

Keepin' It Clean Program Information

FIELD TRIP OVERVIEW

The *Keepin' It Clean* field trip is broken into two 60-minute parts. After a short, 10 minute introduction to the center and topic, one group of 35-students and chaperone/teaching assistants will join a docent for a hands-on investigation into how pollutants can spread through a watershed. The other group of students and their chaperone/teaching assistants will explore the gallery space, learning about the connections between what we consume and how we affect our drinking water supply. At the end of the first 60-minute period, groups switch and experience the other part.

Laboratory Experience

Keepin' It Clean focuses on the role watersheds play in the water cycle, at which point humans impact the water cycle, and how pollutants are spread in a watershed. In the lab experience, students investigate these topics by examining how representative pollutants spread throughout a model watershed. After a discussion of how pollutants spread in the model watershed, students test samples to determine what happened to a fictional local creek. Students then conduct a second series of test, either with samples from a local creek to determine the water quality in their local watershed or with tap water to identify the chemicals that are in their drinking water. The activity wraps up with a discussion on how chemicals can be used in ways that benefit the public and in ways that could harm our environment.

Introduction: The Water We've Got Is All That We've Got (10 minutes)

During this whole class instruction, docent initiates a conversation with students about why water is important to survival; how they use water and the many different ways fresh water can be compromised. The presentation emphasizes how Roseville's supply of water connects with the cyclical nature of the world's water supply.

Activity 1: What We Shed Ends Up In Our Watershed (15 minutes)

Working with a physical watershed model, students identify how pollutants placed on the ground spread through runoff.

Activity 2: Pollution Detection (20 minutes)

Students use colorimetric test strips to determine whether any phosphates, nitrates and chlorine are found in water samples. Students then conduct a second round of tests with tap water to learn how the city maintains a safe water supply.

Closure (5 minutes)

Students process the results of the experiments and discuss how everyday decisions and activities (such as overfilling the garbage can or changing oil in the driveway) can affect the water quality in their local creek, the Sacramento River, even the San Francisco Bay.

Gallery Experience

The gallery experience starts off in front of the globe where students are introduced to the larger problem of our planet's environmental crisis. The docent then leads the group in a brief discussion, pointing out how everyone's choices contribute to the problem and how changes in how they use water can reduce their impact on the environment.

Following a pacing guide, the groups explore each exhibit as they complete a scavenger hunt and identify ideas and solutions for reducing their family's impact on the local water resources.

ACADEMIC STRUCTURE

Outcomes, Essential Questions, and Key Concepts

The instructional framework for *Keepin' It Clean* has three components: essential questions, measurable outcomes, and key concepts. These form the basis for creating links between the RUEC Lab Experience and classroom learning as well as identifying how the lab experience activities can link to the California Content Standards.

Outcomes: What will students do and know?

- Students will understand the relative scarcity of freshwater and the importance of a safe water supply.
- Students will identify stages of the water cycle and understand at which stage humans impact the quality of water.
- Students will identify how pollution spreads in a watershed.
- Students will gain a basic understanding of water pollution and water analysis.
- Students will discuss various prevention methods of water pollution.
- Students will practice safe lab skills for working with chemicals.

Essential Questions: What will students think about and investigate?

CONSIDER: What role could water have in the movement of nutrients and pollutants from the mountains to the oceans?

- CONNECT: How could an overflowing garbage can or too much fertilizer endanger water hundreds of miles away? How do our water supplies remain free of pollutants?
- CONSERVE: What choices can we make as kids to maintain a healthy watershed? Where in the water cycle do we have the most impact on water quality?

Key Concepts: What will be covered?

Water cycle: evaporation, precipitation, storage, runoff

Watersheds

- Non-point source pollution
- Phosphate pollution and algae blooms

Correlation to California Academic Standards

California Content Standards

California has two sets of academic and content standards that apply to the *Elements of Waste* field trip experience. The first set, *The California Content Standards*, apply to specific content that must be addressed at each grade level. Due to the limited duration of the field trip, only the science standards can be addressed with any meaningful connection. Please see the suggested before and after activities for correlations to content areas other than science.

Text that is in light gray is the actual standard students must meet. The black text describes how the *Keepin' It Clean* field trip experience helps students move towards meeting each standard.

Fourth Grade

Grade 4 Earth Sciences, 5c: Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Students examine how runoff transports soil through a watershed (activity one).

Grade 4 Investigation and Experimentation, 6d: Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.

Students conduct several tests to determine which pollutants are contained in a water sample.

Fifth Grade

Grade 5 Earth Sciences 3a: Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.

Grade 5 Earth Sciences 3d: Students know that the amount of fresh water located in rivers, lakes, under-ground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.

The activity starts with a review of how much water is available as fresh water.

Grade 5 Earth Sciences 3b: Students know that when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.

Grade 5 Earth Sciences, 3c: Students know that water vapor ... can fall to Earth as rain, hail, sleet, or snow.

The water cycle is reviewed and featured prominently throughout the first half of the activity.

Grad 5 Earth Sciences, 3e: Students know the origin of the water used by their local communities.

Lake Folsom is visually identified and repeatedly referred to throughout the activity.

Sixth Grade

Grade 6 Investigation and Experimentation, 7b: Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

Students conduct several tests to determine which pollutants are contained in a water sample.

Education and the Environment Initiative

The EEI is a second set of standards that span across content areas and address environmental issues. Although teachers are mandated to teach environmental education, there is still a lack of state-approved curricula. Below are correlations between the *Keepin' It Clean* field trip experience and the EEI. Again, actual text from the EEI is in gray, correlations are in black.

Principle I, Concept a: Students need to know that the goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.

Significant time is devoted to discussing the relative scarcity and importance of fresh drinking water.

Principle IV, Concept b: Students need to know that the byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.

Students investigate how pollutants could be spread from their home into a nearby creek and from there to the wider watershed.

Correlation to the FOSS Curriculum, 2007 Edition

Keepin' It Clean correlates to the following FOSS Modules:

Water Planet, Grade 5 FOSS Module.

This RUEC activity reviews the water cycle's mechanism and discusses how the surrounding area acquires its water. The activity would serve as either an introduction or extension of the lessons *Water Vapor* and *Weather*.

Environments, Grade 4 FOSS Module.

Keepin' It Clean presents to students the problem of balancing human interaction with the environment with the needs of organisms' dependant on the same natural resources. Because this activity focuses on nonliving factors in an aquatic environment, namely runoff and the potential pollutants it carries, *Keepin' It Clean* would serve as either an introduction or extension to the lessons *Aquatic Environments* and *Range of Tolerance*.

PREREQUISITE KNOWLEDGE

The terms and concepts listed in this section are at the root of this experience. Although students will be able to participate in the activity without previous exposure to these terms and concepts, it will enhance their understanding if you are able to explain these concepts and terms in a childfriendly manner.

Concepts:

An area of land that drains into a river is called a watershed.

- Although water is constantly moving through the water cycle, fresh water replenishment can take hundreds or even millions of years.
- Potential pollutants left on the ground can be swept up in runoff and spread through a watershed.

Terms:

Algae – simple, aquatic plants that grow where nutrients are plentiful.

- Algal bloom a sudden, explosive growth in the number of algae living in a body of water.
- Condensation the phase of the water cycle during which water vapor cools and forms into water droplets.
- Evaporation the phase of the water cycle during which liquid water turns into a gas.
- Fresh water storage a phase of the water cycle during which water rests in surface lakes, snowpacks, or in underground aquifers.
- Parts per million an expression of a very dilute concentration of a substance. Just as per cent means out of a hundred, parts per million or ppm means out of a million.
- Pollution a material or chemical that impacts a natural area, possibly creating a hazard to life.
- Precipitation rain or snowfall
- Runoff the phase of the water cycle during which water moves across ground surfaces.
- Water cycle the cycle of phases that move water throughout the earth.

Watershed – an area of land that drains to body of water.

TIPS TO GIVE VOLUNTEER TEACHING ASSISTANTS (Chaperones)

Roles & Responsibilities:

- Assist TechTeam instructor with distributing materials and getting your assigned group's attention.
- Monitor whether students are following instructions.
- Assign students tasks so that everyone has a chance to participate.
- Ask questions and model that it's fine not to know an answer or solution.

Notes for a Successful Activity:

This activity involves working with chemicals readily found in the real world: fertilizer and chlorinated water. While these chemicals are safe, we still want to prevent exposure. Please be sure all students wear their gloves and goggles as demonstrated by the TechTeam instructor.