

# Earth Day



# Every Day

**Teacher Workshop**  
**Pittsburgh Zoo & PPG Aquarium**

# Earth Day Every Day

## Table of Contents

### General Information:

- ❖ Background Information
- ❖ Resources
- ❖ Internet Resources
- ❖ Vocabulary

### Student Activities:

- ❖ Recycled Greenhouse
- ❖ Super Solar!
- ❖ Water Wisdom
- ❖ Tricky Trash
- ❖ Wiggly Worms
  - ◆ Earthworm Chart
  - ◆ Wiggly Worm Fun
- ❖ How Does Your Garden Grow?
- ❖ Animals in Jeopardy
- ❖ Conservation Kids
  - ◆ Taking Care of the Earth Every Day

### Related Activities:

- ❖ 25 Things You & Your Family Can Do At Home To Help
- ❖ 20 Ways To Green Up Your School
- ❖ Electricity-Free Playtime
  - ◆ April 2009 Calendar
- ❖ Create a Butterfly Habitat
- ❖ Soak It Up
- ❖ Recipes
- ❖ Games
- ❖ Songs
- ❖ Conservation Crafts

## Background Information

The earth is a planet in a constant state of change. Mountains are born as tectonic plates collide. Glaciers freeze and thaw as they carve the land into new forms. Volcanoes erupt, spewing ash and gases in clouds that can encircle the earth. Wind blows across its surface. Waves break ceaselessly on the shores. Water is constantly evaporating, condensing, and falling as precipitation. Little wonder that its climate, too, is in a constant state of change.

### **What are greenhouse gases and how do they affect the global climate?**

Greenhouse gases are present in the earth's atmosphere where they play a crucial role in maintaining the earth's temperature at levels that allow life to flourish. Solar radiation passes through the atmosphere and is absorbed by the earth, warming it. This heat is released in the form of infrared radiation. The greenhouse gases trap some of this radiant heat, and the rest is allowed to escape through the atmosphere. Earth's most abundant greenhouse gases, in order, are water vapor, carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons (CFC's).

When too many greenhouse gases are present, too much of the earth's heat is trapped. This is called the "greenhouse effect." To maintain the balance, the earth has two natural "sinks" for carbon dioxide: the ocean, and plant life. They absorb the excess carbon dioxide and release it back into the atmosphere as oxygen. When more greenhouse gases are present than can be absorbed, the result is that the planet overheats, also known as global warming.

### **How has the climate changed?**

Over the course of the 20<sup>th</sup> century, the average temperature of the earth's surface has increased by an average of 1°F. This can be observed in a rise in sea level and warming of the oceans, thawing of the permafrost (which also releases carbon dioxide), decreases in snow cover and sea ice at the poles, and an extended growing season in the mid and upper latitudes.

One degree may not sound like much, but even a small change in climate can have devastating effects. Take, for instance, the "Little Ice Age" lasting several centuries and ending around 1850. Here, global temperatures dropped an average of about 3°F, with even greater swings during the coldest periods. Crops failed, livestock froze, and millions died.

It is the consensus of the Intergovernmental Panel on Climate Change (IPCC) that human activity is contributing to the current rise in global temperatures. Increases in carbon dioxide and other greenhouse gas emissions from burning fossil fuels are escalating this increase. It is thought that, if we do not change our behaviors soon, we may see global temperature increases of 2.5°-10°F by the beginning of the next century.

### **How does this affect wildlife?**

As seas warm and temperatures rise, many animals and plants have shifted their ranges poleward. Some, like polar bears, have been forced by shrinking sea ice to change their hunting patterns and rearing of offspring. Many insects emerge earlier, and many birds lay eggs earlier, subjecting them to the increased dangers of sudden freezes in early spring. The same may be observed in many flowering plants and trees. For a few species, the change is a boon. For many, it is a hard lesson, not easily learned. Warmer temperatures also encourage the growth and spread of pathogens such as the chytridiomycosis fungus, which is killing many species of amphibians.

Wildlife faces other threats that push many species to the brink of extinction, with about 10 % of known species of animals and plants listed as endangered. Many others are disappearing forever at

an alarming rate estimated to be 100 – 1000 times higher than would naturally occur. These threats may be summed up in an acronym known as the “HIPPO Dilemma:”

**Habitat loss** – As wild spaces shrink or are made uninhabitable by pollution, animals have fewer resources available to them to meet their survival needs. The fewer green spaces are available, the fewer wild animal populations are able to be supported. Many species requiring large home ranges (like the Amur tiger), specialized food sources or habitats (like the regal fritillary butterfly), or extremely clean water (like hellbender salamanders) are disappearing.

**Introduction of invasive species** – Plants and animals are often brought into new habitats. Many times this is done intentionally, to add their beauty to a garden, or for the novelty or status of an unusual (and often expensive) pet. Though intended to be contained, this can have devastating effects on the environment, should they get out. Purple loosestrife is one example. Brought from Europe in the 1800’s for flower gardens, this aggressively invasive plant has spread across the country. It quickly takes over habitat (especially wetlands), where, without the normal disease and predation of its native environment, it quickly out-competes local plants. This degrades the habitat, leaving much of it unsuitable for those species that relied on the missing plants for food and shelter.

**Pollution** – Wherever humans go, inevitably we leave evidence behind. Unfortunately, this often takes the form of pollution. There is pollution in the air, the land, and the water. Chemicals, trash, and biological waste all pose serious threats to the environment, and most people are familiar with them. There are two sources of pollution often overlooked: noise and light. Noise pollution can cause stress, disrupt normal predator/prey interactions, and interfere with vocal communication, especially for mating and navigation. One example is the mass beaching among whales following sonar testing. Similarly, light pollution disrupts the natural processes affected by the normal night/day cycle. Increased light levels are linked to changes in behaviors including mating, migration, and nocturnal navigation, as well as to algal blooms.

**Population** – As the human population increases, so do the demands put on the environment. Urban sprawl encroaches on wild spaces, edging some animals out (like Aruba Island rattlesnakes), while others (like Fairy Blue penguins) are preyed upon by the pets we bring with us.

**Overconsumption** – All living things have needs. These include food, shelter, water, and an appropriate space. To meet these needs, they must consume resources. Humans are no different. The problem lies not in meeting our needs, but in the taking of more of the earth’s resources than we need. Overfishing and overhunting have decimated many species (like Atlantic cod), as has over-collection for the pet trade. We also use more than we need of other resources, too. We strip mine for metals, and burn fossil fuels to produce energy we waste. Deforestation devastates tropical forests, causing many animals to dwindle and disappear (like orangutans), some even before they have been identified.

### **What can be done to change this?**

The bad news about the problems facing our planet is that they are largely caused by humans. The good news is that if humans cause the problems, we can also solve them. By making small changes in our lifestyle, we can make a significant positive impact. A good way to start is to determine your carbon footprint.

### **What is a carbon footprint?**

A carbon footprint is one way to measure the impact of your lifestyle on the environment. It takes into consideration many factors, including where you live, how you travel, and your energy consumption. There are many carbon footprint calculators available online, and your results may vary, depending on the variables that are considered. Detailed calculators can be found here:

<http://www.footprintnetwork.org/en/index.php/GFN/page/calculators/> , and [http://www.myfootprint.org/en/quiz\\_results/](http://www.myfootprint.org/en/quiz_results/) , and a calculator for the office at <http://www.thegreenoffice.com/carbon/index.php>.

### **How can I make a difference?**

Every time you make a choice that is good for the planet, you make a difference. Having a positive impact on the planet is something everyone can do.

**Be a Wise Consumer** – A lot of waste can be prevented before you even leave the grocery store. Choose organic, locally-grown produce whenever you can. These are grown without the use of chemical fertilizers or pesticides, and have not been transported long distances. Whenever possible, buy products that are recycled or have recycled content. When you buy new appliances or vehicles, select ones that have the best energy and/or fuel economy. In Pennsylvania, we are able to select our energy provider. Choose energy from renewable sources like solar, water, and wind.

**Reduce** – Avoid products that have a lot of packaging. Selecting fresh foods, rather than processed foods, is less expensive, higher in nutrition, and does not have garbage-producing packaging. If it does have packaging (like beverages), select products with recyclable packaging, like plastics and glass. Only make purchases of new items when it is really necessary. Repair items when possible. If you are redecorating, sell or donate furniture, curtains, etc. rather than have them end up in the landfill.

**Reuse** – Find a new use for things you might otherwise throw away. Paper shopping bags can find new life as book covers, kid's costumes, or lunch bags. Plastic bags can line garbage cans, hold recycling (they can be recycled, too!), or transport wet bathing suits, towels or muddy shoes. Many other "clean" garbage items (cans, bottles, newspaper, CD's, etc) can find new life as art projects, with a little glue and imagination!

**Recycle** – Much of our garbage can be recycled. Paper, plastics, glass, steel, tin, and aluminum can be recycled in most communities. Check with your municipality to find out which products are accepted, and what you need to do to separate it from other garbage. There are several companies that will place paper recycling bins at your school at no cost to you, and some will even pay you for the paper collected.

**Compost** – Organic materials, like vegetable peelings, fruit rinds, and grass clippings, can all be broken down into food for your garden, rather than being sent to the dump. Compost bins make use of natural decomposers, like bacteria, fungi, and insects to do this. Only include plant material in your compost heap or bin; animal products may draw unwanted pests. Composters may be purchased from most home improvement or lawn and garden stores, or you can build your own. Plans for a simple composter can be found at <http://www.compost.org/>. You can also do worm composting (also called vermicomposting) in your classroom. You can find out what you need to get started at [http://www.savvygardener.com/Features/worm\\_composting.html](http://www.savvygardener.com/Features/worm_composting.html).

**Create Green Spaces** – Planting a garden is a fun and effective way of creating green spaces. Even a small plot is enough to make an impact! Whenever possible, use native plants. These are most likely to thrive, and will provide food and shelter for a variety of native species of wildlife. Vegetable gardens provide pesticide-free, fresh and healthy food for you and your students, without using any fossil fuels for transportation! Fertilize it with compost, and mulch it to retain water and deter weeds. Water your garden in the morning or evening to minimize evaporation. Use leftover water from projects, graywater, or rainwater catchments (like a bucket outside your classroom!).

**Conserve Water** – Check inside and outside for leaky faucets and pipes. Promptly repairing these will reduce water waste. In the bathroom, turn water off while brushing your teeth. Take shorter (5 – 10

minute) showers. Install low-flow showerheads and toilets. Only run dishwashers and washing machines when you have a full load.

Conserve Energy – Turning off lights and electronic devices when not in use is an easy, common sense way to make a difference. Unplugging small appliances when not in use, and shutting down computers (instead of using sleep mode) will prevent or greatly reduce the electrical draw they have, even when turned off. Replacing traditional light bulbs with compact fluorescent (CFL) bulbs will reduce electricity consumption by about one fourth. Keeping temperatures a few degrees cooler in the winter will cut down on the amount of energy used by your furnace. Lowering blinds during the hottest part of the day and opening windows can help keep things cooler in warm weather. Walk, bicycle, carpool, or take public transportation whenever possible to cut down on the amount of fuel you use.

Take Action! – Get involved with and support local and national conservation organizations, like the Pittsburgh Zoo and PPG Aquarium. Start a “Green Team” at your school of interested students and faculty. Meet regularly to plan events like recycling drives, earth day celebrations, and eco-awareness functions. Adopt an acre of rainforest. Plant a tree. Petition your district to establish “No Idling Zones” or to go paperless (if they do not already have these programs). If your community does not have a recycling program, attend council meetings and ask for change. Most importantly, continue to learn all you can about the issues involved. The more you know, the better decisions you can make.

“In the end, we will conserve only what we love. We will love only what we understand. We will understand only what we are taught.” – Baba Dioum



# Resources

## Suggested Reading for Students

A River Ran Wild, by Lynne Cherry  
A Tree is Nice, by Janice May Udry  
Bob's Recycling Day, by Annie Auerbach, Vince Giarrano  
The Garbage Monster, by Joni Sensel  
How Groundhog's Garden Grew, by Lynne Cherry  
The Great Kapok Tree, by Lynne Cherry  
Just a Dream, by Chris Van Allsburg  
The Lorax, by Dr. Seuss  
Only Silly People Waste, by Norah Smaridge  
Song of the Smoggy Stars, by Odmond Molarsky  
The Wartville Wizard, by Don Madden  
What Happens at a Recycling Center?, by Kathleen Pohl  
Where the Forest Meets the Sea, by Jeannie Baker  
The Wump World, by Bill Peet



## Teacher Resources

50 Simple Things Kids Can Do to Save the Earth, by Andrews & McMeel  
About Garbage & Stuff, by Ann Zane Shanks  
Ask Larry Landfill, video by Los Angeles Resource Program  
Atlas of Environmental Issues, by Middleton  
Ecology, Usborne Science & Experiments, by Richard Spurgeon  
Environmental Science: 49 Science Fair Projects, by Bonnet & Keen  
Every Day is Earth Day, by Kathy Ross  
Fun with Recycling: 50 Great Things for Kids to Make from Junk, by Marion Elliot  
Garbage, by Hadinghsm, Evan & Janet  
Going Green: A Kid's Handbook to Saving the Planet, by John Elkington  
Good Garbage, video co-produced by Cintia Cabib and Leila Cabib  
Greening Your School: An Environmental Action Plan for Elementary Schools, IS FIVE Foundation  
Greening Your School Ground: A Working Manual by Linda George  
The Healthy School Handbook by Norma L. Miller

## Teacher Resources (continued)

Healthy School Lunch Action Guide by Susan Campbell and Todd Winant

How the Environment Works, by Preston Gralla

How We Know What We Know About Our Changing Climate: Scientists and Kids Explore Global Warming by Lynne Cherry and Gary Braasch, foreword by David Sobel

Kid's Nature Book, by Susan Milford

Ranger Rick's Nature Scope: Endangered Species: Wild & Rare, edited by Judy Braus

Ranger Rick's Nature Scope: Problems and Solutions, edited by Judy Braus

Recycle: A Handbook for Kids, by Gail Gibbons

Recyclopedia, by Robin Simons

Take Action - An Environmental Book for Kids, by Ann Love and Jane Drake

Trash, by Charlotte Wilcox

Where Does the Garbage Go?, by Paul Showers

Waste Not, Want Not by Kath Murdoch

The Wonderful World of Wigglers by Julia Hand

Worms Eat Our Garbage: Classroom Activities for a Better Environment by Mary Appelhof, Mary F. Fenton and Barbara Harris



## Internet Resources

<http://www.climatechangeeducation.org/> - amazing site! Tons of information including video, fact sheets, and much, much more. Also a special section for kids.

<http://www.uticaod.com/news/newhartford/x1855993691> - more green classroom tips

<http://www.solarnow.org/pizzabx.htm> - plans for pizza box solar oven

[http://www1.eere.energy.gov/kids/roofus/pizza\\_box.html](http://www1.eere.energy.gov/kids/roofus/pizza_box.html) - another plan for pizza box oven

<http://www.fsec.ucf.edu/en/education/k-12/curricula/index.htm> - plans for a larger box solar oven, including lesson plans and recipes. Lots of activities for solar energy. Most activities are for older students, but many may be adapted.

<http://www.eia.doe.gov/kids/> - Energy Information Administration – tons of information, games and classroom activities about energy

[http://www.greenroofs.org/index.php?option=com\\_content&task=view&id=26&Itemid=40](http://www.greenroofs.org/index.php?option=com_content&task=view&id=26&Itemid=40) – info about green roofs

<http://gbapgh.org/> - Green Building Alliance of Pittsburgh

<http://www.depweb.state.pa.us/dep/site/default.asp> - PA Dept. of Environmental Protection – gives info on environmental issues in PA

<http://www.compost.org/> - Composting Council of Canada – everything you ever wanted to know about composting, including plans to build your own compost bin, large or small.

[www.aza.org](http://www.aza.org) - Association of Zoos and Aquariums

[www.earthday.net](http://www.earthday.net) - Earth Day Network – the official Earth Day site! Tons of information about current issues, resources and classroom ideas.

[www.earthsite.org](http://www.earthsite.org) - Official International Earth Day site

[www.kidsforsavingearth.org](http://www.kidsforsavingearth.org) – Great site for teachers, parents, and kids

[www.fish.state.pa.us](http://www.fish.state.pa.us) – PA Fish and Boat Commission

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us) – PA Department of Conservation of Natural Resources

[www.pgc.state.pa.us](http://www.pgc.state.pa.us) – PA Game Commission

[www.pa.nrcs.usda.gov](http://www.pa.nrcs.usda.gov) – PA Natural Resources Conservation Service

[www.pa-conservation.org](http://www.pa-conservation.org) – PA Super Trails Forum

[www.conserveland.org](http://www.conserveland.org) – PA Land Trust Association

[www.rachelcarsonhomestead.org](http://www.rachelcarsonhomestead.org) – Rachel Carson Homestead

[www.paconserve.org](http://www.paconserve.org) – Western Pennsylvania Conservancy

[www.nwf.org](http://www.nwf.org) - National Wildlife Federation

# Vocabulary

**atmosphere** – the layer of gases and particulates that surround the earth.

**composting** – use of decomposers to break down plant material from kitchen or yard waste, producing a natural fertilizer for the soil.

**conservation** – the wise use of resources to ensure their continued availability for the future.

**decomposers** – organisms that break down organic materials into nutrients to renew the soil.

**ecology** – the study of the natural world and the interactions of the organisms in it.

**endangered** – a species whose population has been critically reduced and is in danger of becoming extinct.

**extinct** – the total loss of a species.

**fossil fuel** – energy source formed by deposits of once-living things. These include oil, coal, methane, and natural gas.

**global warming** – a worldwide increase in temperature, believed to be due to an increase in greenhouse gases.

**green** – environmentally beneficial.

**greenhouse gas** – gases in the atmosphere that trap the earth's radiant heat.

**habitat** – the place an organism finds food, shelter, water, and appropriate space.

**invasive species** – an animal or plant from another ecosystem which, when introduced, has a negative impact on the environment.

**organic material** – substances from plant and animal sources, such as wood, leaves, or bones.

**organic products** – items that have been grown or produced without chemical fertilizer, pesticides, or processing.

**overconsumption** – using more of a given resource than is necessary to sustain life. This often results in an imbalance in the ecosystem.

**particulates** – tiny pieces of small solids in air or water. Examples are smoke or silt.

**pollution** – contamination of water, air or soil by substances that pose a threat to the health of the environment

**radiant heat** – heat released back into the atmosphere by the earth.

**recycle** – to reuse paper, glass, plastic or metal by breaking or melting it down to make a new item.

**reduce** – cutting down the amount of garbage generated by choosing to buy products with little to no packaging. This is sometimes known as pre-cycling.

**renewable resource** – material consumed that is quickly or readily replaced.

**reuse** – to find a new use for an item that would otherwise be thrown away.

**solar energy** – power produced by the sun

**sustainable** – using or collecting in a way that does not overtax the environment, allowing the resource to be renewed. This kind of consumption is not damaging to the ecosystem.

**threatened** – a species whose population has declined so as to cause concern for its future viability; should the decline continue, it would become endangered.

# Recycled Greenhouse



**Skills:** observation, fine motor, comparison

**Objectives:**

- TSW define greenhouse gases.
- TSW make a greenhouse with the given materials.
- TSW observe the temperature inside their greenhouse.
- TSW compare their greenhouse to the atmosphere.

**Materials:** 1- or 2-liter clear plastic bottles or 16 ounce water bottles (with lids), clear packing tape, small gravel, potting soil, flower or vegetable seeds, small thermometers

**Procedures:**

*Before You Start:* Encourage the students to bring in bottles from home. If you are using water bottles, be sure that they have smooth sides. It will make observation easier. Prepare the bottles: rinse and dry the bottles to remove any residue. Remove the label. Cut around the bottle, about 4 inches from the top. Leave a hinge of 2 – 3 inches uncut.

*Anticipatory Set:*

Ask if any of the students have ever visited a greenhouse. Allow them to share. Greenhouses are special buildings made of glass that use the sun’s energy to grow plants. The glass lets the sun’s heat inside, and keeps it there to keep the plants warm. Earth has a layer of air around it called the atmosphere. There are some gases, like water vapor and carbon dioxide, which do the same thing for the earth. They are called greenhouse gases. Let’s find out how greenhouses work!

*Development of Lesson:*

1. Divide the class into cooperative groups. Older students may do this independently.
2. Give each group a prepared bottle. Put about an inch of gravel in the bottom. This will provide drainage for the plants.
3. Add a few inches of potting soil to the bottle. Plant a seed against the side of the bottle. This will make it easier later on to observe it as it grows.
4. Add 3 – 5 capfuls of water, depending on the size of the bottle. Place a small thermometer in the bottle, bulb above the soil.
5. Put the lid on the bottle, and seal it with the clear packing tape.
6. Place the bottles in a sunny spot, like a windowsill. Place a thermometer in the same area.
7. Observe and record the temperature in the classroom and in the greenhouse.
8. Allow the greenhouses to sit in the sun for an hour or so. Observe and record the temperatures again. After the observations have been made, you may carefully remove the thermometers, if you wish.

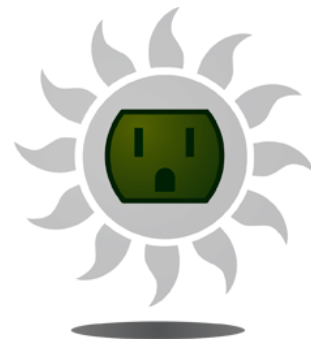
*Summary:*

What happened? The temperature should be higher inside the greenhouses than in the classroom. Why do you think that happened? This happens because the radiant energy from the sun is trapped by the greenhouse, raising the temperature. What else did you observe? As the greenhouses sat in the sun, the water inside began to evaporate and condense on the sides. The water vapor inside contributes to the trapping of solar energy, also helping to raise the temperature. The greenhouse gases in the atmosphere do the same thing. What do you think would happen if there were a lot more of these gases in the atmosphere? The temperature of the earth would rise.

**Extensions:**

- Use the seeds you planted to complete “How Does Your Garden Grow?”
- Visit a greenhouse. Find out what kind of plants are grown there and how they take care of them. How is this greenhouse different from your greenhouses? How is it the same?

# Super Solar!



**Skills:** observation, fine motor

**Objectives:**

- TSW define solar power.
- TSW build a solar oven with the given materials.
- TSW use the solar oven to make a healthy snack.

**Materials:** solar powered calculator, pizza box, aluminum foil, black tempera paint, duct tape, sheet of heavy plastic or lamination about 2' square, newspaper, pencil or dowel rod, oven thermometer, solar oven recipe from "Recipes"

**Procedures:**

*Before You Start:* Pre-cut your solar oven: Measure 1" from the edge of the box lid and draw a square. Cut around three sides of the square, leaving a hinge on the side the lid attaches to the box. Choose a recipe and gather the ingredients. Note: This oven gets warm enough to heat food, but not to bake. Select a recipe with a \*.

*Anticipatory Set:*

Complete "Recycled Greenhouse." We saw how the sun's energy was able to create heat in our greenhouses. We can use the sun's energy to do other things, too. Show the solar calculator to the students. Point out the solar cells used to change solar energy into electricity to run the calculator. We're going to make our own solar collector and use it to cook!

*Development of Lesson:*

1. Open the pizza box. Paint the inside black. Let the paint dry.
2. Fold the center flap on the lid up along the hinge line. Cover the inside surface of the flap with aluminum foil. Tape the foil on the outside of the lid to secure it. The foil will help to reflect the sun's rays into the oven.
3. Tape the plastic across the underside of the box lid so that it covers the opening. Be sure that it is stretched tightly and that it is sealed all the way around. This will help trap the heat inside while also allowing it to enter.
4. Roll the newspaper tightly to fit around the inside of the box. Tape it securely to the sides of the oven, but not the top. This will insulate the oven to help stop heat loss.
5. Set the solar oven in direct sunlight. Place the oven thermometer and recipe ingredients inside. Open the top flap and angle it to reflect as much sunlight as possible into the oven. Prop it in place with the pencil or dowel rod.
6. Leave the solar oven in the sun until the snack is ready. You may need to adjust the flap to keep the maximum amount of sunlight directed into the oven.

*Summary:*

Enjoy your snack while you discuss how the oven worked. Check the temperature on the oven thermometer. How hot did the oven get? Why did it get hot? What would happen if we put the oven in a shady place? Why? Does it matter what time of day you use the oven? Why or why not? How else could we use the sun's energy?

**Extensions:**

- Measure the temperature in your oven every 30 minutes during the morning. Repeat the measurements in the afternoon. Compare your results.
- Use the plans from <http://www.fsec.ucf.edu/en/education/k-12/curricula/index.htm> to build a larger, better insulated solar oven. Compare the temperature to that of the pizza box oven. Why do you think it was warmer? Use the oven to cook a snack!

# Water Wisdom



**Skills:** fine motor, critical thinking

**Objectives:**

TSW identify sources of water pollution.

TSW dramatize the effects of pollution on our water supply.

**Materials:** 2-liter plastic bottle or other clear container, water, small cups\*, potting soil\*, vegetable oil\*, food coloring (3 colors)\*, 3 spice containers (ex. Pepper, garlic powder, oregano)\*, dishwashing soap\*, small paper scraps\*, charcoal for fish tank filter\*

**Background:**

Even though about 74% of our planet is covered in water, most of it is in the oceans or frozen in glaciers. Less than 1% of that water is available for us to use. It is important that we make the best use of it we can.

**Procedures:**

*Before You Start:* Cut the top off the 2-liter bottle. Put a small amount of potting soil, charcoal, and vegetable oil in small cups. Put some water in a small cup and add a drop or two of dishwashing soap. Swish to make suds. Be sure that you have one story element for each student. Story elements are marked with a \*.

*Anticipatory Set:*

Ask the students to name ways they use water. Is water important? Yes. We need it to live. How much water is there? Our planet has a lot of water, but most of it is in the ocean or frozen in glaciers. We can only use a small part the water on the earth. It is important to take care of it. We are going to tell a story about using water wisely.

*Development of Lesson:*

1. Give each student a story element. Fill the 2-liter bottle 2/3 full with water.
2. Show the water to the students. This is the water supply for our town; clean, and clear. We use it to drink, cook, take a shower, and swim. One day the students of (your class) were going on a picnic in the park.
3. The students got up early and took a shower, brushed their teeth, and got ready for school. When they did, soap went down the drain and into our water supply. (Add the soapy water)
4. The cooks in the cafeteria spent the morning preparing food for the picnic. While they were cooking, some spices washed down the drain and into our water supply. (Add the spices)
5. Before the students left, Mr. Sparks, the mechanic, changed the oil on the bus. Some of the oil spilled and went down the drain and into our water supply. (Add the oil)
6. The students all got on the bus and started driving along the river to the park. As they rode, they passed Old Farmer McDonald's farm. As they did, they saw some of the soil from his field wash into the river, and into our water supply. (Add the potting soil)
7. The bus had to stop at the railroad tracks. As the train rumbled by, some of its load of coal shifted and fell into the river, and into our water supply. (Add the charcoal)
8. Finally, the students arrived at the park. They had a wonderful time playing games and enjoying the delicious lunch the cafeteria had prepared for them. When they were finished eating, they carefully cleaned up after themselves and put the garbage in the can. When they did, a gust of wind caught some of the napkins and blew them into the lake, and into our water supply. (Add the scraps of paper)
9. All the students received t-shirts to remember the picnic. As they headed back to school, they passed the factory where they were made. Some of the dye from the shirts got washed into the river and into our water supply. (Add the food coloring – just one drop each!)

10. Show the water to the students. This is the water supply for our town; clean(?), and clear(?).  
We use it to drink(?), cook(?), take a shower(?), and swim(?).

*Summary:*

What happened to our water supply? Did anyone do any one big thing to make it dirty? When you have a lot of small problems, they can add up to a really big one! When you do one small thing to help, they add up, too! What are some wise water habits we can use?

**Extensions:**

- Water can also be used to transport goods, and even produce energy! Visit a local dam or dock to find out how.
- Adopt a local stream or pond. Keep it free of trash and other debris. Be sure to dispose of trash appropriately!
- Complete "Soak It Up" to find out how water pollution affects wildlife.



# Tricky Trash

**Skills:** gross motor, sorting

**Objectives:**

TSW define reduce, reuse, and recycle.

TSW identify items to be recycled.

TSW sort recyclables.

TSW explain the meaning of the recycling symbol



**Materials:** garbage can, raisin packaging pictures, plastic grocery bag, “Recycle Relay” materials from “Games”, products made from recycled materials (ex. Paper, glass bottle or jar, some paper clips), recycling symbol, several different types of plastic recyclables with the symbol on them

**Procedures:**

*Before You Start:* Enlarge and print out the recycling symbol and raisin pictures. Check with your municipality to find out what recyclables are accepted in your community.

*Anticipatory Set:*

Show the students the garbage can. Ask the students what it is for. Where does the garbage go? When we put garbage at the curb, it is taken to a dump or landfill. It does not disappear. There is only so much space in the landfills. What would happen if they were full? One way we can keep that from happening is to put as little in the garbage can as possible. We can do this by following the three R's: reduce, reuse, and recycle.

*Development of Lesson:*

1. What does it mean to reduce? It means to make something smaller. We can reduce the amount of garbage we produce. One way is at the store. Before we buy something, look to see what else you are getting. For example, if we want raisins, we can buy one big box of raisins or single serving size. After we eat the raisins, the thing they came in becomes garbage. Which has less garbage: the big box or the single servings? The big box has one box. The single serving has lots of little boxes plus a plastic bag to hold them all. Which choice helps us reduce the amount of garbage we make?
2. What does it mean to reuse? We reuse things when we find a new use for something we would otherwise throw away. Show the plastic grocery bag. What else could we use this for? (carry shoes, line trash cans, etc.)
3. What is recycling? Recycling is when we take old bottles and cans and paper and use them to make new things. Ask the students if they recycle at home. What kinds of things do you recycle? Paper, plastic, metal and glass can all be recycled.
4. One way we can tell what can be recycled is to look for this. Show the symbol. This lets us know that a thing can be recycled.
5. Put the students into cooperative groups. Give each group an assortment of plastics. Ask them to find the recycling symbol. Point out the number in the center of the symbol. Explain to them that there are different kinds of plastics, used to make different kinds of things.
6. Show the product made from recycled materials and share what was used to make it. Before our recyclables can be used to make new things, they must be sorted.
7. Play “Recycle Relay” from “Games.”

*Summary:*

Talk about what happened. Did all the recycling get separated correctly? Why do you think that is important? Can you think of other things we can reuse or recycle?

**Extensions:**

- Visit a recycling center. Find out what they do with the things in your recycling bins.
- Re-use items to make recycled projects from “Crafts.”
- Find out about other things you can recycle. Have a recycling drive at school!



# Wiggly Worms



**Skills:** observation, fine motor

**Objectives:**

- TSW define composting.
- TSW observe worm body structure.
- TSW observe worm behavior.
- TSW explain how worms renew the soil.

**Materials:** red worms, hand lenses, plastic plates, flashlight, paper towels, dechlorinated water, Earthworm chart, Wiggly Worm Fun Pamphlet (older students)

**Procedures:**

*Before You Start:* Make copies of the packet for the students. Dechlorinate water by allowing it to stand, uncovered, overnight. Copy the Earthworm chart. You may wish to enlarge it.

*Anticipatory Set:*

Show the students a worm. Ask them to identify it. Have they ever seen one in their garden? Why were they there? They were eating dead plants and turning them into food for the new plants, or composting them. This is how worms help to renew the soil. Let's find out more about worms!

*Development of Lesson:*

1. Divide students into cooperative groups.
2. Place one earthworm on each wet paper towel (use DECHLORINATED WATER ONLY to wet paper towel) on a plastic plate on each table for the participants to observe. Give each group a worm, hand lens, flashlight, and paper towels. Give older students a copy of the
3. Ask them which end is its head and use the Earthworm Chart to identify the parts of the earthworm. The worm's mouth is at the front of the worm, and the compost comes out the back of the worm.
4. Look closely at the worm's body. Can you find what look like little rings? These are the worm's segments. As they grow, they get more segments.
5. Find the wide, smooth band near the worm's head. This is the clitellum. This is the part that produces eggs that baby worms will hatch from.
6. Earthworms breathe through tiny openings in their skin. For them to do this, they must stay moist. Gently touch the worm's body. How does it feel? How do you think this helps them? (the slime coat helps the worm stay moist)
7. How does the worm move? Worms use muscle power to wriggle through the soil.
8. How can they communicate? Look closely at its body. Look for tiny hair-like parts called setae. Worms use these like tiny hairs to feel. They are very sensitive to vibration, so can tell if something is walking overhead or if a fellow earthworm is wriggling next to them.
9. Can worms see? Have the students shine a flashlight on the tail end of the earthworm. Observe what happens. Repeat for the front end. Do you think the earthworm can see light? Why or why not?

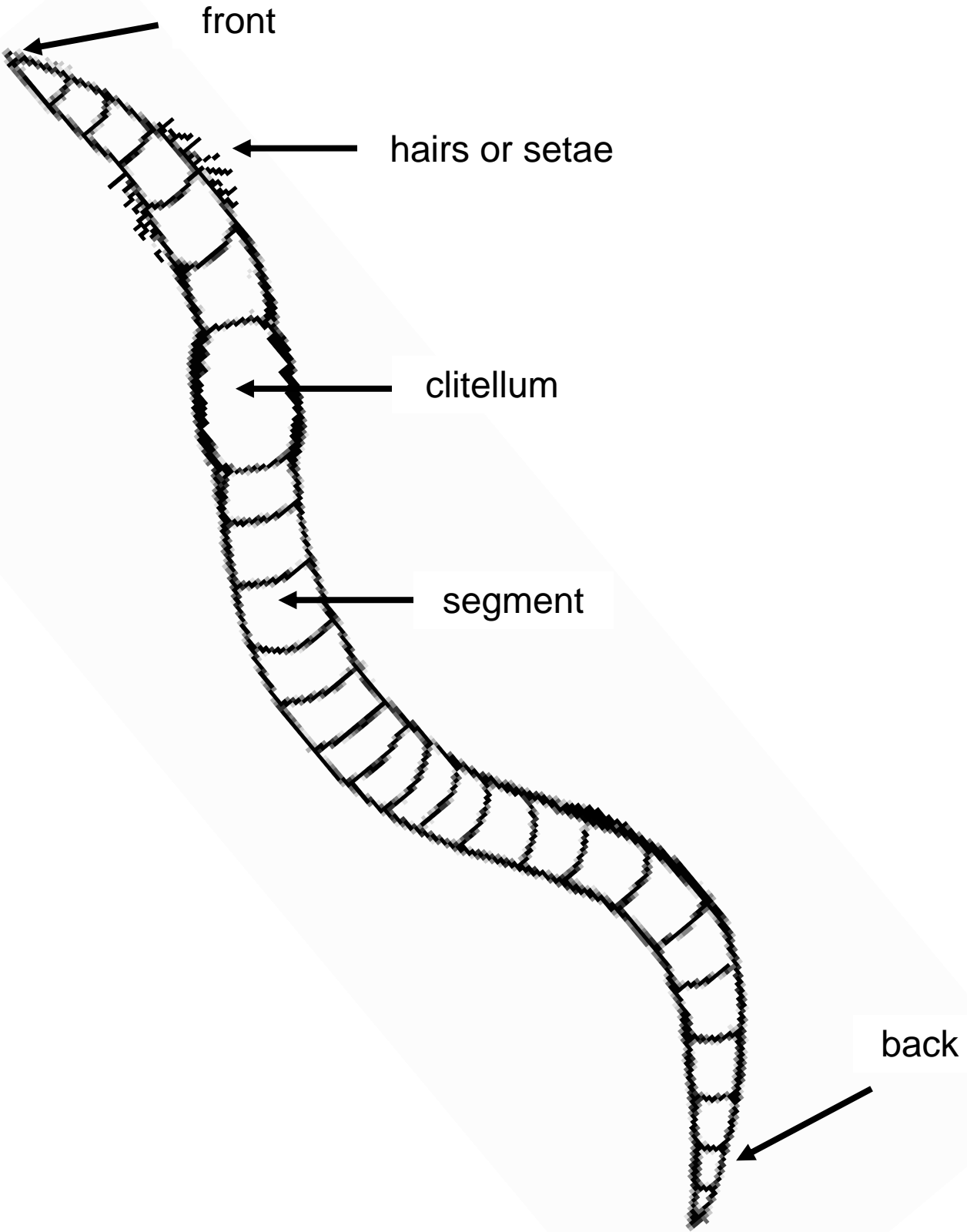
*Summary:*

Discuss what the students learned. What was the most interesting thing you found out about worms? What surprised you the most?

**Extensions:**

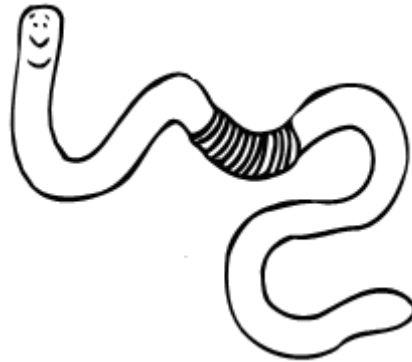
- Start your own worm farm! See "Background Information" under Composting to find out what you need or use the guidelines in the pamphlet to get started. Feed your worms compostable leftovers from the student s' lunches and reduce the amount of garbage you produce!

# EARTHWORM



## Fun Worm Facts

- ◆ They dig holes in the dirt that let air and water get to the bottoms of plants. This helps the plants to grow.
- ◆ There are 2700 different types of earthworms.
- ◆ Earthworms have five pairs of hearts.
- ◆ Earthworms do not have teeth. They use mouth muscles to eat their food.
- ◆ The most common earthworms you see today were originally brought to the US in the 1600s by European Settlers
- ◆ Just one acre of land can hold over one million earthworms.
- ◆ Earthworms can be all different sizes. Someone once found a worm in South America that was over 20 feet long.
- ◆ Earthworms will eat all your leftover fruits and vegetables. In one day a worm can eat half its body weight!



## Wiggly Worm Fun

## Build a Worm Farm

### Materials

- Large Plastic Bin
- Newspaper (do not use the colored ads)
- 2-3 handfuls soil
- Red worms

### Instructions

1. Dampen the newspaper. Make sure that it is lightly dampened, not soaked.
2. Place the newspaper and soil into the bin. You don't want to pack it down.
3. Add in the red worms.
4. Feed your worms.
5. Punch air holes in the lid and cover your box.
6. Enjoy your worm farm.

### Feeding

Red worms will eat fruit and vegetable scraps, breads, oatmeal, and even pasta.

- Avoid meats, dairy products, acidic foods (citrus) or salty foods (potato chips). These can be harmful to your worms and their environment.
- Be careful not to over feed your worms. Add a little food daily until you see how much your worms are eating.

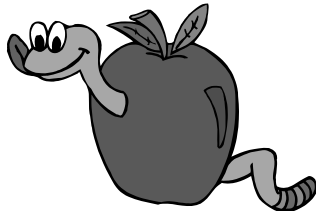
### Maintaining Your Worm Farm.

- Keep your worms comfortable in a dark and safe place. Worms prefer room temperature.
- Make sure that your bin stays moist, but not soaking wet.
- Add more bedding as needed.
- Occasionally, you will need to turn the bedding with a trowel to circulate air.

## What Worms Want

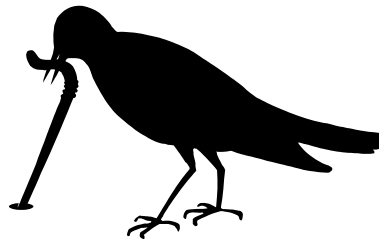
N Z S P V E H V Z U P S I A I  
 P C L A P L E A V E S A L P X  
 F N E S K I A I P V P E H P C  
 J S E T O V Z P T K E U N L U  
 B T P A C Z W Z G P Z M H E P  
 P Z O V E G E T A B L E S C B  
 Z R T M V Z Q N N C G Y J O W  
 J H A T K R A L B G R U F R R  
 I S T I A N A J S R N U F E L  
 O N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

APPLECORE  
 BANANAPEEL  
 BREAD  
 CEREAL  
 EGGHELLS  
 LEAVES  
 NEWSPAPER  
 OATMEAL  
 PASTA  
 PIZZACRUST  
 POTATOPEELS  
 VEGETABLES



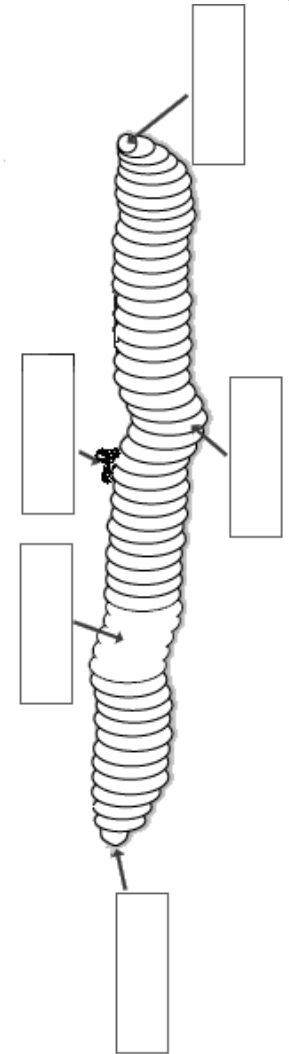
## Who Wants Worms?

There are many animals that love to eat worms. Take the next 2 minutes and list as many animals as you can think of that prey upon worms.



## What Worms Are Made Of

Do you know the parts of an earthworm? Label the following diagram.



1. Front
2. Back
3. Hairs or Setae
4. Segment
5. Clitellum

# How Does Your Garden Grow?

*This lesson takes place over the course of three weeks.*

**Skills:** observation, fine motor, measuring

**Objectives:**

- TSW compare different kinds of seeds.
- TSW predict which seed will grow the most over the course of the study.
- TSW make a graph of the data they collect.
- TSW interpret the graph to compare seed growth.



**Materials:** How Groundhog's Garden Grew by Lynn Cherry, plastic plates, variety of seeds (wild bird seed mix, wildflower mix, vegetable seeds, etc) that have a good range of shapes, sizes and colors, cardboard egg cartons, potting soil, scissors, tape or glue, water, Seed Hunt strips, ruler, chart paper

**Procedures:**

*Before You Start:* Cut the tops off the egg cartons and compost them. Cut the egg cups into groups of six. Copy the Seed Hunt strips.

*Anticipatory Set:*

Read How Groundhog's Garden Grew by Lynn Cherry. What happened in the story? What did groundhog learn to do? Have you ever grown a garden? What did you plant? Seeds. Let's find out how seeds grow.

*Development of Lesson:*

1. Divide the students into cooperative groups. Give each group a plate of seeds. Look at the seeds. Are they all the same? No. Different plants have different seeds.
2. Give each group a Seed Hunt strip. You may wish to have older students do this independently. Have them find a pair of seeds that fit the description in the block (ex. two sunflower seeds, two lima beans, two nasturtium seeds, etc.). Glue or tape the seed in the appropriate block.
3. Predict which seed you think will grow the most after three weeks. Put a star in that seed's block.
4. Give each group (or student) a set of cardboard egg cups. Fill them 2/3 full of potting soil.
5. Cut the Seed Hunt strip into individual blocks. Tape one to the side of each egg cup. Plant the matching seed in each egg cup.
6. Water the seeds and put them in a sunny place. Allow them to grow for three weeks. Check them daily and water them as needed.
7. After the three weeks are up, measure each plant. Graph the results.

*Summary:*

Which seeds grew the most? Did the shape make a difference? Color? Size? Why or why not? Was your prediction correct?

**Extensions:**

- Observe the seeds you planted in the Recycled Greenhouses. Watch how they sprout shoots and roots.
- Plant your seedlings in a class garden! Not only will your class enjoy it, but you will be creating a green space. If you can not do this in your schoolyard, make a window box garden.

**Seed Hunt Strip**

Find a	Find a	Find a	Find a	Find a	Find a
round seed	long seed	light seed	dark seed	big seed	tiny seed

# Animals in Jeopardy

**Skills:** gross motor, critical thinking, listening

**Objectives:**

- TSW define endangered.
- TSW identify reasons for endangerment.
- TSW dramatize the effect of habitat loss on wildlife.
- TSW brainstorm solutions.

**Materials:** The Lorax by Dr. Seuss (book or video), materials from “Going, Going, Gone” from “Games”

**Procedures:**

*Anticipatory Set:*

Watch or read The Lorax. What happened in the story? Ask students to describe some of the problems the animals faced. What caused those problems? People. When we do things without thinking about how it affects the earth, we often cause problems.

*Development of Lesson:*

1. What do animals need to live? Food, water, shelter, and space in the right place. Animals get the things they need from their habitat, or home. When a habitat becomes too polluted or to crowded, animals can not find what they need to live.
2. Play “Going, Going, Gone” from “Games.”

*Summary:*

Discuss the solutions the students provided. Can they come up with more? What are some things that you are able to do? What can your parents do? Our school? What can the government do?

**Extensions:**

- Make a difference for animals at home! Make a no-impact birdfeeder using rice cakes, shortening or peanut butter, birdseed, and yarn: cut a hole in the rice cake, loop a piece of yarn through the hole. Spread the rice cake with shortening or peanut butter and press it gently into birdseed. Hang it in the backyard. When the birds have eaten the rice cake, they can use the yarn to build their nest.
- Make a difference for animals around the world! Participate in the Pittsburgh Zoo & Aquarium’s Wild Earth Day, take a class, or have us bring an assembly to your school. The more you know, the better choices you are able to make!



# Conservation Kids

**Skills:** critical thinking, fine motor

**Objectives:**

- TSW define conservation.
- TSW identify their wasteful behaviors.
- TSW brainstorm alternatives to these behaviors.
- TSW find at least 5 ways to take care of the earth every day.



**Materials:** “Taking Care of the Earth Every Day” student page, “25 Things You and Your Family Can Do at Home to Help” page, “20 Ways to Green Up Your Classroom” page

**Procedures:**

*Anticipatory Set:*

Review what you have learned about taking care of the earth. When we use our resources wisely and take care of the planet, we make sure that all those things will be here in the future. We call this conservation.

*Development of Lesson:*

1. One of the first things we need to do is to find out what we are doing right. What are some ways that you are already taking care of the earth? Have the students list them.
2. The next thing to do is to think of things we need to watch for. Have the students brainstorm answers. Use the “25 Things...” and “20 Ways...” to help you.
3. Have them be Conservation Kids and go on a “Green Patrol” of your classroom. Look for leaks, energy gobblers (appliances plugged in, computers not turned off, etc.), recyclables in the trash, etc. You may even want to extend the patrol to other parts of the school. If there is something you can fix yourself (like lights left on or water left running), fix it! Bring any other concerns to the attention of the proper people.
4. Have the students do a “Green Patrol” at home, too. Fix the things they can, and tell their parents about anything else they see.
5. Ask the students to choose some things that they can do at home to make a difference. Have them write them on the Taking Care of the Earth Every Day page. Send the page home (with 25 Things... copied on the back!). Encourage them to get their families to participate with them.

*Summary:*

Discuss their actions after a week of practice. What things were easy to do? What things were more challenging? Reward their good deeds with a special treat like a nature walk or a picnic lunch.

**Extensions:**

- Complete “Energy-Free Playtime” to become more aware of your energy consumption habits.
- Plan and host an Earth Day Celebration. Make it as green as possible! Use recycled products and compost whatever you can. Include eco-friendly crafts, games, and activities. Make posters and invitations to get your school, your family, and your community involved!
- Sing some conservation songs! Try writing a few of your own, or add verses to the ones here.

## Taking Care of the Earth Every Day

Keep Track of all the good things you do for the Earth. Put a star beside each good deed you do for the Earth. Can you think of more good deeds? Write them in the blank boxes.

<b>Good Deed</b>	<b>Sun</b>	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>	<b>Fri</b>	<b>Sat</b>
1. Turned off TV when I finished watching it							
2. Used both sides of my paper							
3. Helped recycle paper, cans, glass, and plastic							
4. I didn't leave the water running when I brushed my teeth							
5. I picked up litter and threw it in the trash can							
6.							
7.							
8.							

*This activity was adapted with permission from The Happy Earth Day Activities Book published by the Environmental Protection Agency (EPA).*

## 25 Things You and Your Family Can Do at Home to Help

1. Plant native shrubs, trees, and flowers in your yard that provide food and shelter for wildlife.
2. Put up a birdhouse, feeder, or birdbath; bat boxes are a great way to help as well.
3. Use mulch to conserve water in your garden.
4. Start a compost pile and use the rich compost in your garden.
5. Do not pick wildflowers or collect wild creatures as pets; leave animals and plants where you find them.
6. Check for leaky faucets and pipes inside and outside your home. If you find a leak, fix it right away. This will save water and money!
7. Shut down your computer when not in use. Just leaving it in sleep mode draws a lot more energy.
8. In the summer, turn up the temperature on your central AC at least 8°F if you are going away for more than 8 – 9 hours (an average work day). In the winter, turn the furnace down at least 8°F while you are away.
9. Buy locally grown food and locally made products when possible. This reduces the fuel needed to transport them over long distances.
10. Use reusable containers to store food.
11. Try to remove disposable items and excess packaging from your grocery list. Use reusable totes when you shop.
12. Snip six-pack rings from soda before throwing them away; check in your area to see if they are recyclable.
13. Keep your blinds and/or curtains closed during the hottest part of the day.
14. Pack a waste-free lunch.
15. Use your spending power as a consumer to support sustainable products and services. Buy recycled, organic, and renewable energy whenever possible.
16. Walk, bike, carpool, or take public transportation whenever possible to reduce greenhouse gas emissions.
17. Use a trigger nozzle on your hose to cut down on water consumption.
18. Water lawns either early in the morning or in the late evening to minimize evaporation.
19. Keep the freezer and refrigerator full. Food retains the cold better than air.
20. Reduce, reuse, and recycle - it works!
21. Find energy-free ways to have fun: ride bicycles, visit a playground, or go for a nature hike!
22. Replace your light bulbs with compact fluorescent (CFL) bulbs. They last longer and use about one-fourth as much energy.
23. If you can, repair appliances rather than buying new ones. If you must make a new purchase, be sure that it is energy-efficient.
24. Join, support, or volunteer your time to conservation projects and groups.
25. Encourage and educate others to conserve resources.

# 20 Ways to Green Up Your School

## In the classroom:

1. Check your classroom at the end of each day to make sure faucets are all the way off, blinds are down, windows are closed and lights are off. Encourage your students to be part of the energy patrol!
2. Use water-based paints. Check your other art supplies to make sure they do not contain harmful chemicals like cadmium, mercury, and lead.
3. Make your own non-toxic cleaning supplies using formulas from "Recipes". You'll reduce your student's exposure to chemicals, protect the environment, and save money, too!
4. Have students participate in a recycling drive! Take the items to a recycling center. Some will even pay you for certain materials – check with the center near you. Use the proceeds to fund a green project.
5. Use green school supplies! Recycled notebooks, pencils, erasers, and clipboards are just a few of the green products available.
6. Open the windows on nice days. The fresh air will help to regulate the temperature, and will be appreciated by your students!
7. Have the students use both sides of the paper. Model this for them by using old worksheets and homework in your classroom for notes, drawing paper, etc.
8. Put on a show to teach others at your school about environmental issues.
9. Use organic, recycled, and/or biodegradable products for events and class parties.

## Around the School:

10. Get permission to start composting organics from the lunch room and other areas. If your school is unwilling to do this on a large scale, ask to do it on a smaller scale outside your classroom, or start a worm farm to eliminate some of your garbage.
11. Plant a vegetable garden or native flower bed. Fertilize it with your compost, and water it with any leftover water from projects. This creates green spaces, and a harvest all can enjoy!
12. Ask the cafeteria to serve locally grown, organic, or sustainably harvested foods. These might even include vegetables grown by the students!
13. Recycle technology. If you will be getting new computers, invite your kids to join the Goodwill and Dell Reconnect program, which recycles computers and other electronics. Other devices, like cell phones, and technology related items, like batteries are also recyclable.
14. If your school will be undergoing renovations, encourage them to use reclaimed, recycled, and low-emission building materials.
15. Campaign for an Idle-Free School Zone. These encourage parents who arrive at school to pick up their kids to turn off their engines and reduce pollution.

## For Teachers Only:

16. Whenever possible, go paperless. Keep your grades online. E-mail other teachers and administration. If your school hasn't already, try to start an e-mail only campaign that eliminates needing hard copies of substitute requests, field trip proposals and meeting RSVPs..
17. Instead of pouring coffee or water into a styrofoam cup, bring your own mug or glass to school, which can be washed and reused over and over again.
18. Unplug your mini-fridge. Consider sharing a mini-fridge with the teachers down the hall instead of having your own private refrigerator that soaks up extra electricity. Better yet, have one regular refrigerator in a central location (like the teacher's lunchroom) that can be used by all.
19. Apply for a grant. The Live Green Teacher Grants award teachers \$1,000 to put their original green ideas and campaigns to work in the classroom.
20. Carpool with other teachers. Even if you don't have to commute across town, carpooling decreases air pollution, and saves you money.

# Electricity-Free Playtime

**Skills:** comparison, contrast, problem solving

**Objectives:**

- TSW discuss how much energy some of their favorite pastimes consume.
- TSW pledge to reduce their energy consumption by choosing activities that use more human energy and less electricity and oil.

**Materials:** blank calendar pages, pencils

**Background information:**

Many of the activities we choose to entertain ourselves involve plugging something into an electrical outlet. Televisions, computers, and video games all consume electricity. While we might not see any pollution coming out of the socket, pollution is created by making electricity; these pollutants include carbon dioxide, sulfur dioxide and nitrogen oxide.

**Procedures:**

*Anticipatory Set:*

What kind of things do you enjoy doing? Make a list of the students' responses. Many of the things we like to do, like watching TV or playing video games use energy.

*Development of Lesson:*

1. Look at the list of activities. Which of these use energy? (TV, computer, etc.)
2. What does not use energy? Brainstorm more ways to have fun that don't use electricity (sports (baseball, soccer, etc), bicycling, tag, nature walks, bird watching, going to the park or playground, etc.)
3. Encourage your students reduce their electricity use during their playtime. Have the students pledge to increase their electricity-free activities while decreasing their activities that do use electricity.
4. Give the students a calendar page. Have them write the non-electric activities that they participate in. For younger students, keep a class calendar and ask them to report their activities each day. For example:

**April 2009**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2 Rode my bike	3	4 Went to the playground
5	6	7 Went on a nature hike	8	9	10 Played kickball	11
12 Flew a kite	13	14	15	16	17 Wild Earth Day at the Zoo	18
19	20	21	22 Earth Day	23	24	25
26	27	28	29	30		

*Summary:*

Have the students bring their calendars back to class at the end of the month to see how they did. What things did they do that did not need electricity? Did they do anything different than they normally did? What was different? Can you still have fun and not use energy? Why or why not?

**Extensions:**

- Host an Earth-Friendly Activity Day at your school. Set up a variety of electricity-free events and activities. Invite the rest of the students to participate with you!
- Start a “Green Team” to find other ways to save energy around your school.



# April 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	Wild Earth Day at the Pittsburgh Zoo	

# Create a Butterfly Habitat

## Background:

Butterflies are beautiful creatures that bring color and life to any backyard garden. You can attract butterflies to your backyard by growing plants that will serve the needs of a butterfly in each of the four stages of its life cycle. This means a place for the butterfly to lay its eggs, plants for the larvae (caterpillar) to eat, a safe place for it to form the chrysalis, and nectar-rich plants for the adult.

## Plants that Attract Butterflies

### For the egg/larvae stage:

Most butterflies will want to lay their eggs on or near a food plant that it will eat in the caterpillar stage. Caterpillars eat a lot; it's how they spend almost all of their life! Caterpillars can be picky eaters, though. Many will eat only one or two species of plant.

Here are some common butterflies of our region and the plants they will eat as caterpillars:

Monarch: Milkweed

Giant Swallowtail: northern prickly ash or hop tree

Appalachian azure: bugbane

Red-spotted Purple: many trees and shrubs including wild cherry, poplar, oaks, deerberry, birch, willows, and shadbush

Atlantis Fritillary: violets

Common wood nymph: purple-top and other grasses

American Lady: sunflowers, pearly everlasting, ironweed, burdock

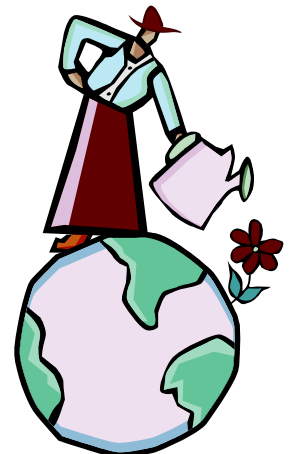
### For the adult stage:

Adult butterflies eat by drinking nectar from plants. Adult butterflies are most attracted to red, yellow, orange, and purple flowers, and they should be flat-topped or clustered with short flower tubes so the butterflies can reach the nectar. Butterflies rarely feed in the shade, so make sure your nectar plants are in a sunny spot. Some common plants of our region that many butterflies like include dogbane, common vetch, goldenrod, milkweeds, Joe Pye weed, sunflower, strawberry, and blueberry.

## Other Things to Remember

Everything needs water to live, and butterflies are no exception. Shallow mud puddles or moist sand usually do the trick. Butterflies also like to warm up while feeding, so placing stones in the sun near your nectar plants can provide a place for them to rest and warm up their wings. Insecticides are lethal to butterflies, so keep your garden free from chemicals. And don't forget that no matter what species you want to attract or plants you want to use, native is always better. They will thrive more easily, need less water and care, and will attract more butterflies common to our region.

Have fun and good luck with your garden! We think you will be surprised by how easy it is to bring lots of life to your backyard, just by knowing what plants to use. If you grow it, they will come!



# Soak It Up

**Time: two 15 minute sessions**

**Skills:** comparison, contrast, drawing conclusions, fine motor

**Objectives:**

1. TSW compare and contrast amphibian and reptile body coverings.
2. TSW observe any differences in how far the dye permeates in an egg with and without its hard shell.
3. TSW discuss how this experiment relates to amphibians and pollution.

**Background Information**

Definition of permeable: having openings that liquids (or gasses) can pass through.

Amphibians have unique skin compared to that of many other vertebrate animals. An amphibian's skin is thinner, which allows for higher levels of oxygen to exchange with the blood vessels that are close to the surface of the skin. This permeable skin distinguishes them from birds, mammals or reptiles – and it is one of the characteristics that have contributed to their declining populations and extinctions.

Many amphibians use their permeable skin to help them breathe. Oxygen is a small molecule that can easily pass through the skin of an amphibian. The oxygen first dissolves into the liquid on the surface of the animal's skin, and then it is picked up by blood that is in vessels close to the surface of the skin. An example of this would be a frog that hibernates at the bottom of a pond. During this hibernation, the frog's skin acts as a giant gill, passing oxygen from the water to the frog's blood. Also, some salamanders are so efficient at breathing through their skin that they do not have lungs!

This same characteristic that help amphibians survive in a variety of habitats also makes it very easy for harmful chemicals to pass into the animal's body. Toxic chemicals found in rainwater, ponds, rivers, and creeks may kill frogs by contaminating their bodies. Reptiles are not as susceptible to these chemicals because their scaly skin is less permeable.

For this activity, you will be using hard-boiled eggs to show how amphibians are susceptible to pollution because of their permeable skin, much like an egg without a shell. The shell of an egg acts like a mammal or reptiles' skin. It is less permeable and therefore acts as a barrier to the water and food coloring. The water will not penetrate into the shelled egg as far as it will for the unshelled or peeled egg.

The peeled egg, with only a thin membrane surrounding it, absorbed more water. The food coloring will travel further into this egg. The absorbed water will also make the egg swell, increasing its circumference.

**Materials:** Picture of frog and lizard, hard boiled eggs (prepared prior to class), food coloring (dark colors work best), rulers, clear cups, water, knife

**Procedures**

Day #1:

*Anticipatory Set:*

Discuss the function of skin with the group. Why is skin important to us? Skin protects us. It keeps germs and other harmful things out of our bodies. Show a picture of a lizard. Reptiles, like this lizard, have special skin. They are covered with scales. Their scales make their skin even tougher

than ours. Show a picture of a frog. Discuss how a frog's skin is very different from ours and from that of reptiles. It lets oxygen and water go through into the frog's body. This can be helpful and harmful at the same time, because it can also let germs, chemicals, and other pollution enter the frog's body. Let's find out how this works!

*Development of Lesson:*

1. Divide the class into small groups. Each group should receive for the experiment:
  - a. 2 hard boiled eggs
  - b. 2 clear cups filled with water
  - c. Food coloring.
2. Instruct the groups to peel one of the hard-boiled eggs (carefully). You may wish to do this step ahead of time for younger students. This egg is like the frog's skin. The other egg is like the reptile's skin.
3. Each egg's circumference should be measured and noted (using either the measuring tape or rulers and string).
4. Put each egg in a cup and label each cup with "peeled" or "un-peeled."
5. Add at least 20 drops of food coloring to each cup (again, dark colors work best). This is pollution that is in the water.
6. Let the eggs rest in the water for **AT LEAST** 24 hours.

Day #2:

7. Have the groups return to their eggs and cups. Remove both eggs from the cups.
8. Gently peel the egg that still has a shell.
9. Carefully cut each egg in half (from top to bottom, through the yolk).
10. Using rulers or measuring tape, measure how far into the egg the food coloring has moved.

*Summary:*

Discuss what happened. Which animal had more pollution in its body, the frog or the lizard? Why do you think that is? What does this experiment tell you about how frogs and other amphibians are affected by water pollution? What types of pollution might affect amphibians? What is the source of the pollution?

**Extensions:**

- Wondering what to do with the left-over eggs? Although you probably don't want to use these eggs in egg salad (since they have been touched by lots of little hands) – use them for compost! By composting these used eggs instead of placing them in the trash bin, you are ensuring that the eggs don't end up in a landfill.
- Visit a pond in the spring. Can you find any frogs or other amphibians? Look for adults, tadpoles, and eggs. Is there anything that might be a problem for frogs or other pond animals (like pollution)? If there is and you can safely clean it up, put the litter in its place! If you notice any contaminants (like run-off) or other concerns, inform the local municipality or PA Fish and Boat Commission.



# Recipes

Cooking with children is a great way to introduce many basic math concepts such as comparing volume, weight and quantity. As you make these recipes with your children, have them count the ingredients, weigh them, measure them, and compare the amounts of different ingredients. You can even graph them! Basic science concepts in chemistry (dissolving = solutions, combining/mixing = compounds) and physics (states of matter: room temperature = liquid, frozen/chilled = solid, boiling = gas) may also be demonstrated. All that, plus a yummy treat to eat!

## Solar Oven Recipes

*Most of these recipes require a dark-colored cooking pot with a lid. They may be ceramic, enameled, or cast iron. Some recipes require pre-heating or a specific oven temperature. Use an oven thermometer to check your oven. Oven temperatures and efficiency will vary, so cooking times are approximate. Always check for appropriate done-ness.*

### Sun Rice\*

1 cup brown or white rice                      2 cups water                                      Pinch of salt (optional)

Put everything in a quart dark-colored cooking pot. Cover and put in a 250° - 275°F solar oven for one hour or until all the water is absorbed.

### Solar Nachos\*

Tortilla chips                                      Grated cheese (cheddar, colbyjack, pepperjack, etc.)

Put tortilla chips on a dark, heat-proof plate. Sprinkle with grated cheese. Put in solar oven until cheese is melted. Be careful, the plate will be hot!

### Sun Muffin Pizza\*

English muffins                                      Pizza sauce                                      Shredded mozzarella cheese

Spread pizza sauce on muffins and sprinkle with cheese. Place on a dark, heat-proof plate. Put in solar oven until cheese is melted. Be careful, the plate will be hot!

### Sun Pretzels

2 ¼ cups baking mix (like Bisquick)                                      1 egg, beaten

2/3 cup milk    Coarse salt

2 Tablespoons vegetable oil

In a large bowl, combine baking mix, milk, and oil, stirring only 20 times. Gently smooth into a ball and knead 5 times. Divide into 32 pieces. Roll each out to the size of a pencil. Twist into pretzel knots. Brush with egg, and sprinkle with salt. Cover and bake in the solar oven about 20 – 30 minutes until done.

### Sunny Rice Pudding

1 cup Sun Rice (or cooked rice)                                      1 Tablespoon butter

3 eggs    1 teaspoon vanilla

1 1/3 cup milk    ½ teaspoon lemon juice

2 Tablespoons brown sugar    Cinnamon

5 Tablespoons sugar

In a large, dark-colored cooking pot, combine rice, milk, eggs, butter, vanilla, and sugars. Mix well. Add lemon juice. Cover and bake about 1 ½ hours. Sprinkle with cinnamon when done.

### Sun-Baked Apples

Apples    Brown and white sugar                                      Cinnamon

Core the apples, but do not peel them. Sprinkle the inside with the sugars and cinnamon. Place in a dark-colored cooking pot. Cover and bake 1 ½ - 2 ½ hours.

## Green Cleaners

*Environmental toxins, including household cleaners, have been linked to increases in asthma, and other serious health concerns. To minimize exposure to harsh and potentially hazardous chemicals, try these non-toxic cleaners in your classroom!*

Five basic ingredients serve as the building blocks for many safe cleaning needs:

1. **Baking Soda** - Cleans and deodorizes. Softens water to increase sudsing and cleaning power of soap. Good scouring powder.
2. **Borax** - Cleans and deodorizes. Excellent disinfectant. Softens water. Available in laundry section of grocery store.
3. **Soap** - Biodegrades safely and completely and is non-toxic. Available in grocery stores and health food stores. Sold as liquid, flakes, powder or in bars. Bars can be grated to dissolve more easily in hot water. Insist on soap without synthetic scents, colors or other additives.
4. **Washing Soda** - Cuts grease and removes stains. Disinfects. Softens water. Available in laundry section of grocery store or in pure form from chemical supply houses as "sodium carbonate."
5. **White Vinegar or Lemon Juice** - Cuts grease and freshens.

### All-Purpose Cleaner

¼ c. baking soda

½ c. borax

½ c. vinegar

1 gal. water

For surfaces that need scouring, try moist salt or baking soda and a green scouring pad.

### Window Cleaner

2 tsp. vinegar

1 qt. warm water

**OR**

2 tbsp. borax

3 c. water

Rub dry with newspaper to avoid streaking.

### Disinfectant

¼ c. borax

½ gal. hot water

### Drain Opener

½ cup baking soda

½ cup vinegar

Pour baking soda down the drain and follow with vinegar. Cover and let sit for at least 30 minutes.

Flush with boiling water.

### How to remove:

**Stickers - Sponge** vinegar over them several times, and wait 15 minutes, then rub off the stickers. This also works for price tags (stickers) on tools, etc

**Crayon** - Apply white vinegar with a toothbrush. Wipe clean.

**Marker - Apply** rubbing alcohol with a cotton ball. \*Note: this only works on non-porous surfaces!

**Gum** - Rub with ice. Gum will flake off.

# Games

Games are a fun and active way to improve your students' gross motor skills while reinforcing scientific concepts such as predator/prey, habitat components, locomotion, and natural history.

## Recycle Relay

***Practice separating your recyclables!***

Materials: clean "garbage" (plastic bottles, pop cans, newspaper, etc.) at least 2 pieces per student, 2 or 3 medium to small boxes or bins, 3 large boxes or bins labeled "paper," "plastic," and "metal," large open space

Directions:

1. Divide the "garbage" evenly among the medium sized bins. Put them at one end of your playing space.
2. Divide the students into 2 or 3 teams. Line them up in squads beside the bins of "garbage."
3. Put the labeled bins at the other end of the playing space.
4. Have the first student take a piece of "garbage" from the bin, put it in the correct bin (recycle it), then return to the end of their squad. If they do not put it in the correct bin, they must remove the piece of trash and place it in the correct bin.
5. When the first student has returned, the next student may take a piece of "garbage," recycle it, and return. Repeat until all the "garbage" has been recycled.

## Going, Going, Gone

***See the effects of human carelessness on wildlife, and how human caring can make a difference!***

Materials: 3 – 4 blankets

Directions:

1. Spread the blankets out on the floor. These blankets represent animal habitat.
2. Have the students stand on the blankets. They are the animals in the habitat. The habitat gives them everything they need to survive: food, water, shelter, and space in the right place.
3. There are many problems that make it difficult for animals to find everything they need to survive. If they can not find what they need where they are, they have to move somewhere else. If they can not find a new place to live, they will not survive.
4. Name a problem facing animals (examples: pollution made the water undrinkable, roads were built through the middle of your habitat, trees were cut for building materials, Japanese knotweed [an invasive plant] took over the spaces where your food grew, rising temperatures made the ice shelf smaller so you have no place to hunt, etc.). As you do, fold one of the blankets in half. Any animals standing on them must relocate to new habitat. Any that can not fit do not survive.
5. Repeat, folding the blanket in half again. Relocate. Repeat, removing the blanket. Continue to play until the habitat is hopelessly overcrowded.
6. Ask the students if their needs are being met. (NO!) The same thing happens for real in nature. Is this a problem? (YES!) There is a solution. Whenever we do something good for the planet, we also help the animals survive.
7. Have the students brainstorm things that they can do to make a difference (recycle, turn off the lights, turn off the water, etc.). As they name solutions, return a portion of the habitat you removed. Repeat until the habitat is restored.

## **Tangled!**

***See how garbage affects ocean wildlife.***

Materials: 1 rubber band per student

Directions:

1. Give each student a rubber band. This represents a piece of garbage that has made its way into the environment.
2. Have them hold up their non-dominant hand in front of them. Place the rubber band around the thumb, stretch it across the back of their hand, and hook it over their pinkie finger.
3. Explain that they have just become tangled in trash. Since they are ocean animals, they may not use their other hand, or teeth to free themselves. Since they are in the open ocean, they may not rub against anything to free themselves. They must keep their hand in front of them while they attempt to free themselves.
4. Give the students 1 minute to free themselves. Explain that most ocean life has a limited time to get free before a serious problem occurs. Those that are unable to free themselves do not survive.
5. Discuss what happened. How did they feel while they were trying to escape? How did they feel when they knew time was running out?

## **Human Knot**

***See how everything is connected while you practice problem solving and cooperation!***

Materials: ink pad and stamp

Directions:

1. Stand in a circle. Place a stamp on the students' right hands.
2. Depending on the number of students, this may be a simple or challenging activity. If you have younger students, you may wish to divide them into two smaller circles.
3. Have each student reach across the circle with their right (stamped) hand, and take the left (unstamped) hand of another student. It does not matter whose hand they take, as long as it is not the person standing right beside them. It does matter which hand they take. Check to be sure that right hands are holding left hands.
4. Work together to untangle the human knot! Do NOT drop hands! Carefully move over, under, and through the arms of the other students to re-form the circle. You may end up with one big circle, two separate circles, or two connected circles, depending on how the hands were joined.

## **How Many Predators**

***See what happens when too many predators come into one habitat.***

Materials: None

Directions:

1. Review meaning of predator and prey.
2. Have the students spread out. Select one student as the predator/ lion. Explain that the rest of them are prey animals/ gazelles, antelope, zebras, etc.
3. Have the lion hunt the gazelles. When the lion catches one, that gazelle must freeze in place.
4. If another gazelle tags the frozen gazelle, it is able to move again.
5. If all the gazelles become frozen, the prey is gone and the game is over.
6. Repeat several times, adding one more predator/ lion each time.
7. What happened when there was only one lion? Why? What happened when there were 3 or 4 lions? Why?

# Songs

Music is a great way to sharpen grammatical skills and, at the same time, present new material or check for understanding in a new and exciting way. Kids really connect with it, so it also makes a great memory tool. Not only that, it's FUN!

## Pickin' Up Trash

*Sung to "Baby bumblebee"*

I'm picking up some trash from the big blue sea.  
Keeping the waters clean for you and me.  
I'm picking up some trash from the big blue sea.  
Why don't you come and join me!

My friends and I are planting brand new trees,  
For the squirrels and songbirds singing happily.  
My friends and I are planting brand new trees.  
Look how pretty it can be.

We're keeping our planet nice and green.  
Have some fun and join our earth day team.  
We're keeping our planet nice and green.  
Come and join our team!

## This Old Earth

*Sung to "This Old Man"*

This old earth  
To stay green  
Needs our help to keep it clean  
With a pick it up; pitch it in; and throw it in the can  
Give our earth a helping hand!

## The Earth Needs Our Help

*Sung to "The Farmer in the Dell"*

The earth needs our help!  
The earth needs our help!  
Turn off the lights when you're done  
The earth needs our help!

The earth needs our help!  
The earth needs our help!  
Turn off water when you brush  
The earth needs our help!

Make up your own verses with more ways to help!

## Working on the Trash

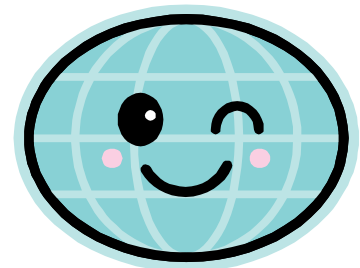
*Sung to "I've Been Working on the Railroad"*

We've been working on RECYCLING  
All the trash we can,  
We've been working on recycling,  
It's a very simple plan,  
Separate your glass and paper,  
Aluminum, plastic, tin.  
Take the trash that you've recycled  
To your recycling bin!

We've been working on REDUCING  
All the trash we can.  
We've been working on reducing  
It's a very simple plan  
Don't go wasting any products,  
Use just exactly what you need.  
Don't buy things in extra wrapping,  
Reduce and you'll succeed!

We've been working on REUSING  
All the trash we can.  
We've been working on reusing,  
It's a very simple plan.  
If it's a paper bag you're using,  
Don't use it once, use it twice!  
Give old clothes and toys to someone,  
To reuse them would be nice

We've been working on COMPOSTING  
All the trash we can.  
We've been working on composting,  
It's a very simple plan  
Feed worms apple cores and peelings  
And grass from when you mow  
They will turn it into good stuff  
To make your garden grow!



## Conservation Crafts

Crafts are a fun way to improve your students' fine motor skills, matching, and counting. They also give you the opportunity to review ways you can make a difference for the planet. Each of these crafts uses a recycled item for at least one portion of the craft. Encourage your students to bring them in from home.

### Recycled Crayons

#### Materials:

- Broken crayons and stubs
- Microwave or solar oven
- Heat-proof bowls
- Potholders
- Silicone ice cube or muffin trays



#### Directions:

1. Remove all paper from the crayon pieces. Separate them by color.
2. Put crayons in heat-proof bowls.
3. Place them in the solar oven until melted. Watch them carefully so that they do not burn. If you are using the microwave, heat the crayons until they are melted. (You may also heat them in a double boiler on the stove)
4. **Teacher only:** Use hot pads to remove them from the oven or microwave. Pour them into the molds.
5. When the wax has cooled, unmold them and use them to draw!

### Recycled Paper

#### Materials:

- Old paper (office paper, colored paper, old homework, etc.)
- Dryer lint
- White glue
- Water
- Screen frames\* (see directions)
- 18" squares of window screening
- Blender
- Optional: flowers, herbs or other plants

#### Directions:

1. Make the screen frames: staple or nail 2" x 1/2" x 18" pieces of wood into squares. Stretch window screening tightly across the opening and staple securely. Make enough frames for the students to share.
2. Select the paper you want to use and tear it into small pieces. Put it in the blender. Add some dryer lint, if you wish. You will need about 2 cups of paper/lint. You may wish to include herbs to make scented paper.
3. Add about 1 cup of water and a squirt of white glue. Blend into a pulp, adding more water, if necessary.
4. Put the screen frame over a bucket or small tub or bin to catch excess water.
5. Pour the pulp out on the screen frame. Spread the pulp in a thin layer. It may be formed into any shape desired, and flowers, leaves, or other decorations may be added. Place a square of screen on top of the paper and carefully press the excess moisture out of the pulp.
6. Carefully flip the frame over. Be sure to support the screen on the other side. Gently remove the screen square with the paper on it. If it tears, gently reshape it.
7. Place the paper on a windowsill to dry in the sunlight. Depending on the thickness of the paper, this may take several hours or overnight.

## Litterbugs

### Materials:

- Variety of “clean” garbage (egg cartons, plastic cups, straws, grocery bags, cans, etc.)
- Assortment of art odds and ends (pipe cleaners, yarn, pompoms, google eyes, etc.)
- Glue or tape
- Markers or paint
- Scissors

### Directions:

1. Use the “garbage” to make creatures! Egg cartons might become heads or bodies, bags might become wings, straws could be legs, etc.
2. Use glue or tape to attach the pieces.
3. Paint the “litterbugs,” if you wish. Decorate with pipe cleaners, pompoms, etc.

## Recycled Instruments

### Materials:

- Clean containers with lids (yogurt, butter, sour cream, etc.) or paper towel rolls
- Dry beans or rice
- Glue, tape, or stapler
- Scissors
- Markers or paint
- Streamers, yarn or ribbon

### Directions:

1. Put a small amount of rice or dry beans inside the container and put on the lid. Secure it with tape. If you are using paper towel rolls, flatten one end and staple shut. Add the beans or rice, then flatten and staple the other end.
2. Paint or decorate with markers. Add streamers or ribbon, if you wish.
3. Allow to dry.
4. Play your instruments in an Earth Day Parade or Celebration!

