

2009

## Just Passing Through! The Water Cycle! On-Site Programming (Grade 4)

Discover Mojave: Forever Earth

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# GRADE 4

*Just Passing Through! The Water Cycle!*

**ON-SITE PROGRAMMING**



**2008/2009 Edition**

# Just Passing Through! The Water Cycle!

## OVERVIEW

Water use is such an automatic and habitual daily activity that students often do not understand the consequences of its use. Seldom do they connect the water that comes out of the faucet to its sources in the natural world. Lake Mead on the Colorado River is one of the most intensely used reservoirs in the western United States, providing recreational activities and domestic drinking, industrial, and irrigation water for millions of users. The quality of this water must be maintained to guarantee a reliable and safe resource for its many uses. Inflow into Lake Mead primarily is from the Colorado River; however, about three percent of the inflow is from tributaries on the northern side of the Lake and from Las Vegas Wash on the northwest side of the Lake.

In “Just Passing Through! The Water Cycle!,” students begin exploring the importance of Lake Mead by making and recording observations of how water is being used in different ways by plants, animals, and people. Students view an animated powerpoint presentation that follows one drop of water through Lake Mead’s water use cycle and then re-create the cycle on a magnet board. Working as scientists, students determine if water is the same in all parts of the lake by comparing water samples from the middle of the lake and from Las Vegas Bay. By examining a number of scenarios, students use scientific reasoning to deduce the major reasons for the current lower lake level. In a culminating activity, students brainstorm ideas for personal actions that they can take to conserve or protect Lake Mead’s water.

## OUTLINE

### On-Site Programming

On-site programming includes activities that take place aboard Forever Earth and activities that take place on shore (typically the Callville Bay picnic area). For a large group, it is convenient to split the students into two or more groups. One or more groups can participate in the shore-based activities while one group is aboard Forever Earth; student groups switch when the Forever Earth group returns to the marina.

### Forever Earth

- Part 1 ▶ [Welcome and Introductions](#)
- Part 2 ▶ [Observations](#)
- Part 3 ▶ [This Is Your Life, Bob](#)
- Part 4 ▶ [Comparing Water from Different Parts of the Lake](#)
- Part 5 ▶ [The Case of the Missing Water](#)
- Part 6 ▶ [Closure: What Students Can Do](#)

### Shore

[The Water Obstacle Course](#)

[Plumbing the Colorado](#)

**Corresponding Pre-Visit Lesson**

- Appear! Disappear! The Magic of Water!

**Corresponding Post-Visit Lesson**

- Going Full Cycle!

**THEME**

Lake Mead not only plays a huge role in supporting life in our desert but also provides a scientific laboratory for understanding how the water cycle works.

**KEY QUESTIONS**

Where does all the water in Lake Mead come from? Is the water the same in all parts of the lake? What happens to the water?

**GOAL**

Students will demonstrate an understanding of how Lake Mead fits into the water cycle and the importance of Lake Mead's role in our daily lives.

**OBJECTIVES**

Students will:

- describe how water is used by living things, including by humans;
- create a diagram to describe how Lake Mead water is obtained and used by the area's human population and then returned to Lake Mead;
- make predictions of how properties of water might be different in different parts of Lake Mead;
- make conclusions based on evidence about the reasons for the lower water level of Lake Mead; and
- list at least three personal actions that they can take to conserve and protect Lake Mead water.

**NEVADA STATE STANDARDS CORRELATIONS**

P.5.A.1. Students know matter exists in different states (i.e., solid, liquid, gas) which have distinct physical properties.

P.5.A.2. Students know heating or cooling can change some common materials, such as water, from one state to another.

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

E.5.A.2. Students know the processes of the water cycle, including the role of the Sun.

E.5.A.4. Students know the role of water in many phenomena related to weather (e.g., thunderstorms, snowstorms, flooding, and drought).

## CLARK COUNTY SCHOOL DISTRICT SCIENCE CURRICULUM ESSENTIALS FRAMEWORK (CEF) CORRELATIONS

Students will:

- (4)1.4. Conduct safe investigations with a partner and with a small group.
- (4)1.5. Identify, gather, and safely use tools (magnet, thermometer, and lens) and materials needed in investigations.
- (4)1.6. Compare a model with what it represents (solar system, electrical circuit, human body models).
- (4)3.1. Investigate and describe the properties of water.
- (4)3.2. Investigate and describe the water cycle, including the role of the sun.
- (4)3.3. Investigate and describe the factors that affect the processes of evaporation and condensation.
- (4)3.4. Investigate and explain that water can be a liquid, a gas, or a solid and can go back and forth from one form to another.

## SNAP CONSERVATION EDUCATION AND INTERPRETATION THEME CORRELATIONS

The on-site grade 4 activities support the following guiding theme developed by Clark County-based educators:

- 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

A pre-visit classroom trip will be made by Forever Earth or National Park Service staff to introduce students to the Forever Earth program and their upcoming field trip. Students learn and agree to the “conduct rules” of Forever Earth, understand basic water safety concepts, and observe how and when to put on a Personal Flotation Device (PFD) during their time aboard Forever Earth.

## VOCABULARY

- |                |                          |                         |
|----------------|--------------------------|-------------------------|
| • collection   | • pH                     | • water clarity         |
| • condensation | • plankton               | • water conservation    |
| • desert wash  | • precipitation          | • water cycle           |
| • evaporation  | • sewage treatment plant | • water treatment plant |

## ON-SITE ACTIVITIES: Forever Earth

### Part 1 ▶ Welcome and Introductions

Forever Earth staff greets students in the parking lot. Students are divided into groups and given team lanyards. The facilitator welcomes students to Lake Mead National Recreation Area and Forever Earth and introduces the concept of National Parks and public lands, emphasizing that the field trip is taking place on public land.

**Facilitator Reference:** **Lake Mead NRA Fast Facts** contains information to answer common questions about Lake Mead. The Captain or facilitator leads the safety presentation (see **Facilitator Reference: Safety Talk Outline**).

### Part 2 ▶ Observations

Students practice observation skills and record observations of how living things use and depend on water.

The facilitator begins with a discussion of the importance of water in the daily lives of the students: *How did you already use water today? Are people the only living things that use water?*

From the top deck, students record observations of how water is being used on **Student Worksheet: Observation Record**.

Students share their observations with the group.

### Part 3 ▶ This Is Your Life, Bob!

Through a PowerPoint presentation, students follow a drop of water through a water use cycle: from Lake Mead to Las Vegas and back to Lake Mead.

Students are each given a magnet board with icons that will appear as graphics in a powerpoint presentation delivered by the facilitator. The presentation takes students through a series of adventures experienced by “Bob the Water Drop” (**Demonstration: Bob’s Wonderful Adventure** and **Facilitator Reference: Narrative of Bob’s Wonderful Adventure**). The icons on the magnet board represent particular places or incidents along Bob’s journey from Lake Mead to Las Vegas and back to Lake Mead (e.g., water treatment plant; brushing teeth; Las Vegas Wash; etc.). At appropriate points in the presentation, students are asked to identify where Bob is and what

**TIME** 10 minutes

#### **MATERIALS**

Color-coded badges to indicate teams attached to lanyards

**Facilitator Reference:**  
**Lake Mead NRA Fast Facts**  
**Facilitator Reference: Safety Talk Outline**

**TIME** 10 minutes

#### **MATERIALS**

**Student Worksheet:**  
**Observation Record**

**TIME** 20 minutes

#### **MATERIALS**

Magnet boards  
Magnet pieces representing various waypoints of Lake Mead water  
**Demonstration: Bob’s Wonderful Adventure**  
**Facilitator Reference: Narrative of Bob’s Wonderful Adventure**  
Laptop computer

he is experiencing by pointing at particular icons.

At the conclusion of the powerpoint presentation, students are asked to demonstrate what they've learned by assembling diagrams on the magnet boards of how Lake Mead water might be used and returned to Lake Mead.

Conclude with the last slide of the presentation by asking students what might happen next to Bob.

**Part 4 ▶ Comparing Water from Different Parts of the Lake**

Students conduct tests and compare data on water samples taken from Las Vegas Bay and from the middle of the lake.

From the previous activities, students should understand that Lake Mead water is used by people in Las Vegas for a variety of purposes, treated, and then returned to Lake Mead. Students compare water from the middle of the lake to a sample from Las Vegas Bay.

**Group 1** Students use probes to collect data for water temperature and pH. Students also use their senses to detect any noticeable odor.

**Group 2** Students use a Secchi Disk to measure turbidity. Students use plankton net to collect plankton. Students assist facilitator in making slides for stereoscope observation.

Facilitator assists students with basic identification of collected microorganisms.

All data are recorded on **Student Worksheet: Data Collection Sheet**.

Groups 1 and 2 switch stations if time allows. Students compare data and average their results; efforts are made to ensure that students have a complete data set. Students answer the questions: *How do the water samples compare? Is the water the same? In what ways are the water samples the same? Different?*

**Part 5 ▶ The Case of the Missing Water**

In this activity, students investigate reasons for the lower lake level.

Five scenarios are presented that might explain why the lake level is much lower than usual. For each scenario, students are given

Television monitor

**TIME** 30 minutes

**MATERIALS**

**Group 1 Station**

- Probes for temperature/pH
- Plastic beakers (3; 500 ml)
- Surface water collector
- Van Dorn Water Samplers

**Student Reference: pH Scale and Examples**

**Group 2 Station**

- Collection tray
- Digital stereoscope
- Digital microscope
- Eye droppers
- Laptop computer
- Microscope slides/cover slips
- Petri dishes (2)
- Secchi disks (2)
- Plankton net

**Student Reference: Plankton I.D.**

**Student Worksheet: Data Collection Sheet**

**TIME** 30 minutes

**MATERIALS**

Graphics that depict each scenario

information and data to evaluate and reach a conclusion.

Scenarios:

1. Desert bighorn sheep drank all the water.
2. People used all the water.
3. There has been a drought in the mountains where the river begins.
4. The wind has evaporated all the water.
5. There is a leak in the dam.

### Part 6 ▶ Closure: What Students Can Do

In this closure activity, students discuss what personal actions they can take to conserve and protect Lake Mead's water.

The facilitator draws the group's attention to the observations they first made about how living things, including humans, use and depend upon water. The students work in small groups and are asked to respond to two questions:

1. What can you do to help conserve (save, not waste, use wisely) water?
2. What would you like to tell people about Lake Mead?

The facilitator brings the groups together to share their thoughts.

**TIME** 20 minutes

#### **MATERIALS**

Chart paper  
Markers

## ON-SITE ACTIVITIES: Shore

### The Water Drop Obstacle Course

In this activity, students move through an obstacle course as drops of water.

Students will:

- Learn how water moves through the water cycle in different forms.
- Understand that Lake Mead is part of the Colorado River.
- Discover how Lake Mead fits in the larger picture of the water cycle.

### Part 1 ▶ Introduction to the Water Drop Obstacle Course

Students are informed that, for this activity, each of them is a drop of water. *What do you feel like? What do you look like? What do you smell like? What kinds of things might happen to a drop of water? What are some of the ways that water can move? (If the group has already participated in the activities aboard Forever Earth, begin by asking about some of the adventures that Bob the Water Drop experienced.)*

**TIME** 35 minutes

#### **MATERIALS**

**Facilitator Reference:**

**Obstacle Course Layout**

**Facilitator Reference:**

**Station Materials**

Obstacle course with materials  
at each station

Map of Colorado River

Briefly explain that the obstacle course laid out in front of them is a model of some of the things that may happen to water in the Colorado River watershed, including Lake Mead. Use a map of the Colorado River Watershed to show how some of the map features are represented by stations. Describe how the direction cards will tell each water drop to perform some sort of action that represents what is happening to them. The card will also tell them how to proceed and to which station. Demonstrate by reading a couple of the cards with them and showing how the movement to the next station represents what is happening to them as a drop of water. For example, when a drop of water evaporates, the card will instruct the student to skip to the next station. For English Language Learners, demonstrate more of the movement directions so there is an understanding of the actions they are to perform. Emphasize that none of the cards will tell the students to run to the next station and that the course is not a race.

#### Part 2 ▶ Go With the Flow

Begin the activity with a “practice” round. Ask the students to find a partner and tell them that, as a team, they will proceed through two stations. The facilitator assigns each team of students to a different station to begin their adventure. After reading a card, the team replaces the card in the envelope before proceeding to the next station. The facilitator stops the group after everyone has completed two stations and asks for volunteers to relate what happened to them as drops of water. Emphasize to students how they should understand what is happening to them as drops of water and why, rather than which station number it happened to be.

The facilitator gives students the option of now proceeding with a partner or as an individual. Each team or individual is given a plastic sandwich bag to collect the station cards. They will use the cards later to assist them in telling a story of what they experienced. Also remind students that the cards may send them to a station that is out of order numerically, that they may end up at the same station many times, and may never visit some stations. The teams and individual students are again scattered throughout the course and are given time to proceed through the obstacle course. The facilitator should judge the timing so that students have collected at least 12-15 cards.

watershed

Plastic sandwich bags

**Part 3 ▶ Telling The Story**

The facilitator asks students: *Where was the starting line for the obstacle course? The finish line? Does our model represent what can happen to a drop of water fairly well? How long have these kinds of things been going on? What other adventures might a water drop have?* Emphasize to students that the water that exists today is the same water that has always been on the earth and the same water that will be available in the future.

Using the collected cards as reminders of their adventures as water drops, students are asked to each tell a story relating some of these adventures. They may write, draw, or diagram their stories. Close the activity by having students volunteer to share their stories or drawings.

**(FACILITATOR NOTE:** Have students replace the cards in the envelopes at the respective stations before moving on to the next activity.)

8 ½ x 11 paper  
Colored pencils, markers,  
pencils, crayons

**PLUMBING THE COLORADO**

*Note: This activity is adapted from the Discover A Watershed: The Colorado River activity book. For additional information, refer to the activity write-up beginning on page 277.*

In this activity, students explore how water moves into and out of the Colorado River system.

Students will:

- Demonstrate water inputs and outputs of the Colorado River system.
- Gain an increased awareness of water users on the Colorado River, including those outside their geographic area.

**Part 1 ▶ Introduction to Plumbing the Colorado**

Explain that the Colorado River is extremely important because much of the area through which it flows is desert. By using dams and diversions to use or “plumb” the river, we’re able to live and grow crops where it would otherwise have been extremely difficult. In this activity, the students will see how water is added to and removed from the river according to the type of process or use of the water.

**Part 2 ▶ Plumbing the Colorado**

First, direct students’ attention to the “rope” model of the Colorado River watershed. Show where major features on the model are

**TIME** 40 minutes  
**MATERIALS**

Colorado River watershed  
“rope” model

located: the headwaters of the Colorado and Green rivers; the confluence of the Colorado and Green rivers; Lake Mead; the U.S./Mexico border; and the Gulf of California. Use the Colorado River watershed map to reinforce the concept of the model representing the flow of the Colorado River from its headwaters to the Gulf of California.

The students are divided into teams. Each team is given a blue bucket that represents the Colorado River. Students will move down the rope model, adding or removing water from their rivers (blue buckets) according to the instructions on the laminated cards. Explain that water in the white buckets represents sources of water (rain, snow, tributaries, etc.). Before letting the students begin the activity, the facilitator should take a few minutes to have students practice using the measuring cups.

Have each team start at the headwaters of the Colorado River, Card #1, and continue down the river to the Gulf of California. Adults should shadow the teams and assist with some of the more complicated measurements. Just below the confluence of the Green and Colorado Rivers, a laminated card asks students to predict how much water will be in the bucket when it reaches the Gulf of California. Emphasize to students that it is not a race and to perform their measurements carefully.

When the river reaches the Gulf of California, there should not be any water left in the bucket. All the water has been used upriver. This is what happens to the Colorado River most years. Only during extremely wet years does water flow all the way to the Gulf of California. Review students' predictions of how much water would be in the bucket when it reached the Gulf.

### Part 3 ▶ Conclusions

Students are asked to review the reasons for when water was added to their bucket (river) and for when water was removed from their bucket (river).

Students are then asked what this means for:

*People living in Mexico*

*People living along the Colorado River*

*People growing food along the Colorado River*

*Fish and wildlife*

6 Measuring cups

6 Blue buckets

6-8 White buckets filled with water

Colorado River watershed map

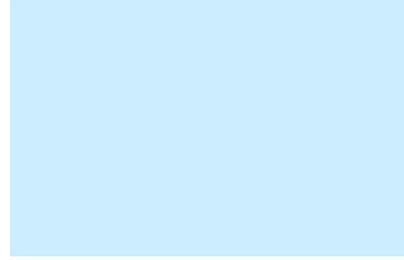
Laminated cards with

information about quantity of water to be added or removed from river buckets and why

*All of us*

Ask students to discuss what would happen in wet or dry years.

Conclude by having students summarize what they learned by doing this activity.



## ADAPTATIONS FOR DIVERSE LEARNERS

- Consult with teachers prior to field trip to determine 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.
- Implement peer assistance by involving teachers in the process of creating color teams.
- Provide diagrams, photos, or other visual organizers as appropriate for processes and techniques.