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Finicky Fish Finish... Last! Pre-Visit Lessons (Grade 5)

Discover Mojave: Forever Earth

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GRADE 5

FINICKY FISH FINISH...LAST!

PRE-VISIT LESSONS

HABITAT NEEDS (DAY ONE)

WHY IS THE RAZORBACK SUCKER ENDANGERED? (DAYS TWO AND THREE)

FINICKY FISH FINISH...LAST!

PRE-VISIT OVERVIEW

The razorback sucker is a native fish species that was once plentiful in the Colorado River system. This rugged fish is adapted to life in flowing waters, including the ever-changing cycles of drought and turbulent flooding that once characterized the Colorado. However, the Colorado River has been altered in ways that now make it hard for the razorback sucker to survive. Today, the razorback sucker is endangered, and as such is a concern of Lake Mead National Recreation Area, the Nevada Department of Wildlife, the U.S. Fish and Wildlife Service, and others. Together, these agencies are working to protect this Colorado River native from extinction.

In “Finicky Fish Finish...Last!” students use the Forever Earth vessel to explore what has happened to the Colorado River and the reasons why it is so difficult for the razorback sucker to thrive in a changed environment. Working as ichthyologists (fish biologists) at Lake Mead, students collect water quality data such as temperature, pH, and clarity—to determine whether current habitat conditions are sufficient for survival of young razorback suckers. Students observe and identify non-native fish in Lake Mead as they learn how the razorback sucker interacts with these neighbors. Students assess whether Lake Mead is still a good habitat for razorback suckers. Using the knowledge they’ve gained, students design ideal refuges for the razorback sucker, including ideas to get the word out about this endangered native fish.

These pre-visit activities are designed to prepare students for this on-site experience by introducing them to habitat needs of all species and to initiate student inquiry into why species, such as the razorback sucker, become endangered.

THEME

Species with specialized adaptations and narrow ranges of tolerance become vulnerable to extinction when their habitats undergo change.

KEY QUESTIONS

What threatens or endangers a species? What is an organism’s “range of tolerance” for survival?
What are the questions and challenges associated with re-establishing an endangered species in an altered ecosystem?

GOALS

Students will demonstrate an understanding of :

- what happens to an ecosystem that contributes to the endangerment of a species; and
- what factors need to be considered for survival of an organism and a species.

OBJECTIVES

Students will:

- describe what is meant by “endangered species” and “threatened species;”
- delineate what the major environmental factors are in an aquatic environment;
- understand that organisms interact within their ecosystems;
- research what factors must be considered to ensure that a species’ range of tolerance is met; and
- understand that science involves asking and answering questions and comparing the answers to what scientists know about the world.

NEVADA STATE STANDARDS CORRELATION

N.5.A.1. Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method.

N.5.A.2. Students know how to compare the results of their experiments to what scientists already know about the world.

N.5.A.4. Students know graphic representations of recorded data can be used to make predictions.

N.5.B.2. Students know technologies impact society, both positively and negatively.

N.5.B.3. Students know the benefits of working with a team and sharing findings.

L.5.A.2. Students know reproduction is an essential characteristic for the continuation of every species.

L.5.C.2. Students know organisms interact with each other and with the non-living parts of their ecosystem.

L.5.C.3. Students know changes to an environment can be beneficial or detrimental to different organisms.

L.5.C.4. Students know all organisms, including humans, can cause changes in their environments.

CLARK COUNTY SCHOOL DISTRICT CURRICULUM ESSENTIALS FRAMEWORK (CEF) CORRELATIONS

Students will:

- investigate and describe how plants and animals require food, water, air, and space;
- explain that living things get what they need from their environments;
- investigate and describe the interrelationships and interdependence of organisms with each other and with the non-living parts of their habitats;
- investigate and describe how some environmental conditions are more favorable than others to living things;
- investigate and describe how organisms, including humans, can cause changes in their environments;
- investigate and describe how, for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all; and

- investigate and describe how environmental changes allow some plants and animals to survive and reproduce, but others may die.

SNAP CONSERVATION EDUCATION AND INTERPRETATION THEME CORRELATIONS

The on-site grade 5 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

Students who have used the Full Option Science System (FOSS) Environments modules listed below will gain the most from the pre-visit lessons.

Investigation 1: Terrestrial Environments

Investigation 2: Bugs and Beetles

Investigation 3: Water Tolerance

Investigation 4: Aquatic Environments

Investigation 5: Brine Shrimp Hatching

VOCABULARY

- | | | |
|-------------------------|----------------------|----------------------|
| • ecology | • extinction | • re-establishment |
| • ecosystem | • food web | • species |
| • endangered species | • habitat | • survival |
| • environment | • organism | • threatened species |
| • environmental factors | • range of tolerance | • thrive |

PRE-VISIT LESSON: HABITAT NEEDS (DAY ONE)

Part 1 ▶ Introduction

1. The teacher introduces students to the idea of a field trip to extend their study of environments. Suspense is built by telling the class that they will visit a large aquatic environment in the area. Students guess possible locations. Students are told that they will be research scientists for Lake Mead—beginning today (in the

TIME 20 minutes

MATERIALS

Computer/projector

classroom) and continuing after their return.

- The teacher presents the Forever Earth PowerPoint (**Demonstration: Introduction to Forever Earth**) depicting the Lake Mead aquatic environment and the floating classroom, Forever Earth. Students are given a map (**Student Reference: Colorado River System Map**) and asked to identify Lake Mead.

- The teacher introduces the problem: *The razorback sucker, a fish species native to the Colorado River, is endangered.* Students examine the map showing the historical and current range of the razorback sucker (**Student Reference: Then and Now—Homes of the Razorback Sucker and Bonytail Chub**).

The teacher reads a historical account of the razorback sucker in the Colorado River (**Teacher Reference: The Razorback Sucker A Teacher Read Aloud**).

- Students are split into small groups, and the teacher facilitates having students address the problem by linking prior knowledge of threatened or endangered species (e.g., Mojave Max).
- The teacher charts the terms “endangered species” and “threatened species.” Students discuss the meaning of these terms with their group members, then with the class.
- Teacher charts the definitions. Students record the definitions in their notebooks.
- Whole group discussion: *What species do you know that are endangered or threatened?* The teacher charts responses.

Part 2 ▶ Concept Development

- The teacher asks students to write in their science notebooks a response to the following question: *What do living organisms need to survive?* Students pair/share their lists.
- Students decide (as a class) which environmental factors are needed for survival (i.e., air, water, food, and space). The teacher

Demonstration: Introduction to Forever Earth (to be developed)
Student Reference: Colorado River System Map

Slides or pictures of the razorback sucker

Student Reference: Then and Now: Homes of the Razorback Sucker and Bonytail Chub
Teacher Reference: The Razorback Sucker A Teacher Read Aloud

Chart paper/poster:
 Endangered species and threatened species

Student notebooks
 Word bank chart

TIME 60 minutes

MATERIALS

Student notebooks

Chart paper

charts responses.

3. The teacher shows students photos while explaining that scientists and researchers are concerned for the future of threatened and endangered fish species native to the Colorado River Basin. Four species of major concern are the Colorado pikeminnow, razorback sucker, bonytail chub, and humpback chub. These species exist nowhere else on earth.

The teacher emphasizes that the razorback sucker is the focus of the students' upcoming study in the classroom and aboard Forever Earth (and on land) at Lake Mead National Recreation Area.

Facts about and images of the four endangered Colorado River Basin fish species (above) can be downloaded from:
<http://coloradoriverrecovery.fws.gov/doc/endangeredfishfacts.pdf>

4. Students brainstorm (in groups) what changes could have occurred to the aquatic environment such that razorback suckers can no longer thrive in it. Student groups share their ideas with the class, and the teacher charts them.
5. The teacher presents a mini-lesson on food webs. Students are asked: *With this information in mind, is there anything missing from the list (brainstorm) of what could have happened to the razorback sucker?*
6. Students reflect on (in their notebooks) the possible reasons for the endangerment of the razorback sucker including the environmental factors charted (air, water, food, and space).
 From the food web examination, students might guess that the endangered species are also preyed upon.

Part 3 ▶ Presentation of Findings

Students bring their notebooks to the science circle. They share their reflections and final thoughts about possible reasons why these species are endangered. Class members respond by asking clarifying questions and by probing for reasoning to support conjectures.

Slides or pictures of the four fish species (Colorado pikeminnow, razorback sucker, bonytail chub, and humpback chub)

Chart paper
 Cause-Effect graphic organizer for each group

Food web graphic

TIME 15-20 minutes

MATERIALS

Student notebooks

Part 4 ▶ Linkage and Closure

The teacher summarizes by explaining that living organisms need food, water, air, and space in order to survive—and that they must get these needs met by their environment. The teacher states the following:

We know what an endangered species is and what environmental factors affect a species' survival. From our work in the Environments Kit (FOSS), we have learned that species have a range of tolerance for each of these environmental factors. We have thought of some reasons why the razorback sucker is endangered. Next we will research what the scientists have to say about possible reasons for its endangerment.

EXTENSIONS

- Students conduct background informational research on other threatened and endangered species, especially those native to Southern Nevada.

RESOURCES

- Full Option Science System (FOSS) Environments module materials
- FOSS Science Stories
- Fish Facts: humpback chub, bonytail chub, Colorado pikeminnow, and razorback sucker; document includes a Joseph R. Tomelleri illustration of each fish.
<http://coloradoriverrecovery.fws.gov/doc/endangeredfishfacts.pdf>

ADAPTATIONS FOR DIVERSE LEARNERS

- Create peer reader and writer groups.
- Allow students to work in collaborative groups to answer questions.
- Use a science circle to encourage thought sharing and discussion.
- Limit Internet research to the following one-page razorback sucker sites:

www.nps.gov/applications/nature/documents/Razorback%20Sucker.doc
http://dine.sanjuan.k12.ut.us/heritage/land/animals/reptiles/razor_sucker.htm
<http://library.thinkquest.org/2551/species/razorbacksucker.html>

ASSESSMENT

Students are assessed in the science circle on oral presentation of conjectures and reasoning, on participation in discussion, and on clarifying questions posed.

PRE-VISIT LESSON: WHY THE RAZORBACK SUCKER IS ENDANGERED (DAYS TWO AND THREE)

Part 1 ▶ Introduction

1. The teacher provides linkage to the Day One Pre-Visit Lesson through a Think-Pair-Share Activity (Lyman, 1981). Students are asked to volunteer facts they've learned, so far, about the razorback sucker (e.g., where it lives, what it needs to survive, how it interacts with other species, etc.). The teacher charts the responses.
2. The teacher summarizes by stating the following:
Yesterday we discussed that living organisms require food, water, air, and space to survive in their habitats, and that they must get what they need from their environments. We established a definition for endangered species, and we discussed what environmental factors may affect an organism's survival. We have thought of some possible reasons for the razorback sucker's endangerment.
3. Teacher informs the class that they will go to the computer lab to find out how scientists explain the razorback sucker's endangered species status. Students will also investigate what scientists are considering in terms of re-establishing the razorback sucker in Lake Mead and other parts of the Colorado River System. The teacher asks students to review **Student Reference: Colorado River System Map** in pairs and discuss what they notice about the Colorado River. Then the teacher asks the class to identify locations on the map (e.g., what states does the Colorado River flow through, where is Lake Mead, and where is Las Vegas?).
4. The teacher presents the overarching issue:
Scientists are trying to re-establish the razorback sucker in the Lower Colorado River system, and it hasn't been easy. There are numerous challenges to re-establishing an endangered species into an altered ecosystem.

Students are given a map that shows the historic and current locations of populations of razorback suckers and bonytail chubs

TIME 20 minutes

MATERIALS

Chart paper

Student Reference:
Colorado River System Map

(Student Reference: Then and Now: Homes of the Razorback Sucker and Bonytail Chub). The teacher facilitates a class discussion about how the distributions of these fish populations have changed.

5. Students work in collaborative groups of four to brainstorm responses to the following questions:
 - *What do scientists need to know about a species and an environment in order to re-establish a species successfully?*
 - *What questions does a scientist ask before re-establishing a threatened or endangered species into an altered ecosystem?*
 - *What are the challenges of re-establishing a species into an altered ecosystem?*

6. Within the collaborative groups of four, assign one of the following informational research questions to individual members such that each group will have all four questions answered.
 - *What is a razorback sucker; what are its distinguishing features?*
 - *Why is the razorback sucker on the Endangered Species list? Why are there fewer razorback suckers now?*
 - *What type of research is being done on the razorback sucker? What environmental factors are scientists monitoring in areas where the razorback sucker is being re-established?*
 - *What is the range of the razorback sucker in the Colorado River System; where are re-establishment projects taking place?*

7. Students take science notebooks and choose a partner within their group to research the razorback sucker in the computer lab.

Part 2 ▶ Concept Development

Within their science notebooks, students document their research on the razorback sucker and print pertinent pictures and maps from the Internet (**Student Reference: Researching the Razorback Sucker**).

**Student Reference:
Then and Now: Homes of
the Razorback Sucker and
Bonytail Chub**

TIME 50-60 minutes

MATERIALS

Computers with Internet access

**Student Reference:
Researching the Razorback
Sucker**

Part 3 ▶ Linkage and Closure

The teacher facilitates a Think-Pair-Share (Lyman, 1981) Activity: *Make a list of what you learned today about razorback suckers.* The teacher charts the responses.

The teacher summarizes as follows:

From our research today we have seen that scientists are looking at the relationships that organisms have with each other and how species depend on specific qualities of the living and non-living parts of their habitats for survival. Scientists use this information to decide how best to re-establish the razorback sucker and to monitor the success of their re-establishment projects. Tomorrow in your groups of four you will have time to prepare and present your findings to the whole class.

Part 4 ▶ Presentation of Findings

Students share their findings in their collaborative groups of four.

Groups prepare poster presentations to include:

- Physical attributes of the razorback sucker;
- The range of the razorback sucker and where re-establishment projects are occurring;
- Environmental factors or changes that may have contributed to the decline in population of the razorback sucker; and
- Scientific investigations into the re-establishment of an endangered/threatened species into an ecosystem.

Collaborative groups present their posters. The teacher concludes:

We now have a good background for our upcoming visit to Forever Earth at Lake Mead—part of the Colorado River System where we will go to learn more about the razorback sucker.

TIME 10-20 minutes

TIME 50-60 minutes

MATERIALS

Art supplies
Photos, maps, and other images printed in Part 2 (above)

EXTENSIONS

- Students investigate other threatened or endangered species, especially those in Southern Nevada.
- On maps of the Colorado River System, students locate and mark the sites where research or conservation efforts are occurring for the razorback sucker or other threatened or endangered species.

RESOURCES

- Full Option Science System (FOSS) Environments module materials

- FOSS Science Stories
- Teacher Resource: Grade 5 Internet Resource list
- Lyman, F. T. (1981). The responsive classroom discussion: The inclusion of all students. In A. Anderson (Ed.), *Mainstreaming Digest* (pp. 109-113). College Park: University of Maryland Press.
- U.S. Fish and Wildlife Service, Mountain-Prairie Region
Razorback Sucker Recovery Plan and Goals:
Recovery Plan: <http://www.fws.gov/ifw2es/Documents/R2ES/RazorbackSucker.pdf>
Goals: <http://mountain-prairie.fws.gov/crrip/doc/rg/Razorbacksucker.pdf>

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.
- Create peer reader and writer groups.
- Allow students to work in collaborative groups to answer questions.
- Pre-print and provide students with the following one-page descriptions of the razorback sucker:

www.nps.gov/applications/nature/documents/Razorback%20Sucker.doc

http://dine.sanjuan.k12.ut.us/heritage/land/animals/reptiles/razor_sucker.htm

<http://library.thinkquest.org/2551/species/razorbacksucker.html>

ASSESSMENT

The poster presentation is evaluated by the whole group. Discussion should consider whether key concepts are included and represented accurately, or whether there are misconceptions in the presentation. Groups are assessed according to ability to function and to self-monitor for task completion.