

Lesson Title: An Inventory and Monitoring Exercise

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Grade Level: 4th-8th grade

Activity Time: Two, 50-minute classes

Day 1:

Students will predict which event caused the species population decrease; test their predictions by completing each “event” sheet while using Baseline Inventory Population Worksheet; and draw their conclusion.

Day 2:

Students will explain their predictions and how they arrived at their conclusions.

Subject Area

- Earth Sciences
- Life Sciences
- Unifying Concepts and Processes
- Personal and Social Perspectives

Objectives

Students will:

- Discover how different natural and human-induced events affect populations of marine organisms.
- Predict natural and human-induced events by the change in populations of selected marine organisms.
- Inventory and monitor populations of indigenous organisms.

Vocabulary

Baseline Inventory – a rigorous effort to document the existing diversity, abundance, distribution, and habitats of biological resources that are found in a natural resource as, for example, the Gulf of Mexico.

Fauna – a group of animals located in a particular region or area.

Flora – a group of plants located in a particular region or area.

Hurricane – a tropical storm that can produce winds that are 74 mph or greater.

Immobilize – an inability to move.

Invertebrates – animals without backbones.

Monitoring – a systematic approach to detect changes or trends in a natural resource.

Oil spill – usually, an accidental release of oil into a body of water from a tanker, oil rig, or pipeline for a short or prolonged period of time that may result in a significant amount of harm to marine life and the environment.

Red Tide – a high concentration of marine algae that may be toxic to humans and other marine life and discolor the water red.

Scientific Prediction – a rigorous statement about what will happen under specific conditions using the scientific method.

Materials (per group of 4-5)

The Teacher shall have the Answer Key to all of the “Event” Worksheets.

Student groups will need the following resources to conduct this exercise:

Matt, note, materials list has Event One, Event Two, Event Three, Event four, Event Five deleted from list below.

- Computer
- Worksheet: Baseline Inventory Population
- One “Event” per group
- Table 1: Effects of Natural and Human-Induced Events on Marine Life and Sea Bird Populations of the Gulf of Mexico
- Table 2: Degree of Devastation Based on Monitoring Studies
- One calculator

Background

The Gulf of Mexico is the ninth largest body of water in the world. It is the home to a vast number of bird and marine species. In recent years, the Gulf of Mexico has experienced two major catastrophic events, one natural (*Hurricane Katrina*) and one human-induced (British Petroleum-Deep Water Horizon Oil Spill). Both have had catastrophic impacts upon the environment and marine life of the Gulf. Some of the other natural and human-induced events that continually impact the Gulf include “red tides,” severe weather events (e.g. cold spells and hurricanes), pollution, and fishing activities. Scientists recognize that despite the magnitude of the Gulf of Mexico: 1) it is finite (has limits), 2) its flora and fauna are sensitive to natural and human-induced events, and 3) it is important to inventory and continuously monitor its natural resources.

Introduction

In this activity students will predict how natural and human-induced events affect several groups of marine organisms in the Gulf of Mexico. Historically speaking, populations of most species in the Gulf are resilient and will return to population levels prior to one of these events. These levels were largely determined from baseline inventories taken by the National Oceanic and Atmospheric Administration (NOAA), state marine resources agencies, and universities. Probably the most widely studied marine life in the Gulf are shrimp, blue crabs, bottlenose dolphin, oysters, fish, sea turtles, and shore birds. This is largely because of their commercial and intrinsic value to humans. The consequences of several natural and human-induced events will be given to students in two tables. Students will be asked to study these carefully and make a scientific prediction of the “event” based on the available data. This activity should take two, 50-minute classes depending on the class size. Additionally, students can inventory and monitor indigenous species of plants or animals in proximity to the classroom over a three to four month period. This exercise will allow students to better understand how natural and human-induced events affect local populations.

Procedures

Break students into groups of approximately 4-5 students. Each group is given:
Worksheet: Baseline Inventory Population (one)

Event One
Event Two
Event Three
Event Four
Event Five

Table 1: Effects of Natural and Human Induced Events on Marine Life and Sea Bird Populations of the Gulf of Mexico (one)

Table 2: Degree of Devastation Based on Monitoring Studies (one)

Day 1:

In order to determine the degree of devastation for each species, students will use the Baseline Inventory Population Worksheet and their “event” sheets to calculate the decrease in population for each species. This calculation can be accomplished by dividing the number of animals lost for each species by the baseline number for this species. **(Matt, delete next sentence and add new sentence) Convert this into a percentage and years will give the degree of devastation.** Students can use this information and Tables 1 and 2 to help predict the event.

Day 2:

One student from each group will give its prediction and explain how the group reached that conclusion. Students will also discuss which event is the most devastating, the least devastating, and how this exercise is relevant to a real life inventory and monitoring program. At the conclusion of this activity, the instructor will provide the correct answer for each event. See Tables 1 and 2, the Baseline Inventory Population Worksheet, and the five different events. The event documents follow Tables 1 and 2 and the Baseline Inventory Population Worksheet.

For the Instructor Only:

Events are as listed:

Event One – Oil Spill
Event Two – Hurricane
Event Three – Red Tide
Event Four – Shrimping Activities
Event Five – Cold Front

Ocean Literacy Essential Principles and Fundamental Concepts (OLEP&FC)

3. The ocean is a major influence on weather and climate.
 - 3.b “The ocean absorbs much of the...”
 - 3.f “The ocean has had...”
 - 3.g “Changes in the ocean’s...”

5. The ocean supports a great diversity of life and ecosystems.
 - 5.c “Some major groups are found...”
 - 5.f “Ocean habitats are defined by...”
 - 5.g “There are deep ocean ecosystems...”
 - 5.i “Estuaries provide important...”

6. The ocean and humans are inextricably interconnected.
 - 6.a “The ocean effects human life...”
 - 6.e “Humans affect the ocean in a...”
 - 6.f “Coastal regions are susceptible to...”

National Science Education Standards (NSES)

Unifying Concepts and Processes
Evidence, models and investigation

Life Science
Life Cycles of Organisms
Organisms and Ecosystems
Populations and Ecosystems
Diversity and Adaptations of Organisms

Personal and Social Perspectives
Natural Hazards

Extension Activities

Monitoring the Spread of Cogongrass—this activity will allow students to monitor and report on the spread of the exotic species Cogongrass in their area.

Assign students into groups to inventory and monitor native plants or animals over a three-month period. Be sure students note any significant “events” that occur during this study. Have students present the results of their survey to the class.

Students can track species populations before and after storm surges and hurricanes.

References

National Research Council (NRC), 1996: *National Science Education Standards*. National Academy Press, Washington, D. C.

Ocean Literacy-Essential Principals and Fundamental Concepts. 2007. National Geographic Education & Children’s Programs. <http://www.nationalgeographic.com>. NOAA Office of Education. <http://www.education.noaa.gov>

Guyton, John, D. Burrage, and R. Kastner. 1997. *Non-Indigenous Species Activities for Youth*. Mississippi State University Extension Service, MASGP-97-030.

Spigener, B. 2011. *Hurricane and Storm Surge Basics*. Institute for Marine Mammal Studies.

Talley, Joseph (Skipper) and Denise Reinke. 2011. *Sea Turtles’ Hurdles*. Institute for Marine Mammal Studies-Center for Marine Education and Research, Gulfport, MS.

Smith, Nancy and Angie Townsend. 2011. *Oil Spill Along the Shore*. Institute for Marine Mammal Studies-Center for Marine Education and Research, Gulfport, MS.

Art used in this activity: www.clipart.com

*Worksheet Baseline Inventory Population**



Represents 1,000, 000 shrimp



Represents 1,000, 000 crabs



Represents 10, 000 bottlenose dolphins



Represents 100, 000 bushels of oysters



Represents 1,000, 000 fish



Represents 1,000 sea turtles



Represents 1,000 shore birds

Matt: deleted old sentence and added following sentence.

***These are hypothetical values with the exception of the bottlenose dolphin data.**

Table 1. Effects of Natural and Human-Induced Events on Fish, Shrimp, Dolphin, Sea Turtle, Oyster and Sea Bird Populations of the Gulf of Mexico

Event	Effect on Biological Systems
Hurricane	<i>Causes an increase in ocean water, turbidity, sedimentation, nutrient release, and low dissolved oxygen levels resulting in decreased populations of fish, shrimp and crabs; incidental losses of dolphin, sea turtles and shore birds.</i>
Oil Spill	<i>Destroys coastal habitats and inhabitants resulting in decreased populations of fish, shrimp, crabs, and other invertebrates. Contaminated fish and shrimp are ingested by marine mammals, sea turtles, and shore birds resulting in sickness on death; oil-soaked birds lose their ability to fly and remain buoyant and will probably die if not treated.</i>
Severe Cold Front	<i>Causes “cold stunning” in sea turtles and manatees which immobilizes them and can result in death.</i>
Red Tide	<i>Causes oxygen deprivation and poisoning which can have adverse effects on localized populations of fish.</i>
Shrimping Activities	<i>Harvest reduces shrimp populations by 20-30%; by-catch reduces crab and juvenile fish populations by 5-15%; incidental catches of sea turtles.</i>

Table 2. Degree of Devastation Based on Monitoring Studies*

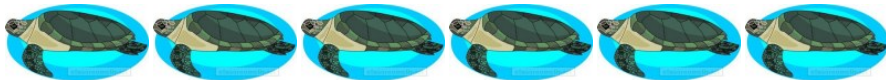
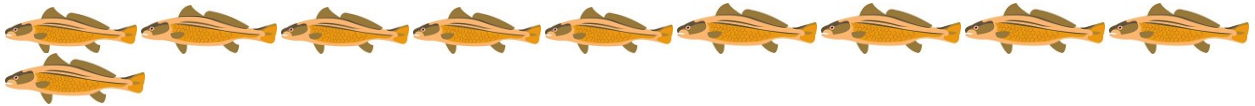
EVENT	Shrimp	Crabs	Dolphins	Oysters	Fish	Sea Turtles	Shore Birds
<i>Hurricane</i>	<i>D</i>	<i>C</i>	<i>A</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>B</i>
<i>Acute Oil Spill</i>	<i>D</i>	<i>D</i>	<i>C</i>	<i>D</i>	<i>D</i>	<i>D</i>	<i>D</i>
<i>Severe Cold Front</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>C</i>	<i>A</i>
<i>Red Tide</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>A</i>
<i>Shrimping Activities</i>	<i>D</i>	<i>C</i>	<i>A</i>	<i>A</i>	<i>C</i>	<i>C</i>	<i>A</i>

* A) None (0%)

B) Mild (1%-10%)

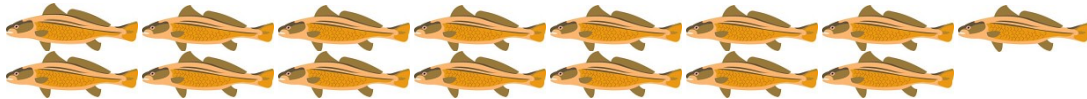
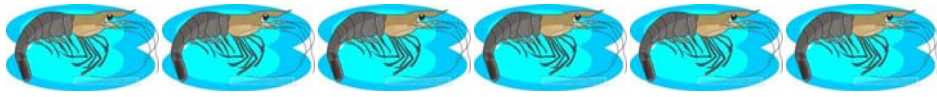
C) Moderate (11%-20%) D) Severe (21%-100%)

EVENT ONE



THE EVENT IS:

EVENT TWO

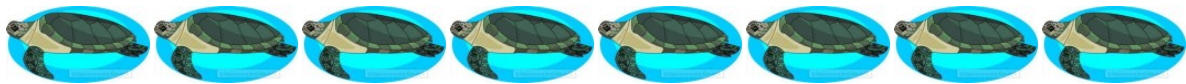
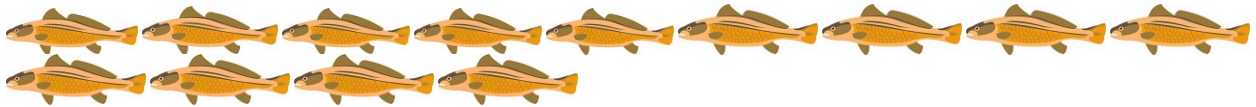
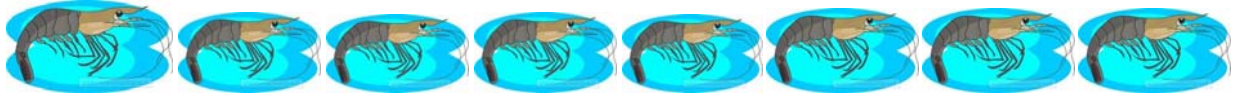


Matt: Deleted one turtle above.

THE EVENT IS:

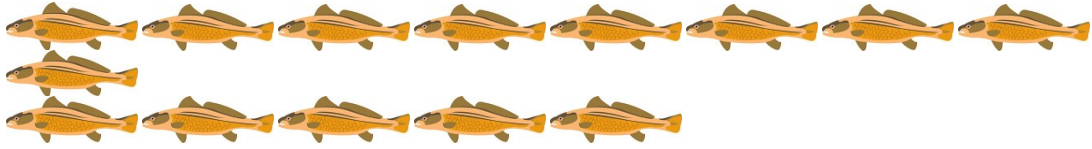
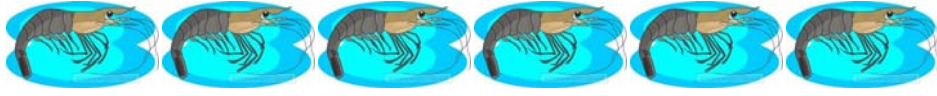


EVENT THREE



THE EVENT IS:

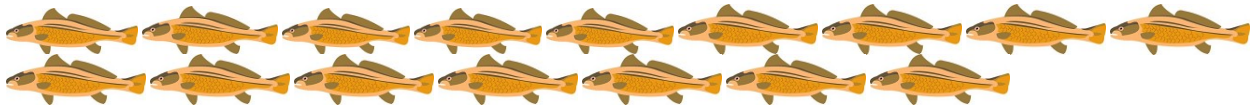
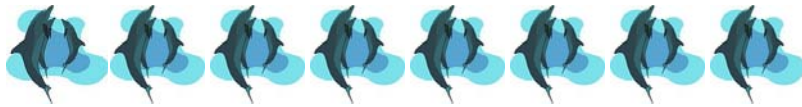
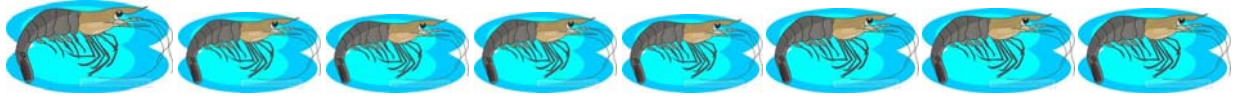
EVENT FOUR



Matt: added one shrimp above.

THE EVENT IS:

EVENT FIVE



THE EVENT IS:
