GRADE 6

ALIEN INVADERS!

PRE-VISIT LESSON

Water Characteristics

ALIEN INVADERS!

PRE-VISIT OVERVIEW

Alien invaders don't just come from outer space! An invasive alien species can be any species on earth that moves from its native ecosystem into a new ecosystem and then causes or is likely to cause economic or environmental harm or harm to human health. In January, 2007 quagga mussels were found in Lake Mead, the first discovery of these invasive mussels in western United States. Quagga mussels are an aquatic species that are native to Eastern Europe and were introduced into the Great Lakes in the late 1980s.

In the "Alien Invaders!" program, students use the Forever Earth vessel to investigate how quagga mussels might affect Lake Mead. Students collect water quality data such as clarity, pH, and temperature to determine whether current habitat conditions would allow quagga mussels to survive and thrive. Students learn about the consequences the quagga mussels could have on the lake and its living and non-living resources. Using the knowledge they've gained, students create their own management plans to prevent the spread of quagga mussels to other waterways.

Two pre-visit activities have been designed to prepare students for this on-site experience. The first activity (Introduced and Invasive Species) involves students in the concepts of introduced and invasive species. The second (described here) gives students an opportunity to explore water quality conditions as they relate to the habitat needs of an organism. Once students understand the purpose of each test, they will gain experience using testing equipment and performing data collection and analysis.

THEME

Introduction of an invasive species upsets the balance of an ecosystem.

KEY QUESTIONS

What effect can an invasive species have on an environment? What, if anything, can or should be done to prevent or control the introduction of an invasive species?

GOAL

Students will understand and know how to test for the following characteristics of water: calcium concentration, dissolved oxygen, pH, temperature, and turbidity.

OBJECTIVES

Students will:

- explain the significance of the water quality indicators: pH, turbidity, temperature, calcium, and dissolved oxygen;
- demonstrate the ability to test water for pH, turbidity, temperature, calcium, and dissolved oxygen;
- identify a minimum of three causes for change in water quality; and

- discuss potential impacts that changes in water quality may have on organisms living in water.

NEVADA STATE STANDARDS CORRELATION

N.8.A.1. Students know how to identify and critically evaluate information in data tables and graphs.

N.8.A.5. Students know how to use appropriate technology and laboratory procedures safely for observing, measuring, recording, and analyzing data.

L.8.C.4. Students know inter-related factors affect the number and type of organisms an ecosystem can support.

E.8.A.3. Students know the properties that make water an essential component of the earth's system.

CLARK COUNTY SCHOOL DISTRICT OBJECTIVES (GRADE 6)

Students will:

- display data in appropriate charts, graphs, and tables;
- use proper lab equipment correctly and safely; and
- discuss the costs and benefits of human and natural caused changes in an environment.

SNAP CONSERVATION EDUCATION AND INTERPRETATION THEME CORRELATIONS

The pre-visit grade 6 activities support the following guiding themes developed by Clark County-based educators:

- Increasing human activity on highly sensitive and easily damaged lands has profoundly altered the natural environment of Southern Nevada, affecting native biota including threatened and endangered species and requiring active management of native and non-native species.
- Maintaining growth and quality of life, and protecting watershed, water quality, and adequate water supplies for all life in both developed and natural communities challenges people to resolve the issue of long-term sustainability.

PREREQUISITE CLASSROOM EXPERIENCES

Lessons on:

- proper use of water quality tests or probeware (depends upon school; refer to "Resources" for suggestions);
- advantages and disadvantages (tradeoffs); and
- computer and Internet use.

Small group application in problem solving:

- using observations and data to make inferences;
- formulating and analyzing problems; and
- using evidence to make predictions.

VOCABULARY

- calcium
- Celsius
- data
- dissolved oxygen
- Fahrenheit
- pH
- probes
- temperature
- turbidity
- water quality

PRE-VISIT LESSON: Water Characteristics

Part 1 ▸ Introduction

TIME 15 minutes

MATERIALS

Water samples in clear containers: tap water; bottled water; water from Lake Mead (if inconvenient to obtain, simulate by using another sample of tap water); muddy water; water with a low pH (use vinegar or dilute acid to 4.0-5.0 pH); salt water

Student laboratory notebooks

Students observe samples of water to stimulate discussions of water quality and its importance.

Students observe six different samples of water that the teacher has put into small clear vials or beakers. Students record observations in their laboratory notebooks.

Students write the answer to the following question in their notebooks: *If you were allowed, which of the water samples would you most likely be willing to drink? Justify your answer with evidence.* (SAFETY: Students should not taste the water samples!)

Discussion Questions: *Why is the quality of water important to us and to other organisms? Where do we get our drinking water? (Lake Mead) What other organisms depend upon Lake Mead water? Generally, how are these organisms dependent on Lake Mead water?*

Students are informed that they will be learning about water quality and how to measure the important characteristics of water.

Part 2 ▸ Concept Development

TIME 30 minutes

MATERIALS

Computers with Internet

Resources that can used to facilitate discussion of water quality: http://ga.water.usgs.gov/edu/characteristics.html

Student Reference: Resources for Water Quality Research

Students work in groups of five. Using the Internet, each student in the group researches one of the following characteristics of water: pH, turbidity, dissolved oxygen, temperature, and calcium concentration. Some recommended sites are listed on **Student Reference: Resources for Water Quality Research**. Students can use AskJeeves for Kids (http://www.askforkids.com/) or other search engines to find additional information.

Each member records what he or she learns on his or her copy of **Student Worksheet: Water Characteristics**.

Each group member shares accumulated information about the assigned water quality characteristic with other members of the group. As they listen and ask questions about the different characteristics of water, students complete the remainder of the **Student Worksheet: Water Characteristics**. A classroom discussion about water quality and the five characteristics provides closure to this part of the activity.

Student Worksheet: Water Characteristics

Part 3 ▸ Learning more—in the laboratory

Students measure five characteristics of water: pH, temperature, turbidity, dissolved oxygen, and calcium concentration.

TIME 1-2 class periods

MATERIALS

Water samples from Part 1 (above)

Probes or water quality testing kits

The five water samples used for observation at the start of the lesson are used by the students for testing water quality. Working in teams of three, each student conducts all five measurements on each water sample. Each test should be done three times.

If there are not enough probes or testing kits, each group may measure one water characteristic for each of the five samples.

Students record the data in tables created for that purpose in their lab books or record the data on the **Student Worksheet: Water Quality Data**. Averages are calculated for each test for each sample. Students discuss why more than one test should be done (validity, reliability).

Student Worksheet: Water Quality Data

Part 4 ▸ Presentation of Findings

Students summarize their findings in a lab report recorded in their laboratory notebooks or on **Student Worksheet: Water Quality Data**.

TIME 30 minutes

EXTENSIONS

Students can bring in samples of water from various places around town, ponds, aquariums, etc. and measure the water quality.

Compare data from water testing at Lake Mead to the data collected in the laboratory. Lake Mead data can be found at: http://nevada.usgs.gov/lmqw/dataformat.htm

RESOURCES

The following websites contain a wealth of information of water-related topics.

- Common water measurements used by USGS: http://ga.water.usgs.gov/edu/characteristics.html

- Learn more about water, its uses, and conservation: http://ga.water.usgs.gov/edu/msac.html
- Refer to **Student Reference: Resources for Water Quality Research** for additional website information.

Water quality kits and testing materials can be obtained from scientific supply companies such as:

- Flinn Scientific: www.flinnsci.com
- Carolina Biological Supply Co.: https://www2.carolina.com
- LaMotte Company: www.lamotte.com/pages/edu/ind-list.html

ADAPTATIONS FOR DIVERSE LEARNERS

- Consult with Forever Earth project manager prior to field trip to discuss specific needs of the class or individuals; decide which aspects of the program content or delivery to appropriately alter for culturally/linguistically, behaviorally, and cognitively diverse learners and for the gifted and talented.
- Instead of handouts, students could make their own tables and graphic organizers in their lab books.
- Group students appropriately so that students can help each other.
- Encourage communication between lab groups.

ASSESSMENT

- Student worksheets
- Lab Reports and Analysis Questions
- Group interactions during the lab activities