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**MSU Coastal Research & Extension Center**

Lesson 1: Introduction to Marsh Ecology

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**Theme**

* Environmental Science/Ecology

**Grade Level**

* 9th – 12th

**Class Size**

* 10-30 Students

**Length**

* 1.5 hours

**Materials**

* ~15 plastic shoeboxes
* 1 bag of play sand
* fake aquarium plants
* 1 large cup of water for each station

**Evaluation Method**

* Discussion (ask pre & post questions), journal entry, Kahoot quiz.

**Date Prepared / Modified:**

* December 8th, 2022

## Goal: Students will learn about the ecology of native marsh systems in Mississippi and how the work they’ll complete with this project will help restore native marsh systems.

## Learning Objectives:

● Students will investigate the ecosystem services that marsh systems provide to coastal Mississippi.

● Students will understand that marsh systems are comprised of highly adapted plant communities.

● Students will be able to relate how the work they’re doing with Plan-It Marsh will help to restore marsh habitats.

**Mississippi College and Career-Readiness Standards:**

● BOT.4 Students will explore the global value of plants and the interaction between humans and plants.

● ENV.2 Students will relate the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.

**Prerequisite Instructor Knowledge:**

Biotic & abiotic factors that influence salt marshes ecosystems, salt marsh plant communities.

**References**

“What is a salt marsh?” NOAA, https://oceanservice.noaa.gov/facts/saltmarsh.html

**INTRODUCTION**

* **Program Objectives:**
* Engage with students to determine their prior knowledge of marsh ecology.
* Investigate the different plant communities and their adaptations that make up a salt marsh system, and the ecosystem services that marshes provide to coastal Mississippi.
* Have pairs of students collaborate to complete the shifting sands hands-on activity.
* Have students participate in class discussion followed by a Kahoot quiz to evaluate what they’ve learned in this lesson.
* Discuss the implications that their work with the Plan-It Marsh program will have for their local coastlines.

**LECTURE**

Marsh Background

-Ask (Pre-Eval): Who knows what a salt marsh is? (Allow time for students to answer you)

* Salt marsh definition
* Coastal grassland that is regularly flooded by seawater
* Salt marshes are found in all 50 states
* Approximately half of the nation's salt marshes located along the Gulf Coast
* Commonly found near estuaries
* **\*NOTE\* (show photo of local salt marsh)**

Marsh Plant Communities

-Ask (Pre-Eval): What do you think a plant community is? (Allow time for answers)

* Plant community definition
* Collection of plant species within a designated geographical unit that interact with each other, wildlife, and the environment
* Does not include abiotic factors (rocks, water…)
* Often defined by dominating species present
* Salt marsh plants
* Adaptations
* “Sweat” – can excrete salt
* Tolerate anoxic conditions
* Deep, anchoring roots
* Plant zonation
* Based on flooding patterns…some plants are adapted to survive frequent flooding
* Species: black needle rush, spartina alterniflora, etc..

Marsh System Importance

-Ask (Pre-Eval): What ecosystem services do marshes provide? (Allow time for answers)

* Natural barriers against storm surges – prevents erosion
* Absorb the brunt of wind and wave action
* This is what activity will be illustrating
* This helps to protect coastal property
* Specialized species adapted to live here – promotes biodiversity
* Plant communities, wildlife
* Food sources and habitat
* **\*\*\*NURSERY GROUNDS OF THE SEA\*\*\***
* “Provide habitat to 75 percent of fisheries species, including shrimp, blue crab, and many finfish1”
* **\*NOTE\* (show photo of sea oats, birds etc. on dunes)**
* Work with Plan-It Marsh program will help to restore natural marsh ecosystems
* Planting native plants
* Prevents erosion
* Help protect your communities
* Provides habitat for wildlife

**Shifting Sands Activity (60 mins)**

Overview and Setup (10 mins)

* Students will be creating “waves” inside of their shoeboxes and noting differences in erosion between trials with and without marshes.
* Prep:
* 15 plastic shoeboxes filled with sand
* 2 boxes per pair of students
* 1 box w/ flat sand on one side, and the other side empty
* 1 box w/ sand piled up on one side, and aquarium plants stuck in the sand (like a marsh), the other side empty
* 1 cup of water per pair

Procedure (50 mins)

1. Assign pairs of students to one of the prepped “sandbox” stations
2. Explain that for this activity they are going to be creating waves on shorelines with and without marshes present
3. Should be starting with the box with flat sand
4. Tell students to pour water from their cup into the empty side of the sandbox, then allow them to use their hand to carefully move the water and create “waves”
5. Encourage pairs to watch what happens to the flat sand – it should be moving around the box a lot
6. Tell students to repeat the steps they just completed on the box with the “marsh” in it
7. Students should notice that there is less “erosion”, the marsh absorbs wave action
8. Students should record all their observations as a journal entry
9. Ask post questions now to evaluate comprehension

Expected Outcomes

* Students should recognize that the box with the marsh in it is stopping wave action.
* Students will understand that marshes are essential to prevent coastal erosion.

**Conclusion / Evaluation (10 mins)**

Take Home Message

-Add class interaction by asking students to discuss what they’ve learned

-At the conclusion of this lesson, students should recognize that…

* Marshes are distinct coastal ecosystems
* Dune systems help to prevent erosion and protect shorelines
* They’re work with Plan-It Marsh program will help to restore an important local habitat

Call to Action

* Encourage students to share what they’ve learned with their family / friends
* Recall key points they’ve learned
* Describe the activity they participated in
* Encourage students to research threats to their local marshes and think about what they can do to combat those threats

Evaluation Methods

* Discussion (pre & post questions)
* Pre: Ask at start of lesson
* Post: Ask after activity is over
* Journaling
* Students write a journal entry describing what they’ve learned, and using that information in context to talk about further implications
* (i.e., coastal management, recovery process from natural disasters, etc.)
* Kahoot Quiz
* Design a Kahoot quiz for students to test their knowledge on

Discussion questions to ask:

* What was the difference in results from the two trials of sandboxes?
* How can healthy marsh systems be useful for natural disaster mitigation?
* How do healthy marsh systems promote biodiversity?

Needed for evaluation

* Participation in class discussion
* Active participation in shifting sand activity
* Journal entry
* Completed Kahoot Quiz