

Before and After Activities

This section includes activities to do before and after your visit to the Tahoe Center for Environmental Sciences. All written activities include a key, as well as a blank student page.

Lake Tahoe

Lake Tahoe Vocabulary.....	2
Lake Tahoe Crossword Puzzle Key and Student Page.....	4
Lake Tahoe Word Search Key and Student Page.....	6

Watersheds

Internet Research Activity.....	8
Searching out Nonpoint Sources of Pollution.....	12

Resources and Energy

Scavenge for Litter.....	14
--------------------------	----

Earth Science

Wind and Water.....	16
When Rain Hits the Land.....	20

Ecology

Help Wanted!.....	23
-------------------	----

Research

Secchi Depth.....	24
-------------------	----

Lake Tahoe Vocabulary

Best Management Practices (BMPs): Things people can do to help prevent pollution, like soil particles and nutrients, from getting into waterways. They could be structures people build like catch basins or wetlands, or they could be behaviors people adopt like picking up after their pet, or not using fertilizer on their lawn.

Eutrophic: A body of water rich in nutrients and low in dissolved oxygen. The water usually looks cloudy and green because of abundant algae.

Oligotrophic: A body of water low in nutrients and high in dissolved oxygen. The water usually looks clear and blue.

Point source pollution: Pollution coming from a specific source (like a factory).

Non-point source pollution: Pollution coming from an indefinite, or diffuse, source (like lawns or city streets).

Watershed: The area from which water drains into a particular body of water.

Water clarity: The depth to which light penetrates water. A lake that is composed of clear, clean water will have a much higher level of clarity than one that is polluted.

Urban Runoff: Dirty, polluted water flowing from urbanized areas (city streets, gutters, etc.). This water flows to the lake and contributes to the lake's loss of clarity.

Deposition: When soil or pollution falls out of the air or water that was carrying it.

Erosion: The wearing down or washing away of the Earth's surface by water, ice, or wind.

Sediment: Any loose material, like soil or gravel, which is moved by water, ice, or wind.

Topography: The contours of the earth's surface.

Food web: A description of the transfer of food energy from one organism to another.

Producer: An organism that converts energy (usually from the sun) into food (usually sugars).

Consumer: An organism that eats other organisms (cannot utilize sunlight to make food). An herbivore eats plants (primary consumer), a carnivore eats animals (secondary or tertiary consumer), and an omnivore eats both.

Decomposer: A special kind of consumer that breaks down dead plants and animals for food.

Phytoplankton: Tiny, free-floating, aquatic plants (also called algae). They are the producers in the Lake Tahoe aquatic food web (in the lake these include diatoms, Chrysophytes, Chlorophytes, Cryptophytes and Dinoflagellites).

Zooplankton: Tiny, free-floating, aquatic animals. They are consumers in the Lake Tahoe aquatic food web (in the lake, these include Daphnia, Bosmina, Diaptomus, Epischura, Mysis shrimp, and several types of rotifers).

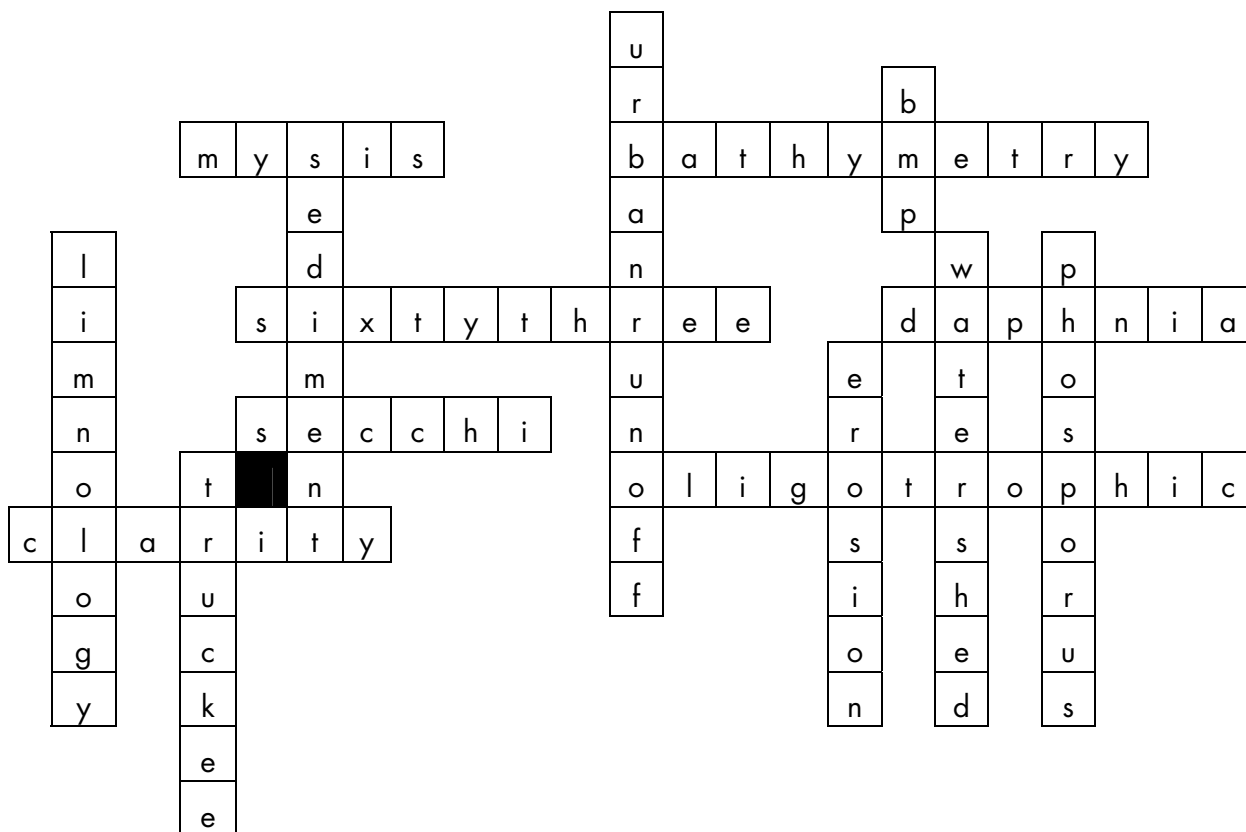
Hypothesis: A scientific guess based on observations.

Theory: A hypothesis that has been tested many times and explains how processes or events are thought to occur. It is a basis for predicting future events or discoveries. Theories may be modified as new information is gained.

Bathymetry: The measurement of water depth at various places in a body of water.

Limnology: The study of freshwater bodies such as lakes and ponds.

Secchi disk: An instrument commonly used for measuring the lake's clarity. It is a round, dinner-plate size disk that is lowered into the water. Once it can no longer be seen in the water, a scientist measures how far down it was lowered to determine the water's clarity.

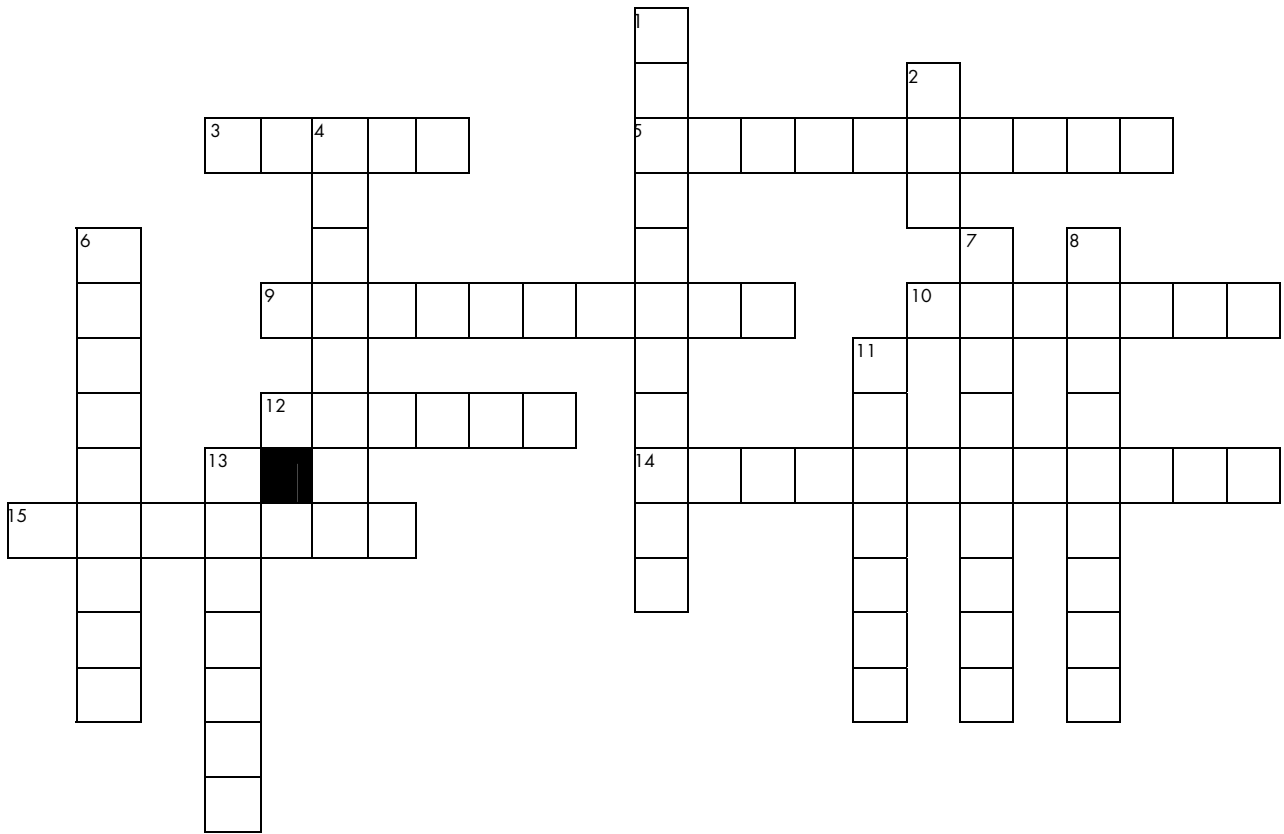


1. Water that flows from streets, parking, lots, gutters, and other urban areas.
2. Any loose material, like soil or gravel, which is moved by water, ice, or wind.
3. The measurement of water depth at different places in a body of water.
4. The study of lakes and other bodies of fresh water.
5. The area from which water drains into a particular body of water.
6. This nutrient's chemical symbol is P, and, along with nitrogen (N), contributes to algae growth.
7. The number of streams that flow into Lake Tahoe.
8. One of several kinds of zooplankton in Lake Tahoe, its numbers were greatly reduced by non-native Mysis shrimp.
9. The wearing down or washing away of the Earth's surface by water, ice, or wind.
10. The _____ disk is used to measure water clarity in Lake Tahoe.
11. The _____ River is the only river or stream that flows out of Lake Tahoe.
12. A clear, blue lake that is low in nutrients (like Lake Tahoe).
13. The depth to which light penetrates water.

Lake Tahoe Crossword Puzzle (Key)

provide food for game fish.

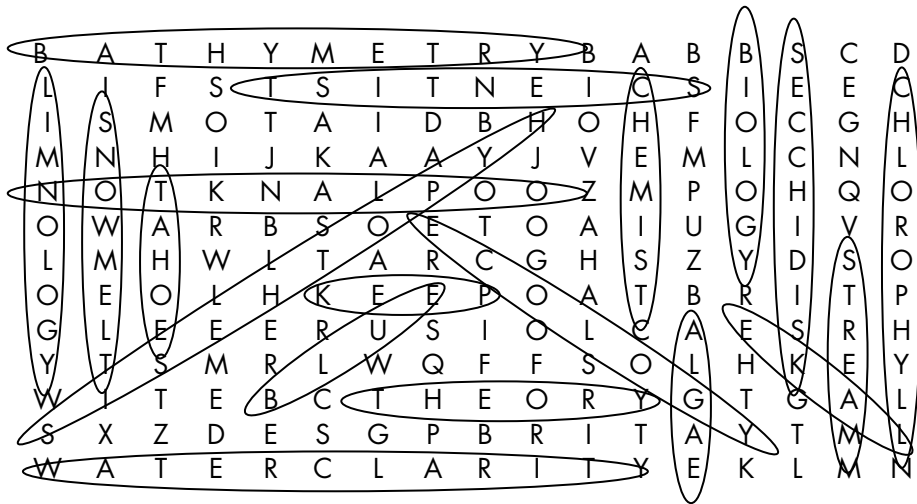
4. Any loose material, like soil or gravel, which is moved by water, ice, or wind.
5. The measurement of water depth at different places in a body of water.
6. The study of lakes and other bodies of fresh water.
7. The area from which water drains into a particular body of water.
8. This nutrient's chemical symbol is P, and, along with nitrogen (N), contributes to algae growth.
9. The number of streams that flow into Lake Tahoe.
10. One of several kinds of zooplankton in Lake Tahoe, its numbers were greatly reduced by non-native Mysis shrimp.
11. The wearing down or washing away of the Earth's surface by water, ice, or wind.
12. The _____ disk is used to measure water clarity in Lake Tahoe.
13. The _____ River is the only river or stream that flows out of Lake Tahoe.
14. A clear, blue lake that is low in nutrients (like Lake Tahoe).
15. The depth to which light penetrates water.



1. Water that flows from streets, parking, lots, gutters, and other urban areas.
2. _____ pollution from getting into waterways.
3. _____
4. _____
5. The measurement of water depth at different places in a body of water.
6. The study of lakes and other bodies of fresh water.
7. The area from which water drains into a particular body of water.
8. This nutrient's chemical symbol is P, and, along with nitrogen (N), contributes to algae growth.
9. The number of streams that flow into Lake Tahoe.
10. One of several kinds of zooplankton in Lake Tahoe, its numbers were greatly reduced by non-native *Mysis* shrimp.
11. The wearing down or washing away of the Earth's surface by water, ice, or wind.
12. The _____ disk is used to measure water clarity in Lake Tahoe.
13. The _____ River is the only river or stream that flows out of Lake Tahoe.
14. A clear, blue lake that is low in nutrients (like Lake Tahoe).
15. The depth to which light penetrates water.

Lake Tahoe Word Search (Key)

Can you find the words listed below? Words can be horizontal, vertical, diagonal, and sometimes backwards!



- | | |
|-------------|---------------|
| Algae | Limnology |
| Bathymetry | Scientist |
| Biology | Secchi disk |
| Blue | Snowmelt |
| Chemist | Stream |
| Chlorophyll | Tahoe |
| Ecology | Theory |
| Hypothesis | Water clarity |
| Keep | Zooplankton |
| Lake | |

Can you find the three words that aren't in the word list? (Hint: they make up a famous phrase about Lake Tahoe.)

Lake Tahoe Word Search

Can you find the words listed below? Words can be horizontal, vertical, diagonal, and sometimes backwards!

B A T H Y M E T R Y B A B B S C D
L I F S T S I T N E I C S I E E C
I S M O T A I D B H O H F O C G H
M N H I J K A A Y J V E M L C N L
N O T K N A L P O O Z M P O H Q O
O W A R B S O E T O A I U G I V R
L M H W L T A R C G H S Z Y D S O
O E O L H K E E P O A T B R I T P
G L E E E R U S I O L C A E S R H
Y T S M R L W Q F F S O L H K E Y
W I T E B C T H E O R Y G T G A L
S X Z D E S G P B R I T A Y T M L
W A T E R C L A R I T Y E K L M N

Algae	Limnology
Bathymetry	Scientist
Biology	Secchi disk
Blue	Snowmelt
Chemist	Stream
Chlorophyll	Tahoe
Ecology	Theory
Hypothesis	Water clarity
Keep	Zooplankton
Lake	

Three words aren't in the word list. Find them and make a famous phrase about Lake Tahoe.

A Tangled Web: Conducting Internet Research

Adapted from Healthy Water, Healthy People Water Quality Educators Guide, Project WET, 2003.

Objectives: Students develop strategies to access information on the Internet, evaluate websites using accepted criteria, and research water quality topics.

State Science Standards:

Nevada: N.8.A.2

California: Grade 6 – 7b, Grade 7 – 7a,b

Materials: Internet access, Copies of “Internet Research Questions” page, Copies of “Evaluating Web Sites” page

Background: Web research requires not only finding information but assessing its reliability as well. One of the first clues to a site’s credibility is the top-level domain of the site’s URL (i.e. .com, .org, .net, etc.), which gives a general idea of what kind of site it is. Usually, government, educational institutions, and reputable non-governmental organizations (NGOs) are considered mostly reliable. When in doubt about the accuracy or objectivity of Internet material, it is best to search for additional corroborative information. Before using any information, it is good policy to find at least two independent sources to confirm it. The skills in this activity help students critically review information gathered from web sites.

Activity:

1. Ask students why they use the Internet and for what purposes. What are some advantages and disadvantages of using the Internet for research? Ask students who is responsible for assessing the reliability of sites being used for research. Remind students that the researcher is responsible for assessing the quality of web sites and that each individual must determine whether or not to use questionable sites.
2. Distribute copies of the “Evaluating Web Sites” page and review each question. Ask students to contribute additional questions that they feel are important when evaluating information from web sites.
3. Distribute copies of the “Internet Research Questions” page and review the questions. Remind students to use their “Evaluating Web Sites” page as they conduct their research.
4. Have students record their answers and the web sites from which they found the answers as well as web sites they disqualified.
5. Review the students’ answers. How difficult was it to find the needed information? Was there more than one source of information for any of these questions? What web sites were disqualified and why? Where there any other criteria they would add to the “Evaluating Web Sites” page? Has their view of information from the Internet changed?

Internet Research Questions (Key)

1. Go to the United States Environmental Protection Agency's "Surf Your Watershed" web site at <http://www.epa.gov/surf> and click on "Locate Your Watershed." Locate your watershed using any of the several methods offered on this page (e.g., zip code, city, county, etc.) and record the name.

Answers will vary. Possibilities include Lake Tahoe, Truckee, or Carson.

2. Click on the "Impaired Water for this watershed" link. How many waters are listed as impaired within this watershed? Scroll down to the "Causes of Impairment" table. What impairment has been reported in the most waters?

Again, answers will vary. For Lake Tahoe, 23 waters are listed as impaired and the most reported impairment is iron.

3. The abbreviation "TMDL" appears on this page. Conduct an internet search for "TMDL" and record its meaning.

TMDL stands for "Total Maximum Daily Load." It is the maximum amount of pollution a waterbody can have and still meet water quality standards.

4. Generate a list of water quality issues for Lake Tahoe (hint: search for Lake Tahoe + water quality issues). Record the web site(s) you gathered your information from and any that you considered unreliable.

The main water quality issue at Lake Tahoe is the loss of clarity due to increased sediments and nutrients (nitrogen and phosphorus) entering the lake.

Internet Research Questions

1. Go to the United States Environmental Protection Agency's "Surf Your Watershed" web site at <http://www.epa.gov/surf> and click on "Locate Your Watershed". Locate your watershed using any of the several methods offered on this page (e.g., zip code, city, county, etc.) and record the name.
2. Click on the "Impaired Water for this watershed" link. How many total waters are listed as impaired within your watershed? Scroll down to the "Causes of Impairment" table. What impairment has been reported in the most waters?
3. The abbreviation "TMDL" appears on this page. Conduct an internet search for "TMDL" and record its meaning.
4. Generate a list of water quality issues for Lake Tahoe (hint: search for Lake Tahoe + water quality issues). Record the web site(s) you gathered your information from and any that you considered unreliable.

Evaluating Web Sites

When evaluating the reliability of websites, you may want to consider the following questions:

1. **Who owns the site?**

- **.edu:** sponsored by education institutions, especially colleges and universities. Typically carries reliable and scholarly information. A tilde (~) in the address may signify a personal web page.
- **.gov:** owned by the U.S. government. Information found here is generally reliable.
- **.org:** owned by an organization that is often, but not always, nonprofit. Can be a good source of information, but may carry an agenda.
- **.mil:** owned by a branch of the U.S. military.
- **.com:** commercial websites maintained by a company. May be reliable, but not necessarily scholarly.

2. **Who are the authors of the site and why did they write it?** What are the author's credentials? What qualifies the individual(s) to comment on the topic? Are they trying to provide information (such as the results of their research), promote their point of view, or sell something?
3. **What is the format of the information?** Is it a journal article, popular magazine, newspaper report or editorial?
4. **Does the author provide other references that help support his/her research or conclusions?**
5. **When was the site last revised?**
6. **Can the information from this site also be found at another site?** The ability to find the same information on different, unrelated, sites is a good way to check reliability.

Other evaluation criteria you have developed:

Searching Out Nonpoint Sources of Pollution

Adapted from Waves, Wetlands, and Watersheds: California Coastal Commission Science Activity Guide, 2003, and Save the Bay's San Francisco Bay Watershed Curriculum.

Objectives: Students examine maps to trace the path water takes in their local watershed, determine what kinds of pollution water may pick up as it travels, and understand how individual choices can reduce water pollution.

State Science Standards:

Nevada: N.8.B.1, L.5.C.4

California: Grade 6—2b

Materials: Map(s) of local area

Background: Water pollution can either be from a “point source” or a “nonpoint source.” Point source pollution originates from a specific place such as an oil refinery or a paper mill. Nonpoint source pollution is contaminated runoff originating from an indefinite or undefined place, often a variety of places (e.g. farms, streets and parking lots, yards, construction sites, and logging operations). The soot, dust, oil, animal wastes, litter, sand, salt, pesticides and other chemicals that constitute nonpoint source pollution often come from everyday activities such as fertilizing lawns, walking pets, changing motor oil, and driving. With each rainfall or snowmelt, pollutants from these activities are washed from lawns and streets into storm drains that often lead directly to nearby bodies of water.

Activity:

1. Ask students what they know about nonpoint source pollution, and write their answers on the board. Have they heard of the term? Do they know what it means? What are some examples?
2. Ask students what types of nonpoint source pollution they think could be originating from their school and their community. Write this on the board.
3. Pass out a copy of a map of your community to each student or group. Have the students locate their school, the nearest creek or river, where that creek or river originates, and where it ends.
4. Have the students study the map and locate possible sources of nonpoint source pollution. Some examples include:

Schools: playground, football field, sewage system, parking lot, sidewalks

Community: farmland, construction sites, residential areas, parking lots, parks

5. Instruct the students to create a comic strip that illustrates the story of a raindrop as it travels through your local watershed. Discuss these questions: What kinds of substances will their raindrop encounter? Are these substances natural or man-made? Are they

harmful or beneficial to the water? Are any of these substances things we personally use (fertilizers, oil, garbage, etc.)? Why should we care if the water is polluted?

6. Brainstorm with students about actions they or their parents/caregivers can take to reduce pollutants entering the aquatic environment. (Note: many of these are activities that adults would likely undertake; students would need to advocate these suggestions to their parents. Brainstorm with students how they can approach adults in a helpful manner.)

Ideas could include:

- Properly dispose of trash in garbage cans. Storm drains empty into local waterways and can carry litter.
- Never dump chemicals on the ground or down storm drains because they may end up in the local water body. Do not dump them in house drains or toilets either, because they may not be removed in sewage treatment and may end up contaminating the local water bodies. Use non-hazardous alternatives whenever possible, or dispose of chemicals at appropriate sites.
- Walk pets in grassy areas or parks. Pet wastes on pavement can be carried into streams by storm water. Pick up after your pets.
- Keep cars well maintained and free of leaks. Recycle used motor oil. Contact local public works or call (800) CLEANUP for how to store and where to take waste oil.
- Don't dispose of leaves or grass clippings in your storm drain. Remember, storm drains usually lead to a body of water, and excess nutrients are a type of pollution. Instead, try composting yard waste.
- Landscape your yard to prevent run-off. Use as few pesticides as possible. Try non-toxic approaches to pest control wherever possible and use organic gardening techniques.

Extensions:

1. Using the maps and information from this activity, create a nonpoint source pollution display for your school and/or community.
2. Find out what types of pollutants your school is generating (detergents, pesticides, fertilizers, etc.) and make a list. Discuss with school staff nonpoint source pollution and suggest alternative products.
3. Conduct a storm drain stenciling activity around your school and/or community to alert people about the hazards of nonpoint source pollution.
4. Write to local or state representatives to find out what measures are being taken (or considered) to reduce nonpoint source pollution in your community.

Scavenge for Litter

Adapted from *Doing the 4Rs—A Classroom Activity Guide to Teach Reduce, Reuse, Recycle, and Rot*, StopWaste.Org, 2005

Objectives: Students collect litter on school grounds and identify the natural resource it came from, graph their findings, and calculate the percentages for different types of litter found on school grounds.

State Science Standards:

Nevada: N.5.B.3, E.8.C.7

California: Grade 5—6a,g, Grade 6—6b,c, 7c

Materials: Paper or plastic bags, latex gloves, graph paper

Background: Litter commonly includes pieces of paper, plastic and glass, packaging, cigarette butts, and bottles, but it can also be anything considered out of place. Litter impacts the environment in many ways. It can become hazardous to wildlife and humans, it reduces the aesthetic appeal of public places and it costs money to clean up. Litter can be a major problem on school campuses. Many items that become litter when discarded could have been reused, recycled, or composted. Teachers can remind students that they can take responsibility for reducing litter by practicing the 4Rs and participating in litter cleanups at school and in their community.

Activity:

1. Explain that students will be collecting litter at their school. Invite the students to guess what items of litter they may find and where they expect to find it. Record and save their ideas on the board so they can compare their predictions to what they actually collected.
2. Decide with the students what categories they will put the litter into. For example, categories could include paper, plastic, glass, metal, and organic.
3. Organize the students into groups and give each group a bag. Tell students they have ten minutes to collect at least five items of litter from the school grounds. Be sure students record where they found each piece of litter. *Note: Ask students to be safe during their search. Pass out latex gloves. Discuss items that should not be picked up. Stress that if the students are in doubt, they should always ask the teacher.*
4. Students should remain in their groups when the time expires. Tell the students that in their group they should identify and list the natural resources used to make the items of litter collected. Next, they will classify their items according to the categories discussed.
5. Write the total numbers of litter in each category on the board. Students will individually graph their data. *Note: You can discuss different types of graphs here and decide as a class which graph would be most effective at depicting the data.*

6. Ask students how their predictions compared to the type and location of waste on school grounds. What might be some ways they can reduce waste at school and at home?

Extensions:

1. Calculate the percentages of different categories of waste found on school grounds and create pie charts.
2. Create a map of school grounds showing the location of litter the students found and where recycling and garbage cans are. Have them hypothesize why they found litter where they did and what steps might be taken to reduce the litter found on school grounds. For example, some areas may be heavily used by students at lunch time but no recycling and garbage bins are in the area, so litter end up on the ground. Students could ask school administrators to place recycling and garbage bins in the area.
3. Create a poster that informs other students about litter commonly found at school and the importance of the natural resources used to make each item. Include information on where the natural resource is found, if it is renewable or not, and what students can do to conserve the resource.
4. Create a booklet listing resources for recycling different things in the community.

Wind and Water

Adapted from Picture Perfect Science Lessons: Using Children's Books to Guide Inquiry, National Science Teachers Association, 2005

Objectives: Students will explore weathering and erosion through a lab simulation.

State Science Standards:

Nevada: N.5.A.6, N.5.B.3, E.5.C.2

California: Grade 6—2a, b

Materials: Pictures of the Grand Canyon (or other erosion-caused landform), unwashed gravel, soil, sand, small unwashed rocks, plastic jar (2 per group), strainer (1 per group), coffee filter (1 per group), container to catch water (1 per group), water, safety goggles, lid from copy paper box or other large, shallow box (1 per group), cup (1 per group), books or other materials describing erosion and weathering (optional), copies of student lab pages

Background: Weathering is the process whereby rock is broken into smaller and smaller pieces. Erosion is the process whereby those pieces are carried away. Water is the most important erosion agent, either as liquid water or ice. Wind also causes erosion, most often in deserts. The process of erosion stops when the transported pieces fall out of the transporting medium (water or air) and settle on a surface, which is called deposition. Weathering and erosion are two of the main forces that shape the Earth's surface. They are usually slow and gradual processes that occur over thousands or millions of years, but they can happen quickly during floods or large storms. They can also be speeded up by human activities. *Note: The Grand Canyon is used in this activity, but any local or regional feature that is caused by wind or water erosion can be substituted.*

Activity:

1. Pass out photos of the Grand Canyon and ask students the following questions: How do you think the Grand Canyon formed? Why do you think it has gotten wider and deeper over time? How long do you think it took for the Grand Canyon to form? (About 6 million years) Write answers on the board.
2. Tell students they will be doing a lab to help them understand how wind and water can cause changes on the surface of the Earth. Distribute the Wind and Water Lab student pages. Divide students into groups and have them complete the lab.
3. When all groups have finished, ask students if they have ever heard the words *weathering* and *erosion*; what do they think they mean? Have students research what they mean or give them the definitions.
4. Ask students what weathering is. In which part of the lab did they observe weathering? (Part B) What is erosion? In which part of the lab did they observe erosion? (Parts C & D)

5. Tell students that there are different kinds of erosion. Based on the lab, can they think of two? (Wind and water). What do they think the definition of water erosion is? What part of the lab involved water erosion? (Part D) What is wind erosion? What part of the lab involved wind erosion? (Part C). Are weathering and erosion constructive or destructive forces? (Destructive)
6. Go back to the original questions. Would the students change what they answered before? Why or why not?

Extensions:

1. Have students research and create a travel brochure advertising the Grand Canyon to tourists. Include the following: A catchy slogan, a drawing or photo of the Grand Canyon, a map showing the location of the Grand Canyon, definitions of weathering and erosion and a description of how each contributed to the formation of the Grand Canyon, an explanation of the changes that still occur every day in the Grand Canyon as a result of weathering and erosion, and three reasons tourists should visit the Grand Canyon.

Wind and Water Lab student pages

Part A How does water carry rocks and soil?

- Fill a plastic jar halfway with gravel, sand, and soil.
- Add water to fill up the jar.
- Close the jar, and then take turns shaking the jar for a total of one minute.
- Set the jar aside for at least 20 minutes (you will observe it in Part D).

Part B How can water cause changes in rocks?

- Divide a cup of rocks into two equal piles.
- Put one pile of rocks into a plastic jar, and fill the bottle halfway with clear water.
- Close the lid, and take turns shaking the jar for a total of 10 minutes.
- Pour the mixture through a strainer into another container.

1. How do the rocks that were shaken in the water compare to the other pile of rocks? _____

2. Examine the water. Is it still clear? _____

- *Very slowly* pour the water through a coffee filter into a container. Examine the filter.

3. What do you see? _____

Part C How can wind cause changes in rocks?

- All team members must have safety goggles covering their eyes before continuing!
- Open a sheet of newspaper in the center of your table.
- Place a paper box lid in the center of the newspaper.
- Pour a cup of sand into one end of the lid.
- Have one student put his or her hand inside the other end of the box, open palm facing the pile of sand.
- Have someone blow *gently* on the sand, and then blow harder until the sand hits the other student's hand.
- Repeat until all team members have felt the sand hitting their hands.

1. How did the sand feel blowing against your hand? _____

- Observe the sand that was blown to the other end of the box and rub it between your fingers. Do the same to the sand left in the original pile.

2. How are the textures of the sand different? Why do you think this is so? _____

Part D How does water carry rocks and soil?

1. In the space below, sketch and label materials in the jar from Part A.

- Now imagine that the water in the jar is flowing down a river.

2. Which type of material would be carried for the longest distance? _____

3. Which type of material would settle to the bottom of the river? _____

When Rain Hits the Land

Adapted from Save the Bay's San Francisco Bay Watershed Curriculum

Objectives: Students perform an experiment to determine which land surfaces cause runoff, summarize their results, and map the land surfaces around their school.

State Science Standards:

Nevada: N.5.A.1, N.5.B.3, E.5.C.2

California: Grade 5—5d, e, g, Grade 6—2a, 7a, d, h

Materials: Metal cans (or other cylinders) with two open ends, water container, beakers or measuring cups, stop watches, data charts (included)

Background: When rain hits the land, it either flows over the surface or it is absorbed by the land. Whether rain becomes groundwater or runoff depends on the type of land it encounters. Rainwater runs off impervious surfaces such as concrete, asphalt, rooftops, and even packed soil, because it cannot soak in. As runoff glides over these smooth hard surfaces, it encounters no resistance and picks up speed. Depending on the slope of the land, the volume and power of this runoff can erode soil and pick up pollutants such as oil and fertilizers. In contrast, water falling on loose soil and vegetated areas is able to seep into the ground to become groundwater. In this case, water is absorbed and slowed, minimizing erosion, filtering out pollutants, and preventing flooding. The faster the runoff and the greater its volume, the more pollutants it can carry, and the more flooding and erosion can occur. The type of land surface and the slope of the land determine the volume and the rate of runoff.

Activity:

1. Ask students to think about what happens when rain hits the land. What happens to the water as it falls to the ground? Now ask the students what their ground looks like. Are they picturing a vegetated area, like a forest or field? Or are some picturing a paved surface like a road or parking lot? Does the rain soak into the ground or does it run off?
2. Ask if students know what the word “percolation” means. Explain that they will be performing a percolation test on different land surfaces around school grounds. The test involves pouring a specified amount of water on various surfaces and recording the amount of time it takes for all of the water to soak into the ground each time. Hand out the data sheets. Ask students to list the things they think should be kept constant in this experiment.
3. Divide students into groups and hand out data charts. Each group should decide which roles each member will perform. They will need a timer, a data recorder, and a water pourer. Other roles could include a can twister, a water measurer, and a water observer.

Each group should also decide how much water they will pour for each test and at what point they will begin timing.

4. Have students identify various land surfaces around school grounds. These could include grass, gravel, packed dirt, loose dirt, pavement, etc. They should record these locations on their data charts. Ask students to predict which surfaces they think will absorb water quickly and which they think will produce runoff and record their predictions on their data charts.
5. Hand out cylinders, and beakers or measuring cups when you are outside. The can twister should place the cylinder on a land surface and, if possible, twist the cylinder into the ground slightly so that water will not flow out the edges. The water measurer should measure an amount of water from the water container (jug, pitcher, bucket, etc.) and pour it into the cylinder. The timer should time how long it takes for all the water to soak into the ground and the data recorder should record it in their data chart. The water observer should tell the recorder any observations they make about the water.
6. Once students have completed the test, have them summarize and explain their results. How did their predictions compare to their results? Did the amount of water poured on the surface make a difference? Did pouring the water out quickly or slowly make a difference? Did the runoff they observed have anything in it (i.e. dirt, oil)? Based on what they learned about land surfaces during the activity, have them describe the runoff they think would occur around their school after a big rainstorm.

Extensions:

1. Map the land uses around the school grounds. If exact areas of different land uses are available, calculate percentages of land with different surfaces and include on the map. Include the information from the percolation test. How do the students think their school rates as far as land use? Are there a lot of surfaces that produce runoff? What things might they change to reduce runoff? Work with school administrators to implement some of these changes.
2. Inventory school grounds or community for bare patches of land. Observe and describe patches before and after rainfall. Where does the sediment go? What might be done to prevent erosion? Work with school or local authorities to design and plant native vegetation or install BMPs.

Percolation Data Chart

Group members:

At what point will you begin timing?

Land Surface	Prediction	Amount of Water Poured	Time for Water to Soak In	Observations

Help Wanted!

Adapted from Save the Bay's San Francisco Bay Watershed Curriculum

Objectives: Students will explain the term *niche*, describe the niche of an organism that lives in the Tahoe Basin and/or their local area, and use what they know to write a newspaper style want ad.

State Science Standards:

Nevada: L.5.C.5, L.8.C.2

California: Grade 6—5c, d

Materials: Resources containing information on plants and animals that live in the Tahoe Basin and/or your local area, example of newspaper want ads (optional)

Background: *Niche* is a term for the specific role or “job” of an organism within its habitat. Everything an organism does is part of its niche—how it obtains food, how it protects itself, where it lives, and when it is active. A well-adapted organism fills its niche very well. An interesting way to help students understand the niche concept is by writing a niche want ad. By completing the niche want ads, students will not only better understand the concept of ecological niche, but they will also learn more about a particular organism and how it interacts with its environment.

Activity:

1. Students choose an organism that lives in the Tahoe Basin and/or their local area.
2. After researching their organism, they write a 30-50 word ad in the style of want ads in the newspaper. The ads should describe the role of the organism in its habitat, including activities and relationships. The description should contain information on how the organism finds food, how it protects itself, where it lives, its position in the food web, and any other unique features of its activities or its relationships with other organisms. You can show students the example below and/or examples of want ads from local newspapers.

a. Example:

Excellent swimmer needed for the night shift in Lake Tahoe. Main responsibilities will be eating insects, snails, and small fish. Experience with camouflage required, prefer tan and brown colors. Rock housing available.
775-555-FISH
(Piute Sculpin)

3. When ads are complete, students read them to each other and try to name the designated organisms.

Objectives: Students construct a graph of Secchi disk measurements from Lake Tahoe and interpret the data.

State Science Standards:

Nevada: N.5.A.4, N.8.A.1

California: Grade 5—6g, Grade 6—7c

Materials: Graph paper

Background: The transparency instrument now named the “Secchi disk” was first tested by Father Pietro Angelo Secchi, scientific advisor to the Pope, in the Mediterranean Sea on April 20, 1865. Today, that same instrument is used to measure water clarity at Lake Tahoe. The Secchi disk, a 10-inch white disk, is lowered into the lake until it can no longer be seen by an observer. The depth at which it disappears, called the Secchi depth, is a measure of the transparency of the water. Transparency decreases as suspended sediments or algae increase. Natural events, such as heavy precipitation, or human activity, such as development or over-fertilization, can increase sediments and algae. The annual clarity measurement of Lake Tahoe is the average of the approximately 25 Secchi depth readings taken during the year by TERC scientists.

Activity:

1. Ask students if they have ever been out on a boat in a lake, pond, or ocean. How far down could they see into the water? How could they know for sure? Have students brainstorm ways to measure water clarity.
2. Introduce (or review) the Secchi disk. What are some factors that might affect the Secchi reading on any particular day? How might scientists overcome those factors?
3. Show students the annual Secchi depth readings from Lake Tahoe (below). Have students graph the readings. How could they best represent the data?
4. What is the overall trend? Why do the readings fluctuate from year to year?
5. Have students look at the years (). What conclusions would they draw about lake clarity if they only looked at those years? What does this indicate about the importance of a long term data set?
6. Based on the graph, what do they predict the Secchi depth is going to be in five years? In ten? What might happen to change the trend?

Extensions:

1. Review the list of ways to measure water clarity. Have students test their ideas, if possible.
2. Build or purchase a Secchi disk and measure clarity in a lake or pond near you.