

## Erosion Control Grades 3-6

Activity 1: Your Watershed Video  
Activity 2: Erosion Control Game  
Activity 3: How Erosion Hurts  
Water Quality

### Science Skills

- Prediction
- Simulation
- Data Comparison
- Data Analysis

### Language Arts Skills

- Vocabulary and Concept Development
- Use of prior knowledge to analyze text
- Strengthen Comprehension through use of structural patterns

### Objectives

Students will:

- read and interpret an expository text
- participate in classroom discussion to development vocabulary words and definitions.
- use a thesaurus to determine related words and concepts.
- make predictions about and compare the rates at which water flows down a slope with and without plants.
- understand how plants help control erosion
- identify at least 3 ways in which humans can help control erosion

### Duration

**Activity 1: 10 minutes**

The segment is about 90 seconds.

**Activity 2 - 45 minutes**

The instructional material and game procedures should be covered in 15 minutes. The game activity and discussion will take 30 minutes.

**Activity 3 – 45 minutes**

30 minutes to create the vocabulary list. Second half of the worksheet can be completed in remaining time, as homework or center work.

## Lesson Two: EROSION CONTROL

### Background

Children have observed how water flows downhill and how it often transports litter or sediment. When watering plants, students have seen how soil and plant matter absorb and hold water. Understanding how vegetation affects water's movement through a site promotes student appreciation of the relationship between water quality and landscape.

As it flows over and through soil, water filters through spaces among particles and around plant roots and vegetative matter. This process slows the movement of water. Sediment (soil and other natural materials carried by water) may be removed from the water as it is captured and stored by vegetation, lakes, ponds and wetlands.

Vegetation slows water runoff by capturing water in its roots. When water is slowed by vegetation, it does not have the energy (velocity) to pick up as much sediment. Roots also help hold soil in place, such that it does not become sediment when runoff is occurring. In addition to slowing the movement of water and capturing it, vegetation captures the sediment and other material that the runoff is carrying. In that way, plants are keeping pollutants from reaching the lake. After trapped, runoff water filters into the ground it moves underground through the soil towards the stream or into the groundwater. During this process the water is leaving behind any sediment or polluting chemicals that it was carrying when it was trapped by the vegetation. Without vegetation, the runoff moves quickly down the stream. As it gains speed it is able to pick up more sediment and carry it to the stream or lake. Sediment that reaches the lakes and streams harms aquatic life, and pollutants that reach the lake encourage the growth of algae and contribute to the loss of water clarity.

Soil being carried by water is a natural ongoing process. Erosion has occurred since water appeared on the planet. (Consider the formation of the Grand Canyon or the gradual leveling of the Appalachian Mountains.) When soil and organic matter are carried from one location to another, the destination site may be enriched and its surface are increased (e.g. the floodplain of a river or delta). However, the effects of erosion are not always desirable. Erosion of topsoil decreases the fertility of soil, and sediment build-up in streams and lakes can harm aquatic life.

Ensuring that the condition of a land area does not promote deleterious erosion and other water resource problems involves the use of Best Management Practices (BMPs). Watershed managers rely on BMPs that reduce erosion and nonpoint source pollution problems. BMPs that prevent erosion include: landscaping areas to promote plant cover; replanting areas cleared by logging; monitoring water that enters and leaves cut areas; building terraces, catch basins, and natural filters to mitigate sediment deposition in lakes, streams, etc.; and leaving a green or planted zone in riparian areas.

## Textbook

### Harcourt Science 3<sup>rd</sup> Grade

Survival of Living Things

### Harcourt Science 4<sup>th</sup> Grade

Interactions of Living Things

Chapter 2 – Plant Growth and

Adaptations

*Plants have adaptations to help them meet their basic needs. These include important plant structures – roots, stems, and leaves.*

### Harcourt Science 5<sup>th</sup> Grade

Systems of Living Things

## Materials

### Activity 1

Your Watershed (Lake Tahoe Report segment 2) on videotape or DVD

### Activity 2

1. 30 yards of rope or yarn
2. hillside or open field for game site
3. poker chips
4. 1 stopwatch (decimal minutes and seconds display)
5. white board, chalkboard or
6. overhead projector
7. lesson plan

### Activity 3

1. Photocopies of newspaper article and worksheet for each student
2. Transparency copies of article and worksheet (optional)
3. Overhead projector and markers (optional)
4. Dictionaries
5. Thesauruses

## Vocabulary

erosion

runoff

sediment

Best Management Practice (BMP)

vegetation

asphalt

mulch

permeable

impermeable

algae

## Activity 1: Your Watershed Video

Note: this video is also used in the Your Watershed lesson; if students have viewed this segment recently, do a quick review of the video content and proceed with Activity 2.

1. Before showing the video, ask students how erosion at Lake Tahoe may affect their lives. (closing trails, killing fish, causing algae to grow on the shores). Why are many people, not only scientists, are concerned about the loss of clarity of Lake Tahoe? Explain that the class will read a newspaper article and create a vocabulary list to help them learn more about the erosion problem at Lake Tahoe.
2. Show the Your Watershed video segment (Lake Tahoe Report segment 2)

## Activity 2: Erosion Control Game (Just Passing Through)

### Instruction

1. Explain that the students will be learning how to play a game that is similar to tag. It will be a fun way to teach others about controlling erosion. Inform the students that they are going to act out the role of water as it flows down a slope into a stream. The game divides the students into two groups, some students represent raindrops and the other students represent vegetation. Each group has rules they must follow because water drops and plants have certain characteristics that allow them to do some things and do not allow them to do others. While learning how to play the game, the students will learn how plants help control erosion.
2. Instructor may choose to draw a blue line of the board (representing a hillside stream) and some green vegetation near the stream. Use this diagram in conjunction with the following game procedures to demonstrate the background information.

### Game Procedures

**Game Site:** Arrange the playing field according to the *Slopes with Plant Cover* diagram. Lay yarn or a piece of rope down the middle portion of the field to indicate the stream. (A section of the yarn can be crumpled up to represent rapids). Use another section of rope to make a circle at the base of the stream that represents Lake Tahoe. Boundary cones may be set up 10 feet from the “stream”. Half of the class will assemble at the top of the stream. These students represent raindrops. The other half of the class will represent vegetation and will space themselves around the stream according to the rules.

**California Science Content Standards – Grade 3**

- 1. Energy and matter have multiple forms and can be changed from one form to another.
- 1.f. Students know evaporation and melting are changes that occur when the objects heated.
- 2. Adaptations in physical structure or behavior may improve an organism's chance for survival.
- 2.c. Students know living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, some are beneficial.
- 5. Scientific progress is made by asking meaningful questions and conducting careful investigations.
- 5.c. Use numerical data in describing and comparing objects, events and measurements.
- 5.d. Predict the outcome of a simple investigation and compare the result with the prediction
- 5.e. Collect data in an investigation and analyze those data to develop a logical conclusion.

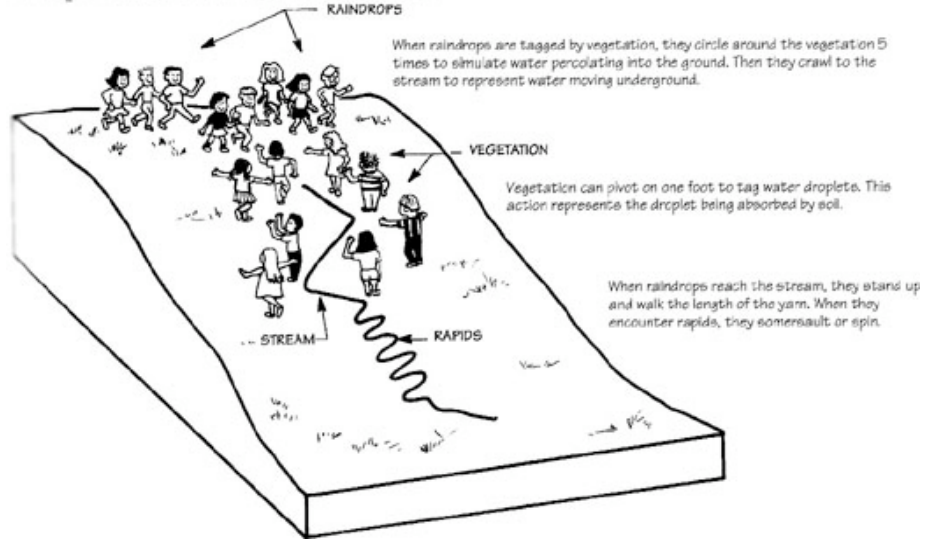
**California Science Content Standards – Grade 4**

- 3. Living organisms depend on one another and on their environment for survival.
- 3.a. Students know ecosystems can be characterized by their living and nonliving components.
- 5. Waves, wind, water and ice shape and reshape Earth's land surface.
- 5.a. Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

**California Science Content Standards – Grade 5**

- 4.c. Students know the causes and effects of different types of severe weather.
- 6.a. Classify objects (e.g. rocks, plants, leaves) in accordance with appropriate criteria.
- 6.e. Identify a single independent variable in a scientific investigation and explain how this variable can be used as information to answer a question about the results of the experiment.

**Slope With Plant Cover**



**Part 1**

- 1. To begin, have the students take their places at the top of the stream (raindrops) or along the stream's edges. At the height of the storm, the raindrops move down the slope, taking the most direct route to the stream (walking downhill swiftly). This step represents water falling on and flowing over the land's surface.
- 2. The vegetation slows the flow of water. To demonstrate this, students that represent vegetation try to tag the raindrops. However, vegetation must keep one foot in place, and can pivot on that foot. "Vegetation" students can also stretch their arms out to reach the "raindrop" students. Tagging the water droplets represents roots trapping the water.
- 3. If a raindrop is tagged, the "raindrop" student must circle five times around the "vegetation" student. "Raindrop" students then crawl toward the stream. Raindrops cannot be tagged a second time. Circling five times around the vegetation simulates raindrops filtering into the ground. Crawling towards the stream represents water continuing to be filtered as it moves underground. (Explain to students that in reality this process takes days, weeks, or months, depending on rock material and gradient.)
- 4. Once raindrops reach the stream, they stand up and walk the length of the yarn. If they encounter rapids, they can spin about or do forward rolls to represent water spilling over rocks. At the end of the stream, they should wait for the rest of the raindrops.
- 5. Record the time it takes all the raindrops to pass through the site. If there is time, students can exchange roles and repeat the simulation.
- 6. Discuss the results of the activity. Ask the students to describe the water movement. Help the students to understand how plants slow the rate of flow, allowing time for water to filter into the soil.

**Part 2**

- 1. Ask the students how the results of the activity will differ when vegetation is

**California Language Arts  
Content Standards Grades 3, 4,  
5**

**Reading**

- 1.1 Know and use complex word families when reading (e.g. -ight) to decode unfamiliar words.
- 1.2 Use word origins to determine the meaning of unknown words.
- 1.3 Use knowledge of root words to determine the meaning of unknown words within a passage.
- 1.6 Use sentence and word context to find the meaning of unfamiliar words.

**Reading Comprehension**

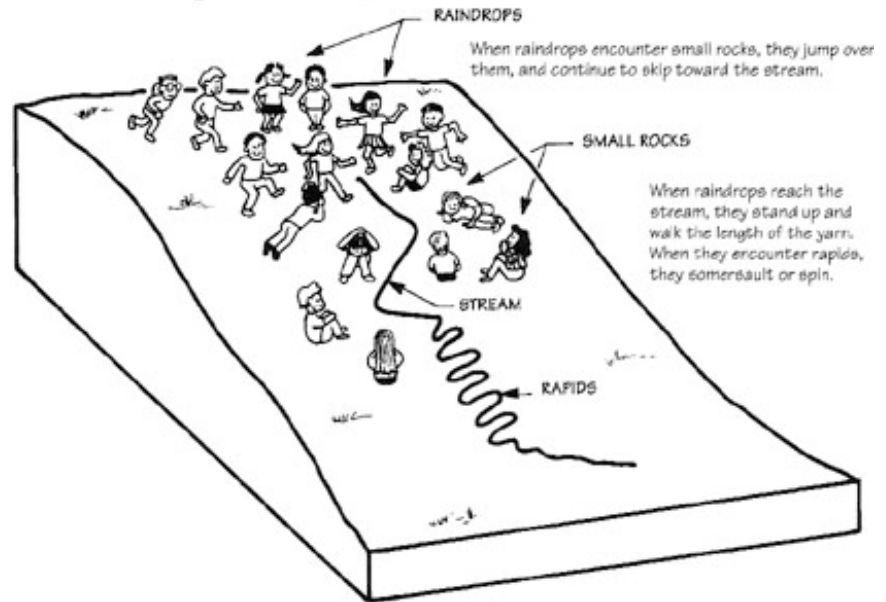
- 2.1 Identify structural patterns found in informational text (e.g. compare and contrast, cause and effect, sequence in chronological order, proposition and support) to strengthen comprehension.
- 2.2 Use appropriate strategies when reading for different purposes (e.g. full comprehension, location of information and personal enjoyment).
- 2.3 Demonstrate comprehension by identifying answers in the text.

**Listening and Speaking**

- 1.10 Compare ideas and points of view expressed in broadcast and print media.
- 1.10 Evaluate the role of the media in focusing attention on events and in forming opinions on issues.

removed. Have the students perform the second version of the activity. (See *Barren Slope* diagram) Again, half of the class represents raindrops and the other half represents “small rocks”. Students representing small rocks should sit or lie down, curling themselves into tight balls. When raindrops move near a rock, they can walk around or jump over it, continuing to flow down the slope.

**Barren Slope**



- 2. Compare the time required for raindrops to flow through sites with and without plant cover. Discuss the implications of water racing down a barren slope, how plants capture water and control erosion.

**Part 3**

- 1. Explain that the third demonstration will demonstrate what happens when raindrops dislodge and transport soil and other materials to the lake. While scattering the chips near and around the “stream”, explain that the red chips represent chemicals (such as motor oil that is dumped near rivers), the blue chips represent fertilizers and pesticides and the white chips represent pebbles, twigs, dead leaves, or biodegradable items that may pollute the lake. (Instructor may choose to scatter actual pebbles, twigs, etc.)
- 2. Set up the playing field as in *Part 1*. As raindrops flow through the site, they pick up sediment. If tagged, raindrops circle five times around the vegetation and drop all the chips they have collected. Once the raindrops are tagged, they drop their chips and crawl to the stream. "Raindrops" do not pick up more sediment while crawling to the stream because they represent ground water movement. However, after they reach the stream, they can continue to pick up chips as they walk down the stream. Dropping the chips represents the sediment being deposited near the vegetation instead of being carried to the lake. Remind students about gravity; raindrops must keep moving as they bend down to collect materials.
- 3. After raindrops make it to the lake, have them count the number of items that they are still holding and drop the chips in the lake. Instructor will time how

long it takes all the students to reach the lake.

4. Arrange the playing field as in *Part 2*, and have raindrops flow through the site picking up sediment. In conclusion, students should find that the raindrops than in the previous simulation collected a larger amount of sediment.
5. Discuss problems associated with erosion and unchecked transport of sediment and how the lake could be affected by an accumulation of sediment. Discuss what could be done to decrease the quantity of sediment that flows into the lake, and how Best Management Practices accomplish this.

#### **Rule Review**

Raindrops can only flow downhill (gravity), not back and forth across a slope. Raindrops must take the most direct route to the river and stay within the boundaries.

Raindrops can only be tagged once by vegetation.

If the raindrop is tagged by vegetation, he/she must circle the vegetation 5 times (representing filtering), then crab crawl to the river (representing underground water movement).

After reaching the stream, the raindrops must follow the line of the stream down to the lake.

Vegetation must be 5 feet from the river.

Vegetation must keep the same foot planted in the same place, but they can pivot on that foot and stretch their arms out.

Vegetation can only tag one raindrop at a time.

In part two, students representing rocks cannot move.

In part three, raindrops do not pick up more sediment as they crawl to the stream, however, after they reach the stream, they can continue to pick up chips.

Raindrops can only pick up pollution that is in the line of where they are going down.

### **Activity 3: How Erosion Hurts Water Quality Article**

1. Pass out article and worksheet. Explain that after reading the article the class will use the worksheet to create a vocabulary list and, as a group, write definitions for the words. Students will then use a dictionary to add to the class created definitions and a thesaurus to complete the second half of the worksheet.
2. Instructor reads aloud, or students read the article individually or in groups. Ask them to mark words that they believe should be on the class erosion vocabulary list. Once the students have read the article, have them call out the vocabulary words they marked. Write the words on the overhead copy. Discuss each word briefly and write a short definition for each, based on the discussion. Students write the words and the short definitions on their worksheet during the discussion.
3. Instructor may begin by re-reading the first sentence and choosing the word soil erosion for the vocabulary list. Ask the students to use the surrounding text, root words, etc. to tell you what the word means. Write the word and a brief definition for it on the board. Have the students read a sentence aloud

that includes another vocabulary word.

4. Following are questions that may be used to help lead the discussion. What moves the soil? (Water runoff moving quickly over surfaces) How do humans speed up the process of erosion? (Runoff moves over manmade surfaces more easily than natural surfaces; construction removes vegetation, which holds soil in place; off vehicles/hiking/skiing/biking loosen the soil, making it more susceptible to erosion) What is a permeable surface? Impermeable? (Permeable surface allow water to run into its surface i.e. sand, impermeable surface allow water to run off its surface i.e. asphalt). How does soil erosion damage the environment? (Sediment clouds the lake and carries other pollutants to the lake) Does anyone have an example of what types of chemicals may accidentally be deposited in the lake? (Painting chemicals, motor oil, fertilizers) What is mulch? (Grass clippings and other plant matter, dead leaves, bark, soil, and microorganisms that are decomposers. It is often used in gardening.) How would mulch help control erosion? (It holds water well, so the water runs into the ground instead of running off) How does a planter box or ditch control erosion? (It holds the water long enough so that it can be absorbed into the soil.
5. After the vocabulary list has been created, review how to use a dictionary and thesaurus for completion of the remainder of the worksheet. Explain that the remainder of the worksheet will be completed independently.
6. If time allows, re-read the article and ask students to share what they have learned by reading this article.

### **Extensions and applications**

1. Students convert the times recorded, in part two of the game, to decimal form, round to the nearest minute and/or find the difference between the rates. Students discuss advantages and disadvantages of the different estimations.

Page 15 will be Erosion Hurts Lake Tahoe article

Page 16 will be Defining What We Know worksheet