:

Salt Marsh Educational Poster

Materials

- Large construction paper, posterboard, or other paper
- Crayons, markers, or colored pencils
- Tape for hanging posters

Procedure

1. Divide students into pairs and give each pair a sheet of large construction paper and coloring utensils.
2. Have students draw an educational poster promoting environmental stewardship of the salt marsh. The poster should contain some of the following elements, depending on grade level:
 - the four levels of the intertidal zone and the uplands
 - a reason the salt marsh is an essential ecosystem
 - an example of a negative human impact on the salt marsh
 - an example of environmental stewardship of the salt marsh
 - a slogan or message promoting environmental stewardship of this valuable ecosystem
3. Have pairs briefly present their posters and encourage discussion of effective communication and educational methods to maximize impact, possibly analyzing which slogans were most efficacious in accomplishing the objective of promoting good stewardship. Voting (anonymously avoids hurt feelings!) by peers or adults can add scope.

Worksheet Answer Key

1. C. Kayaking is environmental stewardship because it allows recreation in a natural area without harming the resource.
2. D. Littering is harmful because it introduces toxic chemicals and other noxious substances into an area, damaging water bodies, habitats, and polluting the environment.
3. A. Sewage dumping is harmful because it pollutes natural areas with medical waste, harmful bacteria, and chemicals that contaminate water ways, habitats and other natural resources.
4. E. Measuring catch is environmental stewardship because it allows smaller catch to be returned and to grow to mature, reproductive age, helping to ensure future generations of fish.
5. B. Planting marsh grass is environmental stewardship because it helps restore an important ecosystem, providing habitat, protecting water quality, and reducing erosion.

History & Ecology



Protecting the Salt Marsh

Aside from providing an irreplaceable habitat for birds, fish and mollusks, the salt marsh also offers essential services to humans including erosion and flood control, recreation, jobs and food. Despite their significance, salt marshes face many threats from human activity, including contamination from sewers and runoff, overfishing, pollution and erosion. However, the importance of the salt marshes are encouraging some people to practice environmental stewardship, which include responsible and sustainable practices such as hiking, permitted fishing and clamming, trash cleanups and more. These activities help ensure that the salt marsh will continue providing essential habitat and important services to future generations.



Some examples of human activity in the salt marsh are pictured above. Match the photo with the name of the activity and decide whether it is harmful or an example of environmental stewardship. Explain your answer.

Example: F Bird watching is environmental stewardship because it can increase knowledge of birds to improve conservation efforts.

1. Kayaking is _____ because _____.
2. Littering is _____ because _____.
3. Sewage dumping is _____ because _____.
4. Measuring catch is _____ because _____.
5. Planting marsh grass is _____ because _____.