



Restore it?

A lesson in restoration ecology

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Restore it?

Subject: Life Science

Grade Level: 9-12

Time Required: One class period, plus time for student research

Key Terms: ecosystem, habitat, restoration ecology, natural resource, wetlands, erosion

I. Course of Study:

Alabama Course of Study (ALCOS)

9th – 12th Grade, Environmental Science Elective Core, Content Standard 7

Identify reasons coastal waters serve as an important resource.

9th – 12th Grade, Environmental Science Elective Core, Content Standard 11

Describe agents of erosion, including moving water, gravity, glaciers, and wind.

9th – 12th Grade, Marine Science Elective Core, Content Standard 6

Describe components of major marine ecosystems, including estuaries, coral reefs, benthic communities, and open-ocean communities.

9th – 12th Grade, Marine Science Elective Core, Content Standard 11

Describe positive and negative effects of human influence on marine environments.

National Science Education Standards

Science as Inquiry H.A.2 *Understanding about scientific inquiry*

Life Science H.C.4 *Interdependence of organisms*

Science in Personal and Social Perspectives H.F.3 *Natural resources*

Science in Personal and Social Perspectives H.F.4 *Environmental quality*

Science in Personal and Social Perspectives H.F.5 *Natural and human-induced hazards*

History and Nature of Science H.G.1 *Science as a human endeavor*

Ocean Literacy Standards

Essential Principle 1: *The Earth has one big ocean with many features.*

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

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

Essential Principle 6: *The ocean and humans are inextricably interconnected.*

II. Concepts

Ecology is the study of organisms and their interactions with other organisms and the physical and chemical environment. Restoration ecology is the scientific study and practice of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. The damage may have been caused or aggravated by natural

events such as wildfire, floods and storms or, caused as the direct or indirect result of human activities. Restoration is defined as the return of an ecosystem to a state very similar to its condition prior to a disturbance. It is important that both the structure and functions of the ecosystem be recreated for an area to be considered restored. The goal is to match, as closely as possible, a natural, functioning, self-regulating system that is integrated within the landscape that it occurs. Historic conditions are generally used as a model for restoration.

Often in ecological restoration and management, the economic value of a particular ecosystem is determined. In order to do this, ecosystem functions and services are first determined. Ecosystem functions include the chemical, physical and biological processes that contribute to how the ecosystem works. Services are the benefits the ecosystem provides for the natural system or humans that come as a result of the functions. Wetlands, for example, function as habitat for many species of plants and animals, provide resources for breeding and migrating animals, trap sediment, store carbon and improve water quality. In addition to these functions are the related economic services wetlands provide. Wetlands support commercial and recreational fishing, duck hunting, bird watching and other recreational activities. They also absorb, filter and slowly release surface water, rain, groundwater and flood waters from storms.

Wetland restoration is of great concern in Alabama. According to the US Fish and Wildlife Service, Alabama lost 50% of its wetland area between 1780 and 1980. Wetlands make up less than 1% of the total surface area of the planet but are some of the most productive habitats on earth. Coastal wetlands, like salt marshes, are especially vulnerable to degradation. Currently, more than half the population of the United States lives near the coast and marshes have been filled in to accommodate the rise in population. Marshes occur along the margin of the land, often just inches above sea level, making them vulnerable to rising sea level. Erosion, both natural and human induced, also threatens these important habitats.

Restoration projects often include monitoring activities to evaluate long-term success. Such projects have been implemented by the Dauphin Island Sea Lab in marshes, oyster reefs, and seagrass beds. The results of restoration of this kind can include improved habitats for fish, birds and other wildlife, protection against flooding, better water quality, enhanced recreational opportunities, and increased economic opportunities through activities such as commercial fisheries and tourism.

III. Learning Objectives

Students will:

- Examine natural and degraded habitats
- Learn what natural and human activities can degrade or destroy ecosystems
- Explore the science of restoration ecology
- View examples of restoration projects
- Research a restoration project of interest and give a presentation

IV. Materials

Background information on restoration ecology

Images and case studies of restoration projects

Computers with internet access

V. Instructions

Opening

Introduce or review basic ecological principles and theories: communities, biodiversity, abiotic, biotic, energy flow, disturbance, succession, fragmentation, ecosystem function, evolution, etc. Use the concepts above and additional resources to discuss the science and practice of restoration. Show examples of restoration projects highlighting local restoration efforts, if applicable. Include successful and failed restoration efforts. Discuss natural and anthropogenic (human induced) sources of damage.

Student Research

Instruct students that they are to research a restoration project of their choosing. Students should use the NOAA Restoration Atlas or other restoration database to choose a restoration project to research. Following the research, students should present their findings to the class. Included in the presentation should be answers to the following questions:

- What caused damage to natural resources?
- What economic and social consequences resulted from this damage?
- What restoration activities were undertaken?
- Who undertook these activities?
- What ecological, economic and social benefits have been achieved through restoration activities?

Extension

Discuss the natural resources in the Gulf of Mexico damaged or threatened by the Deepwater Horizon oil spill. Examine efforts targeted specifically at restoring areas damaged by the oil spill. Discuss why the areas affected (salt marshes, seagrass beds, oyster reefs) are so important to the environment and to people.

Assessment

Student presentations should reflect an understanding of causes of environmental degradation, the science of restoration and the ecological and economic benefits of habitat restoration.

VI. Resources & References*

NOAA Habitat Conservation Restoration Center

<http://www.habitat.noaa.gov/restoration/>

NOAA Restoration Atlas

<http://www.habitat.noaa.gov/restoration/restorationatlas/index.html>

National Ocean Service Natural Resource Restoration

<http://oceanservice.noaa.gov/ecosystems/restoration/>

NOAA Gulf Oil Spill Restoration

<http://www.gulfspillrestoration.noaa.gov/restoration/>

NOAA Habitat Restoration Photo Library

<http://www.photolib.noaa.gov/habrest/>

Dauphin Island Sea Lab - Discovery Hall Programs

<http://dhp.disl.org>

*This lesson plan was adapted from the NOAA Ocean Service Education lesson *Caution: Fix It!*

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