Mangrove Ecology Program with Sediment Analysis Lab

Grade Level: High School and Above (***APES***)

Summary: The mangrove ecology is a component of our core program and allows the staff to truly use the outdoors as a classroom. Mangroves provide an important habitat and play a vital role in the ecological functioning of other associated habitats in the keys. Students will learn about mangrove ecology during a discussion on the boat on the way to the mangrove snorkel site. Boat will stop at various locations so instructors can point out any animals to identify (birds!), examples of mangrove adaptations, the identifying characteristics of the three species of mangroves and unique habitats created by the mangroves. Students will collect a sediment core from two different mangrove zones and analyze with instructor. Students will then snorkel and get a hands on lesson with marine invertebrates collected by the instructor.

Program Objectives:

After completion, students will be able to:

- Identify three mangrove species and explain their identifying characteristics
- Explain the role of the mangrove habitat within the FL Keys marine ecosystem
- List five invertebrates found in the mangroves
- List three threats to the mangrove habitat
- List four adaptations that mangroves possess to allow them to live in salt water
- Collect a sediment core
- Use concepts discussed during mangrove ecology lesson to explain three differences in the sediment cores they observe

Concepts Covered:

- Three species of mangroves in the FL Keys and their identifying characteristics
- Mangrove adaptations
- Bird identification
- Interconnectedness of mangrove habitat within the overall Florida Keys subtropical marine ecosystem
- Florida Keys geology
- detritus based food web
- abiotic factors controlling geographical distribution and zonation of mangroves
- Anaerobic mangrove sediment
- Sulphur reducing bacteria
- Organic matter accumulation and degradation

Vocabulary: detritus, prop root, propagule, pneumatophore, lenticels, tannin, facultative halophyte, adaptation, aerial root, zonation, vivipary, salt exclusion/excretion, biogenous, terrigenous, exotic species, mutualism, sediment core, denitrification, tannin, peat, cellular respiration, geological oceanography

Procedures: The students will board the boat for a mangrove ecology lesson. Sediment cores will be collected from red and black mangrove sediment. Cores will be will be analyzed looking at grain size, percent organic material, and sulfuric odor. Lab will be followed by a mangrove snorkel. The program includes collection, identification and discussion of representative organisms from mangrove root habitat.

Resources: http://floridakeys.noaa.gov/plants/mangroves.html, http://mangroveactionproject.org/

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Standards:

Next Generation Sunshine State Standards

SC.5.L.17.1: Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

SC.5.L.14.2: Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

SC.6.L.15.1: Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

SC.7.L.17.2: Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

SC.7.N.1.5: Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.

SC.912.L.17.2: Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.

SC.912.L.17.4: Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

SC.912.L.17.6: Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Ocean Literacy Principles

Principle 2. The ocean and life in the ocean shape the features of Earth.

a. Many earth materials and geochemical cycles originate in the ocean.Many of the sedimentary rocks now exposed on land were formed in the ocean. Ocean life laid down the vast volume of siliceous and carbonate rocks.

Principle 5. The ocean supports a great diversity of life and ecosystems.

b. Most of the organisms and biomass in the ocean are microbes, which are the basis of all ocean food webs. Microbes are the most important primary producers in the ocean. They have extremely fast growth rates and life cycles, and produce a huge amount of the carbon and oxygen on Earth.

d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics, and energy transfer) that do not occur on land.

i. Estuaries provide important and productive nursery areas for many marine and aquatic species.

Principle 6. The ocean and humans are inextricably interconnected.

d. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution), changes to ocean chemistry (ocean acidification) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

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