

Indiana Environmental Education 2013

Guide Book for
Solid Waste Management Districts
Kindergarten – Fifth Grade (K-5)



Compiled by Indiana Solid Waste Management District Educators in conjunction with the Association for Indiana Solid Waste Management Districts and the Indiana Department of Environmental Management.



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Indiana Solid Waste Environmental Education: An Overview

Solid waste management has changed significantly over the past thirty (30) years. There have been continual developments to improve solid waste management through collaborative efforts among waste haulers, solid waste districts, and the Indiana Department of Environmental Management (IDEM). These changes have resulted in vast improvements in waste management itself, but also in public understanding.

In the late 1980's, lack of landfill space was of grave concern in Indiana. It was estimated that at that time, Indiana had only seven years of landfill capacity remaining. This was largely due to the importing of solid waste from out of state. In response to the looming landfill crisis, the Indiana State legislature formed Solid Waste Management Districts through House Enrolled Act (HEA) 1240. These Solid Waste Management Districts were tasked with implementing programs to educate and promote integrated solid waste management within the public and private sectors. Elements of the various programs have expanded over the years to include waste reduction, recycling, composting, resource recovery, prevention of illegal dumping & burning, and proper disposal of household hazardous waste, unwanted medications and non-recyclable solid waste.

The goal was to decrease the amount of waste going to final disposal (landfills and incinerators) through education, source reduction, reuse, and recycling. In order to educate the public, Solid Waste Districts and the Indiana Department of Environmental Management developed education programming on a variety of pertinent issues concerning solid waste management.

Today, Indiana now has approximately 42 years of landfill capacity. This is in large part to public education about recycling, as well as advancements in landfill technology, construction and regulation. Having averted the possible landfill crisis, the motivation and message of recycling education has shifted from conserving landfill space to conserving natural resources and energy, as well as pollution reduction.

Solid Waste education covers a wide range of topics, including: the construction and benefits of landfills as final disposal options, conservation of natural resources, energy conservation, pollution reduction, proper management and disposal of Household Hazardous Waste and the importance of buying recycled content products. Students are exposed to environmental education in schools as early as Kindergarten, so they grow up with an understanding of wise personal choices and the way that these choices affect waste management and natural resources.

This is an established education program which meets the standards in the curriculum model developed by IDEM.

Indiana Solid Waste Management District Education Curriculum Model

In accordance with SECTION 40. IC 13-20-17.5-6, the Indiana Department of Environmental Management (IDEM) developed a curriculum model for the Indiana Solid Waste Management Districts (ISWMD) to implement for their environmental education programming.

The ISWMD compiled curriculum that are classified into five categories: *Landfill and Incineration; Renewable and Non-Renewable Natural Resources; Pollution; Composting and Vermicomposting; and Household Hazardous Waste*. Each curriculum includes the corresponding Indiana Academic Standards for science, grades Kindergarten through Fifth Grade.

Overview:

The presentations are designed to help students recognize the importance of the environment, teach them their role in the environment, and recognize how their choices impact their environment.

Solid waste environmental educational programs included in this booklet cover Indiana Academic Standards for Kindergarten through Fifth Grade and are classified in five curriculum categories:

- Landfill/Incineration
- Renewable and Non-Renewable Natural Resources
- Pollution
- Composting and Vermicomposting
- Household Hazardous Waste

These categories are intended to describe the area of environmental education to which the program chiefly prescribes. Most, if not all, programs relate directly to multiple categories. In order to clarify principle topics, the programs in this booklet are separated into the category to which they most directly pertain. The included programs are to be used as a guide; individual Districts are encouraged to include specific information/data that pertains to local programs and services.

Landfill and Incineration

The lessons included in this section focus on waste generation, waste reduction, and the role of individuals in these processes. Students will become aware of the benefits of recycling and the amount of items that end up in a landfill or incinerator that could have been diverted.

1. Basic 3R's (Reduce, Reuse, Recycle)
2. Recycling Superheroes
3. Landfill Cookie
4. Edible Landfill

Renewable and Non-Renewable Natural Resources

The lessons included in this section will discuss what natural resources are and the differences between renewable and nonrenewable resources. Students will learn how we mine for the resources, how the resources are used, and how they can help extend the life of the resources.

1. How Do They Do That?
2. Coffee Can Papermaking
3. Renewable is Do-Able

Pollution

The lessons included in this section introduce the concept of litter as being a pollutant in air, land and water. Students will identify different pollutants, how they entered the environment, and what can be done to prevent litter.

1. Litter Bugs
2. Freddy Fish
3. Who Polluted the River?

Composting and Vermicomposting

The lessons included in this section focus on how composting and composting with worms (vermicompost) is an effective way of keep yard waste and food waste out of landfills. Students will learn how to make compost and the benefit of compost to the Earth.

1. Compost Stew
2. Squirmy Wormy Composting Made Easy

Household Hazardous Waste

The lessons included in this section will identify Household Hazardous Waste (HHW), where it is found within the home, and how to properly dispose of HHW. HHW, such as Mercury, can be detrimental to human and environmental health. The lessons will teach students how to properly handle HHW with adult supervision and how to properly dispose of HHW with adult supervision.

1. Hazardous House of Horrors
2. Household Hazardous What?
3. Got Household Hazardous Waste?

Landfill and Incineration

Basic 3 R's (Reduce, Reuse, Recycle)

1. Category: Landfill and Incineration
2. Grade Level(s): K-4
3. Correlation to State Standards: SCI.K.1.1, SCI.K.1.2, SCI.1.1.1, SCI.1.4.1, SS.1.2.5, SS.1.3.9, SS.1.4.1, SS.1.4.5, SCI.2.4.2, SCI.3.2.5, SCI.4.2.5
4. Description/Purpose: This program teaches students about the importance of the 3R's, and provides definitions and examples of each concept to insure understanding of how they, as children, can easily play a part. It also teaches students about the implementation of these concepts at home and at school.
5. Duration: 30 minutes
6. Background: This program is the most basic and and arguably the backbone of all Solid Waste education. It is an introduction to the concept of waste generation, waste reduction, and the role of individuals in these processes. It has many variations and room for adaptations based on the grade level of the students. Teaching students the most basic and practical 3R skills is vital to their understanding of current and future environmental issues as well as the part they can/will play.
7. Application to real world situations: Students will be able to associate their own actions and possible actions with their larger environment and community. They will become aware that they are necessarily involved in the process of waste generation and the important role they can play in waste reduction.
8. New Vocabulary: 3rs, Reduce, Reuse, Recycle, Disposable, Durable, Landfill, Natural Resources, Post-Consumer Products
9. Materials: The materials for this program are divided into categories:
 - a. Reduce (Disposable goods: paper plate, paper bowl, Styrofoam cup, plastic spoon, roll of paper towels, paper napkin; Durable goods: ceramic/plastic plate, metal spoon, glass/plastic drinking cup, dish towel, cloth napkin)
 - b. Reuse: (Assorted items that have been made using other items (e.g. items made from packaging, homemade magnetic keyboard letters, steel can holding pencils) – can purchase from various websites or make your own examples)
 - c. Recycle (food box, recycled toilet paper, recycled aluminum foil, recycled can, recycled PET items - Polyethylene terephthalate, a synthetic type of plastic resin)
10. Preparation: Gather materials listed in #9. Make sure that the items are separated into the three listed categories before you begin. Use any type of bag or bin that the students will not be able to see through to keep the items separated into the three categories. Separating the durable goods and disposables will make that part of the program more efficient.
11. Pre-Activity Questions: How many of you recycle? What are the **3R's**? They are reduce, reuse, recycle. Why are they important? How can you, as children, make a difference? What happens to the stuff we throw away?
12. Directions/Procedure: Have students sit on the floor. Talk briefly about the 3R's (reduce, reuse, recycle) and why each is important to waste management. Discuss where trash goes (into the trash can, to the curb, to the trashman, to the landfill or incineration). Show them a picture of a **landfill** (available in the extra materials at the end of this lesson plan). Explain what it is and that when items go into a landfill, they are buried there forever. (If their trash is not landfilled, depending on where they live and who their trash hauler is, talk about the incineration process). Talk about how there is adequate landfill space because over the years people have become more aware of the importance of conserving **natural resources** by reducing, reusing and recycling. Also discuss how the 3R's conserve natural resources and energy, etc. Then, read a book to get them thinking about the 3R's. The book determines the theme of the program. Some theme ideas are as follows: *Recycling Superhero* - Ellie Bethel, *Michael Recycle or Michael Recycle meets Litter Bug Doug*; *Keep trash from the landfill* - Melvin Berger, *Where Does all the Garbage Go?* (This is a BIG book); or *Why Should I Recycle?* - Jen Green. Read one of the books above to get them thinking about the 3R's and where our trash goes. Then, break down the 3R's one by one.

The activities for each concept are:

Reduce: Means sending less trash to the landfill. If they don't understand what reducing really means, try this brief activity. Choose 5 children to stand at the front of the class. Each child gets one **disposable** item such as a paper plate and paper napkin, Styrofoam cup, Styrofoam bowl and plastic spoon, and a roll of paper towels and a plastic grocery bag (can also include a disposable lunch kit using juice pouch, plastic baggies, paper napkin, etc...). Talk about how using disposable "dishes" for your meals is convenient, but when they are done eating or drinking, everything just gets thrown away. Have the student holding the plastic grocery bag collect the disposable items. Observe the amount of trash created using disposable dishes. Ask them how they could "reduce" the amount of trash made. Usually they will figure out that if "real" dishes are used, less trash is created. Repeat this scenario with a new group of students using **durable** goods such as a glass/acrylic plate and cloth napkin, a plastic or glass cup, a reusable plastic bowl and stainless steel spoon, a dish towel and a reusable bag (lunch would consist of a lunch box, cloth napkin, washable fruit container and a reusable sandwich container and a thermos). The reusable bag is passed around, but they will see that no trash is actually collected. This helps them understand the concept of reducing: reducing means they are not using the item in the first place.

Reuse: Talk about what it means to reuse items from the trash. Show them several items that used to be something else, some of which were purchased and some of which were made. These could include items such as: a bird feeder made from a milk jug, a pencil pouch made from juice pouches, a belt made from a tire, bottle caps, and a seat belt buckle. Then look around the room to find things that their teacher has reused in the classroom (we always find things - cans to hold pencils or scissors, popsicle sticks for counting, etc...). Then pull out a #5 yogurt cup and ask them to use their imaginations to come up with reuse ideas. They usually come up with a piggy bank, food container, drinking cup, musical shaker, etc... Then explain that any trash can become reusable just by using your imagination.

Recycle: Using the same yogurt cup, ask them what happens to the #5 yogurt cup if it was recycled. Talk about how natural resources are altered and used to make the products we buy at the stores and briefly discuss how the manufacturing of paper, plastic, glass, and aluminum use a lot of energy. Discuss why recycling is a better option. Talk about the recycle symbol and what it means and show them a water bottle and a plastic coffee canister. This way they can see the different plastics and the recycle symbols. Talk about the various recycling processes and how plastic and aluminum get melted down and how paper gets shredded, mixed with water, and dried to become new items. These items then become something brand new and are called **post-consumer products**. Show them various products people buy at stores that are made from recycled products (e.g. food packaging, toilet paper, egg cartons, aluminum foil, plastic bottles, a PET jacket, a LDPE bear, etc...). Show them an aluminum can and tell them how it comes from bauxite (if you can get a real sample of bauxite, it is a good visual tool). Then show them post-consumer products made from recycled aluminum such as water thermoses, new soda cans, pie pans, etc. The same process can be done with glass (some glass companies will supply you complimentary samples of ground up glass or you can carefully grind your own).



13. Discussion/Follow-up questions: Ask the students what they can do at their houses to make a difference and have them list several. Suggest to them that they can make a difference as students by talking with their parents about different ways to reduce, reuse and recycle in their homes.

14. Extensions/Related Activities (optional): If there is time students can participate in a recycling/trash sorting activity. (Be sure to bring along any other supplies that you would want for this activity.)

15. Resources:

Ellie Bethel, *Michael Recycle or Michael Recycle meets Litter Bug Doug*, Illustrated by Alexandra Colombo, Worthwhile Books, 2008 and 2009

Melvin Berger, *Where Does all the Garbage Go?* (This is a BIG book), Doubleday Book, 1992

Jen Green, *Why Should I Recycle?*, Illustrated by Mike Gordon, Barron's Educational Series, 2005

Bridget McGovern LLewellyn, *One Child, One Planet*, photographs by Carl R. Sams II and Jean Stoick, Emerald Shamrock Press, 2009

David M. Beadle, *The Day the Trash Came Out to Play*, Illustrated by Laurie A. Faust, Ezras Earth, 2004

Image of a Landfill



Recycling Superheroes

1. Category: Landfill and Incineration
 2. Grade(s): K-1
 3. Correlation to State Standards: SCI.K.1.1, SCI.K.1.2, EL.K.1.2, EL.K.1.3, EL.K.1.4, EL.K.1.12, EL.K.1.22, EL.K.2.1, EL.K.2.2, EL.K.2.3, EL.K.2.5, EL.K.3.1, EL.K.3.3, EL.K.3.5, EL.K.7.1, EL.K.7.2, EL.K.7.3, SS.K.2.4, SS.K.2.5, SS.K.3.7, SCI.1.1.1, SCI.1.4.1, EL.1.2.1, EL.1.2.3, EL. 1.2.5, EL.1.2.6, EL.1.2.7, EL.1.3.1, EL.1.3.3, EL.1.3.4, EL.1.3.5, EL.1.7.1, EL.1.7.2, EL.1.7.3, SS.1.2.4, SS.1.2.5, SS.1.3.9, SS.1.4.2
 4. Description/Purpose: Become a Recycling Superhero! This program makes a fun and interactive activity highly educational in order to introduce students to the concept of recycling. Students will learn how to recycle by sorting through a pile of solid waste and separating materials into the correct bins. Students will learn that waste materials end up somewhere; they do not just “go away”. The entire class will also receive a recycled content promotional “gift” if you choose.
 5. Duration: 45 minutes to 1 hour
 6. Background Information: As students learn that in the past the environment was not as clean as it is today because of new laws passed specifically to protect the environment, they will become more aware of the benefits of recycling. Include what can be recycled locally to help the students connect the information with their community and their lives.
 7. Application to real world situations: The sorting game the students play demonstrates what and how to bring recyclables to a local recycling facility or statewide program. The Michael Recycle book demonstrates behaviors that the students can do to keep the community clean e.g. not littering, reuse, recycling.
 8. New Vocabulary: Landfill, Environment, Paperboard
 9. Materials: 5 Labeled Recycling Bins, Clean Recyclables (rinsed, free of debris, safe, dry), Recycled Toy made from plastic water bottles, Recycling (RIC) Symbol picture, Landfill picture, Michael Recycle Book by Ellie Bethel, Examples of processed recyclables (granulated plastic, crushed glass, shredded paper, crushed aluminum cans, baled cardboard), Recycling Superhero Handout (available at the end of this lesson plan). (Be sure to bring along any recycled content promotional items if you will be giving them to students at the end of the program.)
 10. Preparation: Label the 5 recycling bins with the following labels (Cardboard, Paper, Metal, Books, Plastics) I exclude glass due to safety concerns but discuss that glass can be recycled.
 11. Pre-activity questions:
 - a. What does a Recycling Superhero do? (recycles glass, paper, metal, etc.)
 - b. What is recycling? (Taking a used item and making it into a new item by a process)
 - c. Where do my recyclables go in Our County?
 - d. Where does my trash go in Our County? (From trash can to dumpster to trash truck to landfill)
Show photo of landfill. Explain that a **landfill** is an constructed area of land where trash is disposed of in layers of dirt and trash which is designed to keep the trash in place.
 12. Directions/Procedure: Talk about and show examples (live objects that you provide) of the items that can be recycled in *your County*; be sure to let children know that there are some slight variations from area to area. Ask the children what the item is, what it is made of, and where it comes from. For example, using a paperboard tissue box, the item is made of paper (paperboard), and it comes from trees. You can show the physical steps of recycled materials (i.e. paper = shredded product and plastic = chipping).
 - Paper- **paperboard**(flexible/blendable), cardboard, notebook, office, junk mail, scrap, envelopes, newspaper, magazines, etc. (come from trees)
 - Glass- green, clear, blue, brown (come from sand) (Only let them look because it can break.)
 - Metal- aluminum and steel (come from rocks)
 - Books- paperback and hardback (come from trees)
 - Plastics- #1 & #2 (Show children how to tell the difference both with an example and a large recycling symbol sign) (come from oil)
- Show the five recycling bins or reuseable bags with labels (cardboard, paper, metal, books, plastics) with photos of the recyclable types. Let the children see this before setting up the activity. (Do not include glass because of safety issues.) Explain that the children will be sorting through the “recycle” pile and finding the correct recycle bin. Divide the group into 2-4 smaller groups to conduct the recycling, make sure each student gets a turn.

Read *Michael Recycle* by Ellie Bethel. Ask questions throughout such as “Would you like to live here?” “Why is Michael a hero?” etc. Discuss with the children about not littering.

Why would a superhero recycle? To save **resources** and energy by reusing, to protect the **environment** for inhabitants (explain that an environment is the area where someone or something lives), and to keep the world clean.

What happens to recyclables once they are sorted and brought to the recycling center? Show examples of processed recyclables (from Materials list) and show products that are made from recycled sources.

Thanks for helping me to recycle today. Give the children a recycled content promotional “gift” if you choose.

13. Discussion/Follow Up questions: What can you do to be a recycling superhero? (recycle paper at school, recycle at lunch, etc.) Why is it important to be a recycling superhero? (important to be wise with our resources and because by working together we can all help make a **bigger, collective** difference). Each SWMD might put their drop off site locations on the back of the Super Hero coloring page.

14. Extensions/Related Activities (optional): : Recycling Superhero Handouts (available in the extra materials at the end of this lesson plan)

15. Resources: Use local recycling guide or SWMD resources to include local information.

Image of a Landfill



Processed Recyclables



Processed Recyclables



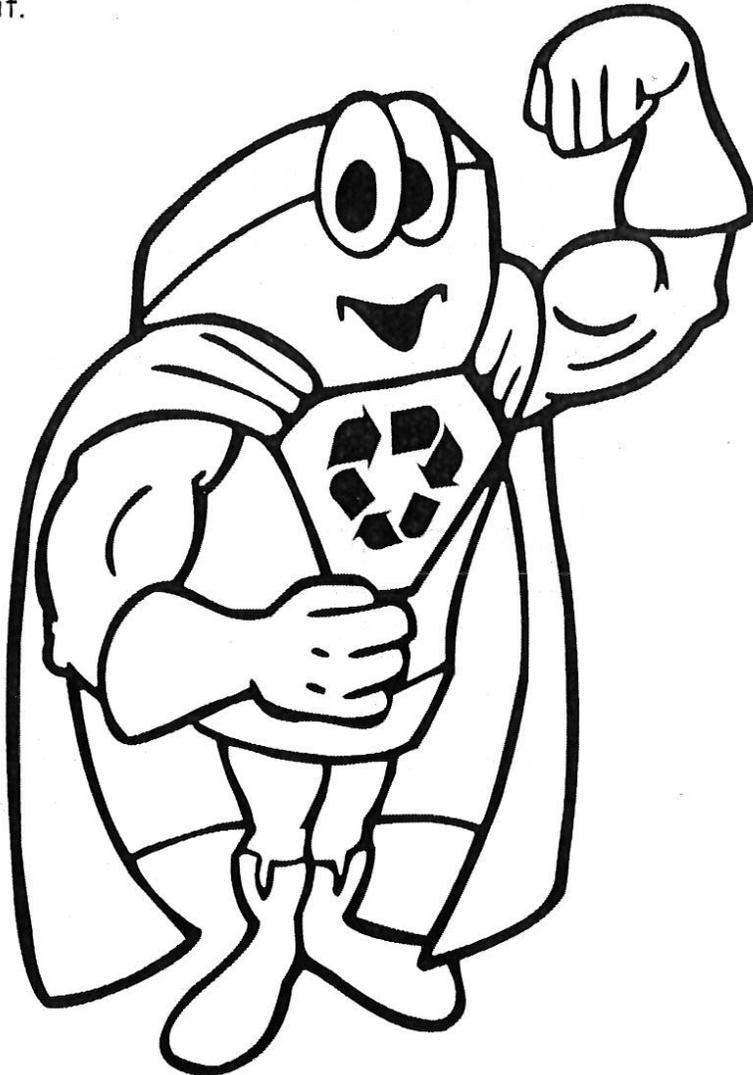
Processed Recyclables



RIC Symbol

You Can Be A Recycling Superhero!

Recycle. Recycle at home and at school. If you don't have a recycling program at your school, start one. If you have one, improve it.



LANDFILL COOKIE

1. Category: Landfill and Incineration
2. Grade Level(s): 3-5
3. Correlations to State Standards: SCI.3.4.2, SCI.4.2.5, SCI.4.2.6, SCI.4.3.4, SCI.4.5.2, SCI.5.3.2
4. Description/Purpose: The purpose of this activity is to introduce students to the waste stream and to emphasize conservation benefits of personal decisions as well as the and the importance of the 3 R's - Reduce, Reuse, Recycle.
5. Duration: 45 minutes
6. Background: In order to understand the importance of waste reduction efforts, it is important for children to know and understand what goes into the waste stream from an average household. Once this is established, children learn about disposal options other than their trash can. This lesson can be enhanced with a discussion about how those waste reduction options are vital to conserving natural resources and energy.
7. Application to real world situations: Students learn that most (80%) of the trash that goes into the landfill could be diverted by recycling or composting. They will be able to connect their own actions (waste disposal) to environmental impacts. They will learn about recycling and composting as ways to divert waste.
8. New Vocabulary: Garbologist, Landfill, Leachate, Household Hazardous Waste (HHW), Decomposition, Waste diversion
9. Materials: ***Warning: Because this program uses foods that contain possible allergens, consult about possible student food allergies and have a full list of ingredient labels available.**
 - d. Small signs (paper on toothpicks) to label the percentages (make ahead of time)
 - e. 4.5 lb. bag of garbage (if demonstrating daily waste generation)
 - f. Pre-baked big cookie using 1 Roll of Sugar Cookie dough, sliced and baked together on one foil pizza pan)
 - g. 1 disposable aluminum pizza pan
 - h. ½ a can of white icing
 - i. Writing icing (any color)
 - j. Paper towels
 - k. Wet wipes
 - l. Pizza Cutter
 - m. Napkins for serving
 - n. Small laminated signs mounted on toothpicks as markers for the various percentages of trash
 - o. Chocolate Syrup (optional)
 - p. "GARBAGE" FILLERS – there are several different ingredient options, but I try to use relatively healthy items that resemble the trash that each represents. Represent each type of trash by sprinkling small quantities on the cookie in appropriate ratios to correspond with the the 2011 Purdue University Calumet "Municipal Solid Waste Characterization Study for Indiana"(found at www.IN.gov/idem/recycle/files/msw_characterizarion_study.pdf). This is the most recent data on recycling and solid waste displacement.

<i>Paper</i>	<i>Mini marshmallows, cereal, popcorn (paper wads)</i>
<i>Yard Waste</i>	<i>broken pretzels (small twigs) and green/brown sprinkles (grass)</i>
<i>Metal</i>	<i>blue or silver sprinkles</i>
<i>Food Waste</i>	<i>Swedish fish, food shaped candies or goldfish pretzels</i>
<i>Plastic</i>	<i>gummy soda bottles (this is non-healthy, but I only use about 6 per program)</i>
<i>Glass</i>	<i>clear rock candy (very small quantity)</i>
<i>HHW</i>	<i>green gel icing, sprinkles (small quantity)</i>
<i>Other</i>	<i>Oreo cereal, Cheerios, or any other round cereal with holes in the middle (tires), anything white for diapers (Marshmallows, cereal)</i>

10. Preparation: Have your large pizza-sized cookie pre-baked, lightly iced, and divided into the percentages of trash (like pizza slices). Have all other ingredients assembled and ready. Have signs/markers for percentages made.

11. Pre-activity Questions: Do you ever think about what goes into your trash can? Where does your trash go? Have you ever heard of a Garbologist? What is a **garbologist**? It is a scientist that studies garbage. Why do we need garbologists? What happens to the trash that goes into the **landfill**? Does it **decompose**?

12. Directions/Procedure: Tell the class that today they are all going to be garbologists. Discuss the role of a garbologist and why they are important. Have them think about what each person throws away at one's house. Have them list a few things they threw away during the course of the day, either breakfast or lunch (Their examples are usually as follows: Plastic wrappers, food waste, paper plates and napkins, juice boxes, packaging materials, diapers, newspaper and homework papers, etc...). As they name things, categorize them aloud as paper, plastic, glass, food waste, yard waste, metal, other, or **Household Hazardous Waste (HHW)**, so they become familiar with the categories. Show them a 4.5 lb. bag of garbage and explain that each person throws this much trash away a day. Have them calculate how much garbage a family of four would throw away each day.

Then introduce the cookie, which is pre-baked and pre-iced in white icing and divided into slices using writing icing to represent the proper trash percentages or fractions, depending on the age (see chart). Explain that this cookie represents a **landfill** and that each landfill is lined with various protective layers of plastic liner, clay, gravel, and soil before the trash goes in. These layers keep "garbage juice," called **leachate** (which comes from the **decomposition** of the materials in the landfill) from seeping into our groundwater and contaminating the soil. These layers are represented in whole by the white icing. Depending on the age of the children, we will discuss percentages. Younger children may need this divided into fractions instead. Explain that a "whole" is 100%, and each type of trash will have its own slice, or percentage. Each of these slices (percentages or fractions) added together will equal 100% (or a whole).

Start by asking, "What kind of trash do you think makes up the biggest percentage of trash that goes into our landfills?" Let them guess. Once they figure out it's paper, then have several children come up to place paper wads (popcorn or marshmallows) on that slice. Discuss other types of trash thrown away and fill in each particular percentage (slice) as the children name them off. Continue to do this with each "slice", letting the children add the "trash" as you go.

Here are the categories of trash and their percentages based on the 2011 Purdue University Calumet "Municipal Solid Waste Characterization Study for Indiana" (www.IN.gov/idem/recycle/files/msw_characterization_study.pdf chart available at the end of this lesson plan):

a. Paper (newspapers, junk mail, school papers, magazines)	28%
b. Yard Waste (grass clippings, tree limbs, weeds, leaves)	6%
c. Metal (food cans, aluminum foil, soda cans, fencing)	6%
d. Food Waste (banana peels, chicken bones, food scraps)	11%
e. Plastics (soda bottles, detergent bottles, milk jugs)	16%
f. Glass (apple juice bottles, soda bottles, food jars)	3%
g. Household Hazardous Waste (paint, aerosol cans, mercury, oil, electronics)	1%
h. Other (tires, diapers, plastic bags, textiles, wood furniture, rubber, construction debris, fines and sharps)	29%

Laminate signs on toothpicks to help keep track of what each slice was (see photos in the extra materials at the end of this lesson plan). As each item/percentage is introduced, the children will name off things that would be included in that section. Several children will help by putting food that represents those items on that "slice". After they fill each slice, ask them to consider what a better option than throwing it in the trash would be (recycling, reusing, composting, etc.). Once the "landfill" is full, ask them, "What percentage of trash in a landfill should never have gone into the landfill in the first place?" Let them guess the percentage. "Would it surprise you to know that about **80%** of what we throw away should never have gone into the landfill in the first place? Only roughly **20%** of the waste we make should be put in landfills as actual trash." Fill in 80% of the cookie with chocolate syrup or cut out approximately 20% and remove it from the pan. Explain that only the section that does not have syrup or that is set aside is actual trash. Everything else should have been recycled in some manner. Remind them that at that point, they are paying attention only to the size of the piece, not the type of trash remaining inside the piece.

13. Discussion/Follow-up questions: Stop to think about what you throw away! Be your own garbologist at home! If what your family throws away can be recycled or reused, the garbage can is not where it goes. This is called **waste diversion**. Talk with your parents about the proper way to dispose of items and have them call their local Solid Waste Management District or Recycling District office if they're not sure.

14. Extensions/Related Activities (optional):

15. Resources:

<http://your.kingcounty.gov/DNR/Kidsweb/solidwastemain.htm>

www.cleansweepusa.org/educators.aspx

www.earth900.org

www.epa.gov/osw/

"Municipal Solid Waste Characterization Study for Indiana"

www.IN.gov/idem/recycle/files/msw_characterization_study.pdf



Landfill Cookie Flags



Paper
28%



**Yard
Waste**
6%



Metal
6%



**Food
Waste**
11%



Plastic
16%



Glass
3%



HHW
1%



Other
29%

Edible Landfill

1. Category: Landfill and Incineration
2. Grade Level(s): 4-5
3. Correlation to State Standards: SCI.4.2.4, SCI.4.2.5, SCI.4.2.6, EL.4.1.3, EL.4.1.7, EL.4.7.1, EL.4.7.2, EL.4.7.8, EL.4.7.15, SS.4.2.6, MA.4.1.4, MA.4.2.1, MA.4.2.2, MA.4.2.12, SCI.5.3.1, SCI.5.3.2, EL.5.1.4, EL.5.1.6, EL.5.7.1, EL.5.7.2, EL.5.7.3, EL.5.7.12, MA.5.1.4, MA.5.2.1, MA.5.2.6
4. Description/Purpose: This program is designed to be a completely interactive learning experience. Participants will learn the differences between dumps, Solid Waste Disposal Facilities, and incinerators as final destinations for trash. They will also learn about the contents of the waste stream and the role they play in waste disposal and diversion. A primary focus will be placed on why it is important to use waste alternatives to reduce the amount of waste destined for landfills and incinerators.
5. Duration: 45 minutes – 1 hour
6. Background Information: When doing this program, students will likely need to be reminded of general food-related health practices such as washing hands and excusing oneself to cough or sneeze. It is also important to note that there are many variations of this project, which include group construction and distribution and/or the use of other edible materials.
7. Application to real world situations: The goal of this program is to make students aware of the fact that they generate waste and that they are responsible for that waste; it also introduces Solid Waste Disposal Facilities as valuable outlets for waste that should be used for disposal of non-recyclable and non-hazardous wastes. The application of this knowledge to their everyday lives, and especially to their home, is a desired consequence. The information disseminated in this program is part of a real world situation every time a person decides which disposal option (or bin) to use for their waste item.
8. New Vocabulary: Solid waste, Solid Waste Disposal Facility or Landfill, Dump, Incinerator, Waste to Energy, Cells, Bedrock, Leachate, Perforated, Geo-synthetic, Textile, Organic Waste, Decompose, E-waste, Household Hazardous Waste, Mercury, Toxic, Sharps, Fines, Methane, Erosion, Compost
9. Materials: ***Warning: Because this program uses foods that contain possible allergens, consult about possible student food allergies and have a full list of ingredient labels available.** Extra items should be kept in the original packages so the labels can be read and the item is free of contamination in the case that a student is able to consume a specific item. The ingredients listed in the chart below are suggested and consequently any or all ingredients can be substituted to meet the needs of the students and/or educators. These items are therefore recommended only by merit of their success in previous usages and are intended to guide the selection of ingredients necessary for this environmental educational program. In order to maintain the overall experience of the project and the quality of the educational message, the altering of quantities per student is not recommended.
10. Preparation: Buy and prepare all materials in advance. One can buy containers to use, but reusing sectioned Veggie or Fruit trays works really well. Take everything that doesn't fit in the containers along as well. Use tables large enough for 4-6 students to stand around. Set tables as indicated above, placing one napkin, cup and designated color for eating spoon in front of each place where the student will stand. Setup for each table: 5/6 participants per table, 2 spoons per item. All other materials should be accessible in the center of the table. Draw a pie chart (Purdue Calumet study example available at the end of this lesson plan) on the board to represent the waste stream for reference when it comes time to fill the landfill. Write in the categories of waste as you go, asking students to make a guess for each category. Before the students arrive for the lesson, make an example landfill to demonstrate what it would look like to have a landfill without any recyclables or compostables in it. Make sure to add all base and cap layers. Set this aside for later.
11. Pre-activity questions: "Today we are going to TALK TRASH, or rather Municipal **Solid waste**, which is what we call all of the things left over from the things we use. We are going to talk about how much stuff we throw away and what happens to it. We are also going to make a delicious treat called the Edible Landfill.
Can anyone give me an example of solid waste? -- any material that is left over and no longer serves its original purpose; everything from banana peels and gum wrappers to shoes and TVs.
Do you know how much waste you make each day? We each make 4.5 pounds of waste per day! Write out a math problem for the students to see including: the amount of waste per day, number of days in the year, number of people in the U.S., and then the answer, $4.5 \times 365 = 1642.5 \times 300,000,000 = 492,750,000,000$ pounds in the U.S. each year. Just think about how old you are? So... That is A LOT of waste! The U.S. has only 6% of the world's population and we make HALF of the world's waste.

Edible Landfill Contents			
Item	Amount per student	Amount per 130 students	Notes
9 oz. Clear Cup	1	130	Biodegradable
Spoon	1	275	2 colors of spoons: 1 for eating 1 for scooping (+24 per table) Biodegradable
Napkins	≥1	130	Recycled content
Graham Cracker Crumbs	4 tsp.	6 boxes	13.5 oz. each
Fruit Rolls	2 1in squares	7-8 rolls	all natural options are available
Choco Puffed Rice Cereal	2 tsp.	1	Family bags 42 oz.
Fruity Puffed Rice Cereal	2 tsp.	1	Family bags 42 oz.
Puffed Rice Cereal	2 tsp.	1	Family bags 36 oz.
Chocolate Puffed Cereal	1 tsp.	1	Family bags 41 oz.
Puffed Corn Cereal	1 tsp.	1	Family bags 36 oz.
Raisins	1 tsp.		
Circle Cereal (wheat)	1 tsp.	1	Family bags 42 oz.
Fruit Circle Cereal	1 tsp.	1	Family bags 36 oz.
Pretzel Sticks	1 (whole)		The thin kind, not thick
Pretzel Sticks	1 (break in half)		The thin kind, not thick
Chocolate Syrup	1 squirt	2	24oz, 6 containers: One bottle makes 6 individual containers, or one per group
Green Sprinkles	3 shakes	2	Died Sugar, 6 containers
5 section containers (Veggie/Fruit Trays)		12	2 for each table
Rounded square bowls		12	6 for Grahams, 6 for fruit rolls
Scissors		1	
Rags		3-4	For clean-up
Review Worksheets	1	130	Master copy for teacher
Bags		2	Compostable

So when we throw ALL of that waste “away”, where is away? Does it magically disappear when it is put in the garbage truck? Of course it doesn’t. Trash usually ends up in one of two places - an incinerator or a landfill.

An **incinerator** is basically a specially designed furnace which burns or combusts waste materials. Some incinerators use the heat energy they create to produce different kinds of power. That is called **waste to energy**.

Another is called a **landfill**. Do you know what a landfill is? The landfill replaced what used to be called a **dump**. Many years ago, people just “dumped” their trash into big holes (thus the term “dump”). When the hole filled up, it was covered with dirt and left alone. Prior to solid waste laws passed in the 1980s, the way trash was disposed of at dumps was causing harm to the environment in the land, water, and air. As laws and regulations improved, solid waste disposal became more environmentally friendly. Now our trash goes to what is called a **Solid Waste Disposal Facility** or landfill. It is essentially a big hole in the ground that is designed to protect the environment and human health with many protective liners and layers before the garbage ever goes into it. The environment, which includes the ground, water, air, plants and animals, can be harmed by waste and the things that waste generates if it is disposed of improperly. So, we take special care at landfills to make sure that the environment is protected.

So where does the trash in your city/town go? (Discuss where the solid waste is taken in this area.) It depends on who is hauling the garbage. Do you know where your household trash goes? It goes to _____(fill in where the waste goes in your area)_____ Have you ever visited a landfill or incinerator? AWAY is not as far as we might have imagined, ----(place mentioned in the last sentence is _____(x miles)_____ from where we are right now.”

12. Directions/Procedure: “We are going to construct a Solid Waste Disposal Facility or landfill cell using all these yummy things to represent all the different parts of a landfill.

An average landfill takes up 100 to 200 acres of land. The area must be free of debris and able to hold the weight of the landfill mass. The landfill is divided into many different smaller areas called **cells**. So, think of your entire group as a landfill and each of you will make one cell. As waste is put into landfill cells it is compacted/ squashed continuously. Now you add the various part of the “waste” to the cup. As each layer is added, fill in the pie chart that you drew earlier and discuss each section of waste. Use different colored markers for recyclables versus waste.

LAYER 1 – cup Everyone has a cup. This cup represents the hole that has been dug out for the base of the landfill. Although landfills are deep, they rarely reach **bedrock**, which is the bottom layer of rock deep in the ground.

LAYER 2 –Chocolate Puffed Cereal, 1 spoon – this represents a layer of compacted clay 2 to 5 feet thick that acts as a barrier. The clay used is a natural barrier and only allows liquid to penetrate at 1.2 inches per year at the most, which is very slowly. In a real landfill this layer goes all the way up the sides around the cell, but we are making this one so that we can see all the layers.

LAYER 3 – 1 square of fruit roll – next we add a **geo-synthetic** liner. What is that? We take the word apart and figure out that geo means earth and synthetic means man-made; this liner is made by people to act like a natural barrier. It is a layer made of a material that keeps waste from getting out into the natural materials, like clay and then into the environment. This material is impermeable, which means that it is designed not to allow liquids to pass through. It is like a very very large plastic trash bag.

LAYER 4 –1 pretzel stick, broken in half then 1 spoon of graham cracker crumbs this layer is the leachate protection system. What is leachate? **Leachate** is garbage juice! All of the liquid put in the trash, all the liquid created by decomposing (rotting) and rain water that might get in while a cell is being filled is part of this. This layer is made of pipes (pretzel) which are **perforated**, or holey on top to allow leachate to enter the pipes and then sand (grams) to help hold the pipes in place and ensure that they are not crushed. The pipes collect and move the leachate to collection ponds, or wells that are monitored and treated. The sand is also an absorbent kind of material, more absorbent than say, rocks. It serves as a part of the filter as well.

LAYER 5 –Graham Cracker Crumbs, 1 spoon – this is another layer of sand and dirt, which also is intended for drainage.

That concludes the BUILD part of making a landfill. How many layers have we made? 5! Have we put in any waste yet? No we haven’t, but now we are ready for the Fill stage, which means we have to truck in some waste materials from our homes.

LAYER 6 – WASTE! (Statistics are from the Purdue University Calumet 2011 “Municipal Solid Waste Characterization Study for Indiana” www.IN.gov/idem/recycle/files/msw_characterization_study.pdf)

1. Puffed Rice Cereal, 2 spoons – this is paper and cardboard, 28% of waste, which is made from trees.
2. Fruity Puffed Rice Cereal, 2 spoons– this represents **organic waste** – Organic means natural, these are wastes from foods, like leftovers or scraps 11%, and yard wastes like leaves and grass 6% – they are called organic, or natural because in nature the Earth **decomposes**, or breaks down the wastes into nutrients - this makes up 17% of our waste.
3. Raisins, 1 spoon – this is plastic. Milk jugs, margarine bowls, water bottles, wrappers etc. are all plastics which is 16% of what gets thrown out. (Side note - talk about compostable cups vs. normal plastic cups and how long they take to decompose in a landfill. Also point out the spoons.)
4. Puffed corn cereal, 1 spoon – this is glass. This is 3% of what goes in a landfill. Glass can be recycled forever without losing its strength, it can be melted and reformed indefinitely.
5. Circle Cereal (wheat), 1 spoon – these are metals, 6% of what is put into landfills as waste. This category is made up of metal from soup and pop cans as well as small metal items from houses.
6. Chocolate Puffed Cereal, 1 spoon – these are wood, textiles, home construction materials and rubber, which is 20% of the waste put into landfills. Wood makes up 8%, while textiles and construction materials make-up about 6% each of the total for this category. Rubber makes up about 0.5% of this category (so we round) What is a textile? **Textiles** are cloth or fabric, this means clothes, shoes and other fabric items that people can't use anymore.
7. Fruit Circle Cereal, 1 spoon – This is OTHER. It makes up 10% of what is in landfills and is saved for last because it catches all items not previously noted. What could other be? Diapers make up 3% of the 10% in this category. Durable goods, such as sports equipment, toys, ceramics, appliances and electronics make up about 3%. Although electronics (called **e-waste**) are classified as durable goods, they should not be disposed of in landfills or incinerators, in fact, there is now a law in Indiana against it. They should be disposed of through available local programs for recycling. **Household Hazardous Waste** makes up less than 1% of the 10% other category. Household Hazardous Wastes are harmful to human health, animals and/or the environment and include materials such as **mercury**, which is an element that is **toxic** (poisonous to humans and animals). Things such as **sharps**, injection needles, and **fines**, which are crushed or powdered materials, make-up the remainder of this category.
8. Chocolate Syrup, 1 squirt – around the edge. This is leachate; remember that leachate is the liquid that makes its way into the landfill cell as it is being filled.

LAYER 7 – pretzel stick, vertically inserted – these are the methane gas monitoring pipes that are placed into the cell to capture and monitor the **methane** gas that is created by the waste. They are placed vertically to ensure that no pockets of gas are trapped inside, because methane is flammable. Methane is collected at most landfills and used as energy to heat homes. (*Use information about your waste destination if available or point out: Rumpke Landfill in Cincinnati, OH or Southside Landfill in Indianapolis that collect Methane gas to heat homes and businesses. Southside Landfill also operates a large greenhouse on it's methane gas.*) This is another example of waste to energy.

CAP YOUR LANDFILL

This is the end of the filling stage of a landfill. Now we must close up the landfill. Why should we cover it over? The Landfill is given a cap so that no rain water can enter the landfill; it also prevents animals from getting in and gases and waste from getting out.

LAYER 8 – Graham Cracker Crumbs, 1 spoon – the first layer placed on top of the waste is soil.

LAYER 9 – Chocolate Puffed Rice Cereal, 1 spoon – this is more clay, do you remember that from the bottom of the landfill and what it does? It acts as a barrier.

LAYER 10 – 1 square of fruit roll – this is another geosynthetic layer made of plastics which also serves as another layer of barrier.

LAYER 11 -- Graham Cracker Crumbs, 1 spoon – a layer of sand and soil is added as a final measure on top of the liner.

LAYER 12 – Green Sprinkles, a few – grass is planted as the very last layer of the landfill because it keeps the dirt from eroding. What is **erosion**? Erosion is the movement and loss of soil by water or wind forces. Why can't trees be planted on top of landfills? The roots could destroy the lining system.

Now that our landfill is closed, can we walk away and never think about it again? NO, a solid waste disposal facility such as the landfill that we built must be monitored for 30 years after it is closed. This is to make sure that the environment around the landfill is not being harmed by the byproducts of the waste itself, (the leachate and/or the methane gas). If leachate gets into (contaminates) groundwater, then it could contaminate plants and animals, and even humans. Hence, groundwater is monitored as a precaution. Landfills take special measures to predict problems and make sure the landfill remains safe. They also provide financial assurance that the landfill will be taken care of in general and especially in the rare case that something need to be cleaned or corrected after the landfill is capped.”

At this point, allow students to eat their treat as you finish the lesson.

“Before you got here, I made one of my own. (Show the landfill made earlier.) Can anyone tell me why mine is different than yours? When I made my landfill, I imagined a world where everyone followed the 3R’s like I do. Everyone reduced, reused and recycled. I didn’t put any materials into the landfill that can be recycled, or disposed of in a more environmentally friendly way.

Can you see the Choco puffed cereal, I didn’t put tires in the landfill, I recycled them into mulch to be used on playgrounds and in flower beds. Can you find paper? I recycled ALL of the paper I could instead of putting it in the landfill. (Point out any area specifics about items that are and aren’t accepted, for clarity) How about plastics and glass? What do you think I did with those? I recycled them. Recycling one glass bottle saves enough energy to keep a light bulb on for 20 hours! And glass NEVER breaks down in a landfill. What were the metals? I recycled those too! Did you know that when you recycle one aluminum can you save enough energy to run your TV for 3 hours? My Organic wastes can be composted, which means that it is allowed to decompose naturally right in my own backyard. In some areas, residents are not permitted to put yard waste in the trash because it takes up so much space in landfills.

I do have some waste in my landfill, and that is because landfills are necessary for final waste destination for things that cannot be recycled or composted. My landfill is the same size as yours, but it is much less full in the same amount of time. Why is it important to use landfills only for the things that we have to put in them? WASTE DIVERSION, RESOURCE CONSERVATION and POLLUTION REDUCTION. Diverting waste from landfills by recycling and composting conserves natural resources as well as reduces manufacturing pollution.

How can you best use the resources in our area to reduce waste and recycle?”

Discuss any available programs not yet mentioned.

13. Discussion / Follow Up / Questions: “As you eat and enjoy your treat, think about how much waste was put in your landfill. Think about what it represents, and remember that it is only one cell and the classroom is full of landfill cells that represent 500 billion lbs of waste per year in the United States. There is no rule that says you HAVE to generate 4.5 lbs of waste per day, right? Who makes your waste? You do. So, Who is responsible for the waste that you make? YOU ARE! Be an Eco-Advocate and reduce, reuse and recycle.”

14. Extensions/Related Activities (optional): Follow-up worksheet titled Edible Landfill Worksheet

(Tip: Call your local hauler to ask for free samples of geosynthetic landfill liner.)

15. Resources: Variations and Ideas: www.IN.gov/idem/files/solidwaste.pdf

Study: www.IN.gov/idem/recycle/files/msw_characterizarion_study.pdf

Edible Landfill Review (p. 1)

Use the following vocabulary words to fill in the blanks below.

reduce	recycling	erosion	methane	30
	cell	compost	landfill	
five	reuse	leachate	4.5	wells

1. Our County does/doesn't have a _____. Our waste goes to _____.
2. According to the EPA, each person creates about _____ pounds of waste per day.
3. The working area of a landfill where waste is currently being placed is called a _____.
4. _____ is the liquid in a landfill cell that can potentially contaminate soil and groundwater, so it is collected in holding tanks for pretreatment and monitoring.
5. There are _____ layers engineered into a landfill before any waste is ever put in.
6. _____ gas is a natural by-product of waste decomposition. It is collected from the landfill, purified, and sold to homes for heating and cooking.
7. Groundwater monitoring _____ are in place around landfills to insure that the liners and other safeguards are working to protect the soil and groundwater.
8. Landfills must be monitored for _____ years after the landfill is given its final cap.
9. Grass is planted on capped landfills to prevent _____ of the soil.
10. _____ is largely responsible for diverting waste from landfills.
11. Before recycling, we should _____ the amount of trash we make in the first place, and then _____ every material possible.
12. Instead of throwing away food scraps, vegetable peels, and other organic matter, we can mix them with yard waste to make _____, which is a beneficial soil amendment.

Edible Landfill Review (p. 2)

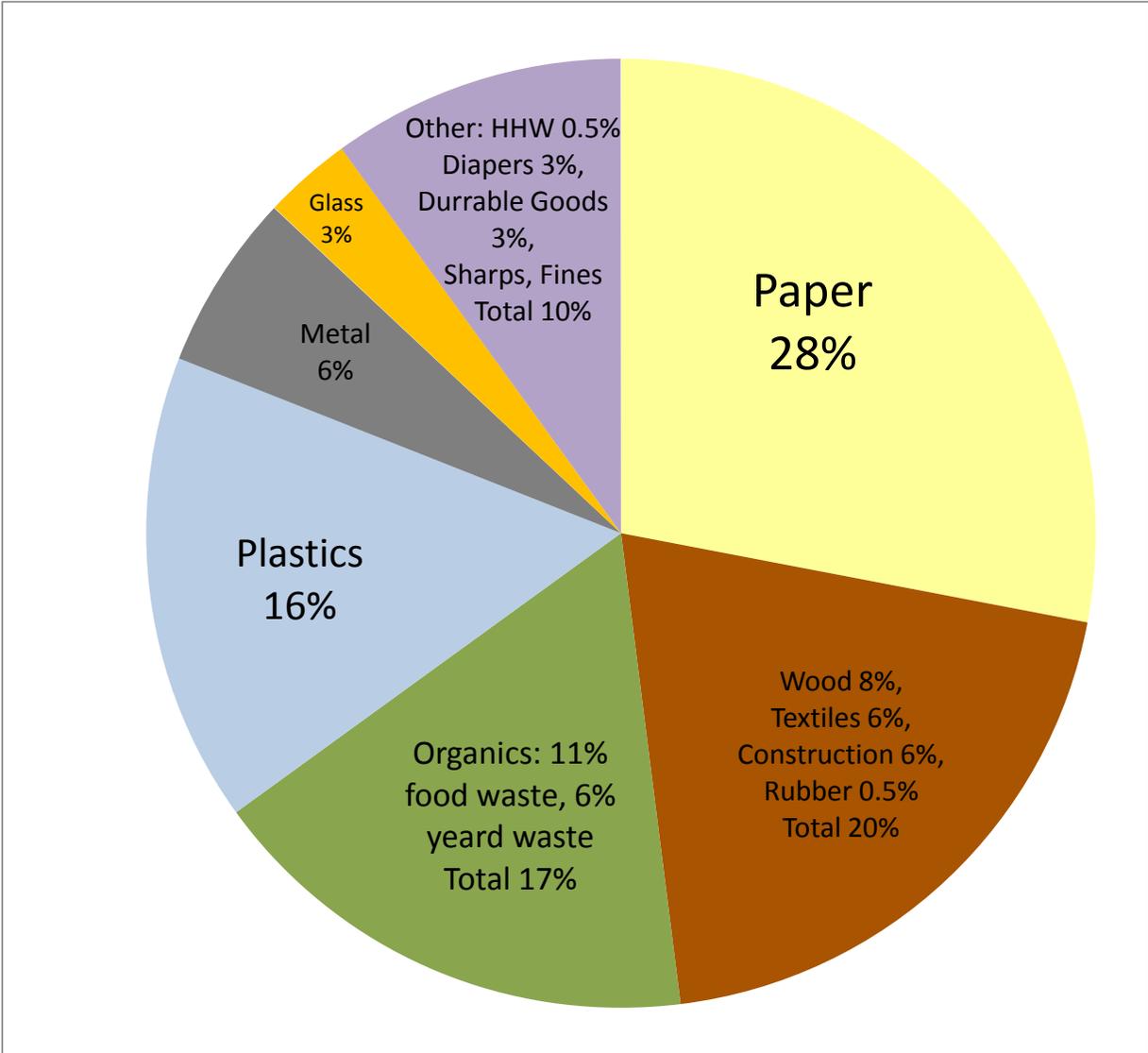
		Landfill cell	Edible Landfill
	12.		Green Sprinkles
	11.		Grahams
	10.		Fruit Strip
	9.		Chocolate puffed rice cereal
	8.		Grahams
	7.		Pretzel
	6.	<ul style="list-style-type: none"> a. b. c. d. e. f. g. h. 	<ul style="list-style-type: none"> a. Chocolate Syrup b. Fruit circle cereal c. Chocolate puffed ball cereal d. circle cereal e. puffed corn cereal f. Raisins g. Fruity cereal h. puffed rice cereal
	5.		Grahams
	4.	<ul style="list-style-type: none"> a. b. 	<ul style="list-style-type: none"> a. pretzel (broken in half) b. Grahams
	3.		Fruit Strip
	2.		Chocolate puffed rice cereal
	1.		cup

Edible Landfill

Municipal Solid Waste Characterization Study for Indiana Purdue University Calumet Study

Original study available at

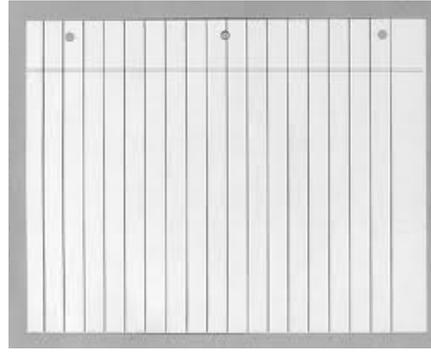
www.in.gov/idem/recycle/files/msw_characterization_study.pdf





PLASTIC





PAPER





CARDBOARD





METAL





BOOKS



Renewable and Non-Renewable Natural Resources

How Do They Do That?

1. Category: Renewable and Non-Renewable Natural Resources
2. Grade(s): K-5
3. Correlation to State Standards: SCI.K.1.1, SS.K.4.1, SS.K.4.2, SS.K.4.3, SCI.1.1.1, SCI.1.3.4, SCI.1.3.5, SS.1.2.4, SS.1.3.9, SS.1.4.1, SS.1.4.5, SCI.2.4.2, SS.2.2.5, SS.2.5.1, SCI.3.2.5, SCI.3.2.6, SCI.3.4.2, SS.3.4.2, SS.3.4.8, SCI.4.2.4, SCI.4.2.5, SCI.4.2.6, SCI.4.3.4, SCI.5.1.3, SCI.5.1.4
4. Description/Purpose: This program teaches students the importance of renewable and non-renewable natural resources to our Earth. Students will also learn how reducing, reusing, recycling, rethinking and buying post-consumer products they can help protect our natural resources, save energy, save money and reduce pollution.
5. Duration: 45 minutes - 1 hour
6. Background Information: Everything that we have or use can be traced back to the Earth and its resources. We use these resources to make the items that help us have more comfortable and convenient lives. This program has been developed to demonstrate to students that they are part of a system that uses and disposes of natural resources. It also teaches students the value of recycling as a method for conserving resources.
7. Application to real world situations: Students will learn about the creation of a product from a natural resource. They will be able to connect the objects in their daily lives with the process of production and recycling of natural resources.
8. New Vocabulary: Non-Renewable, Renewable, Natural Resources, Reduce, Reuse, Recycle, Rethink, Post-Consumer Recycled Products, Close the Recycling Loop
9. Materials: For this program you will need to have a variety of items to showcase what have been made from the reusing and recycling process. Some suggested examples are below. The *“How Do They Do That”* activity cards found in the extra materials at the end of this lesson plan will also be needed to complete the program.
 - a) The following are examples of reused or recycled products that we have in our “How Do They Do That” bin to showcase at the end of the program: A belt made from a seatbelt, bowl made from telephone wire, a CD case made from a license plate, a bracelet made from magazines, a bag made from the top of the Colts dome, a placemat made from reused newspaper bags and a flower pot made from recycled tires. Educators are welcome to use any other reused or recycled products they may have. It is helpful to have a variety of items to showcase. We use approximately 10-12 different items in the program.
 - b) Promotional item made from recycled materials to give to each student/participant (this will need to be purchased by the educator or entity of the educator). We give Preserve Toothbrushes to each student to help them understand the concept of closing the loop. Any type of recycled product that the students can keep will be a good physical reminder of the value that recycling and buying recycled can have on our Earth (saving natural resources), our community (creation of jobs), and on our lives (reduction of waste and increase in reuse and recycling can help us save money and increase our creativity).
 - c) Using the sheets found in the extra materials at the end of this lesson plan, make necklaces with pictures and actions that show the process of turning a natural resource into a product we buy at the store. There are two different versions including paper made from trees and aluminum cans made from bauxite ore. It is also helpful to have an example of bauxite ore and pre-form examples of the plastic recycling process to show the students when you are talking about these procedures.
 - d) Having an example of the recycled plastic process as well as an example of bauxite ore would be helpful. We obtained our recycled plastic examples in the 4 pre-form containers from NAPCOR. You can buy bauxite ore from a variety of places online.
10. Preparation: Prepare the room by placing tables at the front of the room to display the reused and recycled content items. Set out the recycled plastic process and the bauxite ore. Ensure the cards are in numerical order and untangled. Tip: talk to the cafeteria before presenting to find out what the children had for breakfast that morning. This helps you assist them in thinking of items they already that day and whether it was a renewable/natural resource and if it was recyclable. Where did coffee, orange juice, bagel, etc. come from?

11. Pre-activity questions: Where do the things we buy at the store come from? Where do they go when we are done with them?

12. Instructions / Procedure: “What are the 4 R’s (**Reduce, Reuse, Recycle, Rethink**) and specifically what can be recycled, especially in your area? Why do we do the 4Rs? **Reducing** means using less or throwing away less. **Reusing** means getting the most use out of a product by using it again for something else and thinking creatively about how it can be most useful rather than throwing it out. **Recycling** is a process that uses waste materials to manufacture new products. The 4th R is Rethink. When we **Rethink**, we consider carefully our impact of the Earth and how best we can do the other Rs. All of these things help to decrease pollution, save energy and save natural resources. What are natural resources? What are some examples? Did you know that everything that is in this room and everything that you see or have is made from natural resources? We can trace everything we have or use back to the earth. A **natural resource** is something, such as a forest, a mineral deposit, or fresh water, that is found in nature and is necessary or useful to humans. Some natural resources are **renewable** (trees - more can be planted-we can get more of the resource through effort) and some are non-renewable (petroleum - there is a set amount of it - when it is gone it is gone). Show examples of plastic, aluminum cans, steel cans, etc. to explain the differences between renewable and non-renewable.

Two ways to conserve resources is by recycling and to buy products made from recycled materials. These products are called **post-consumer products**. Let’s look at the things that we put in the recycling bin to see if we can find out what natural resources they come from and if they are non-renewable or renewable sources. Are they **post-consumer products**?”

Paper – Tree – renewable

Glass – Sand – non-renewable (not in our lifetime)

Metal – (steel and aluminum) – Minerals – non-renewable

Plastic – Petroleum – non-renewable

If we could recycle just these things we could conserve so many natural resources.

Activity: This activity compares the production of a consumer good made with raw materials to that of a product that is made with recycled materials, a **post-consumer product**. These materials may be either **non-renewable resources or renewable resources**. Discuss the difference between the two again in the context of this activity. Students will do this by acting-out both of these production processes using the activity cards available in extra materials at the end of this lesson plan. This activity demonstrates the conservation of, time, energy and money and gives students an understanding of the environmental benefits of “closing the recycling loop” (manufacturing new products with recycled materials). Depending on the age of the students, pick different natural resources (Trees to paper for younger students and Bauxite to aluminium can for older children).

“We are going to recreate the process of getting a natural resource and making a product from those raw materials. We will also show the process to make that same product using recycled materials. These products are called post-consumer products.”

Pass out a card to each student. Instruct them to do the action on the card in the order that the natural resource would be gathered and made into the item. After the action begins, the students will continue to do their action until the next step in the process begins. Then go over the steps of the process of recycling, using different students as demonstrators and pointing out which steps aren’t needed anymore. The flow of the activity is as follows:

1. Start with all of the steps lined up at the front of the class
2. Tell the students you will be timing them as they act out the process but first give the actors and actresses a moment to get familiar with what their move is. Each step in the process is portrayed by their move.
3. Review the steps of the process with the entire class going through each step and allow the actor/actress to practice his/her moves.
4. Set the timer and on your mark, get set... GO! Have the children act out their activity cards one after another with each child continuing their action until all actions in the process are complete.
5. Let them figure out how long that took. Does it really take that long in real life? No! It would take much longer! Why?
6. Now ask the last person in the process what they are going to do with the item they purchased when they are done with it? If they say “Throw it away.” You can say, “Okay, I guess we have to go back to the Earth and get some more Bauxite or some more Trees”. Point out that could not go on forever. If they say “Recycle it.”, move to step #7.

7. Talk about recycling and what activities would be eliminated if we were to recycle the product. Remove those children from the line. Now have the students look at the line. Point out the line is smaller because when we make paper from paper, or cans from cans (depending on which Activity Card set you are using) instead of paper from trees, or cans from bauxite ore. We save the natural resource, we save energy in all of those other steps and we save space in the landfill because our shopper made a wise choice.

8. If you think the children are old enough to not get confused, discuss how recycling jobs are created from recycling materials. These jobs may include the hauler, Material Recovery Center (MRF), truck/driver to the mill or refinery, etc. Add those activity cards/children back into the line.

9. Ask the shopper what would happen if they “Reuse” the can or the piece of paper. Would we need any of the other people/steps in the process? No. Why? Reusing only takes you and your imagination. That is why we say that Reusing is even better than recycling. We save all of the energy that the process would take for getting a natural resource and turning it into a product or recycling a product. We save the natural resource and we also save space in the landfill. So always try to reuse an item first (for younger kids this is a great opportunity to remind children to always ask their parents before reusing something to make sure it is safe) . If an item can't be reused then recycling is an awesome alternative. As we know recycling saves valuable resources, energy and helps create jobs.

It is not only important to recycle, but to buy recycled post-consumer products made from recycled products. This is called **closing the recycling loop**. Discuss the importance of buying post-consumer products made from recycled materials and how this is a closed loop. For example, when shopping, look for paper products (such as copy paper, paper towels, or toilet paper) made from recycled paper - it is usually labeled as “recycled content” or “post-consumer”. There are many cool things on the market that have been made from the very things that you put in your recycling bin. Show all of the examples (listed in the Materials section) and describe how they are made (also listed in the materials section). Point out that you can reuse an item before recycling it.

Tip: Younger children usually follow the paper activity better while older children can follow the more complex cycle of aluminum cans.

13. Discussion/Follow Up questions: What is the difference between a non-renewable and a renewable resource? Which kind do we want to use (when possible) and why? (The answer being to conserve natural resources and energy). How can you help conserve our natural resources? What is the benefit in doing so? Show examples of plastic chips or spun fiber used before they are melted and recycled. Then show products like blankets, pens, bags, stuffed animals, toothbrushes to emphasize the concept of a closed loop or cradle to grave cycle. If you need items to show, various companies are willing to donate samples for educational purposes.

14. Extensions/Related Activities (optional): Begin recycling at home and/or find some recycled or post-consumer products at the store and consider replacing non-post-consumer items with them. Talk about the cycle of recycling with regards to a closed loop.

15. Resources: Cards available in the extra materials at the end of this lesson plan as examples. Research Hoosier businesses that make or sell recycled products. What did you find and where did you find it?

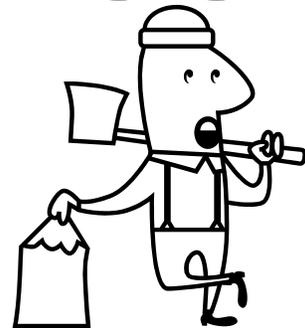
1

Tree



2

Logger



3

**Bark
Stripper**



4

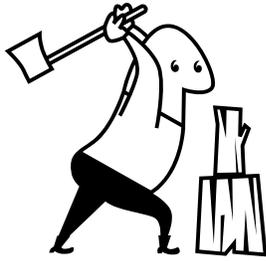
Driver



<p>Action:</p> <p>Pretend to chop down the tree</p>	<p>Action:</p> <p>Stand straight and tall with arms out</p>
<p>Action:</p> <p>Pretend to drive a “big rig”</p>	<p>Action:</p> <p>Pretend to shred the bark with your nails</p>

5

Chipper



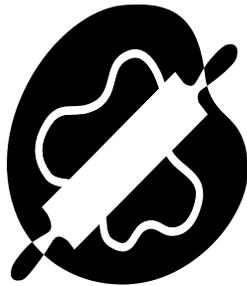
6

Pulp Maker



7

Roller



8

Cutter



Action:

Be a big blender

Action:

Pretend to chip the log

Action:

Pretend to cut the paper

Action:

**Pretend to use a
rolling pin**

9

Driver



10

Store



11

Consumer



Action:

**Pretend to sell a piece
of paper to your
customer**

Action:

**Pretend to drive a
“big rig”**

Action:

**Pretend to buy a
piece of paper**

1

Bauxite



2

Miner



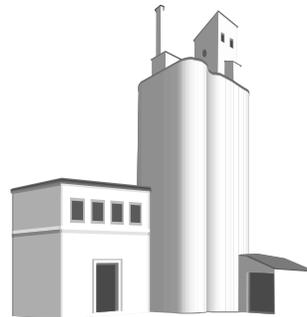
3

Engineer



4

Mill



<p>Action: Pretend to use a pick-axe</p>	<p>Action: Stand “stone-cold”</p>
<p>Action: Pretend to smash rocks</p>	<p>Action: Pretend to drive a train</p>

5

Driver



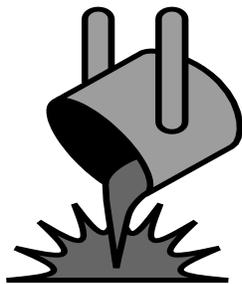
6

Refinery



7

Smelter



8

Power Plant



Action:
Act “hot”!

Action:
**Pretend to drive a
“big rig”**

Action:
Do a Dance!

Action:
Do a Dance!

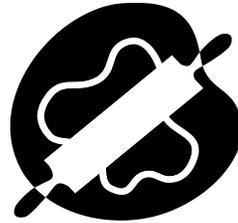
9

**Ingot
Maker**



10

**Aluminum
Roller**



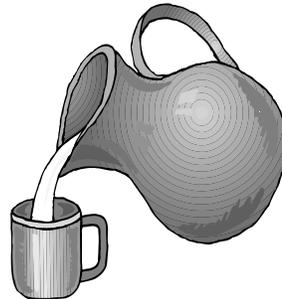
11

**Can
Maker**



12

**Can
Filler**



<p>Action:</p> <p>Pretend to roll out dough</p>	<p>Action:</p> <p>Pretend to make blocks</p>
<p>Action:</p> <p>Pretend to pour liquid in a can.</p>	<p>Action:</p> <p>Pretend to punch a can shape out of the rolled out aluminum (like a cookie cutter).</p>

13

Driver



14

Store



15

Consumer



Action:

**Pretend to sell a
pop to your
customer**

Action:

**Pretend to drive a
“big rig”**

Action:

**Pretend to buy the
can and drink it.**

R-1

Hauler

R-2

**Material
Recovery
Facility
(MRF)**

R-3

**Truck
Driver**

Action:

**Pretend to sort
materials**

Action:

**Pretend to “haul” a
load of recyclables**

Action:

**Pretend to drive a
big semi-truck**

Coffee Can Papermaking

1. Category: Renewable and Non-Renewable Natural Resources

2. Grade Level: 2-5

3. Correlation to state standards: SCI.2.4.2, SS.2.4.1, SCI.3.2.6, SS.3.4.1, SCI.4.2.4 SCI.4.2.5, SCI.4.2.5, SCI.5.1.4, SCI.5.4.2,

4. Duration: 45 minutes

5. Description/Purpose: This lesson teaches students about the paper **recycling process**, and what it means to “**close the loop**”. It also stresses the importance in changing the way we use trees as a **renewable natural resource**, a resource of which we can get more. Using common household paper, students will tear, blend, and press old paper to create their own piece of paper. This simple process allows students to understand the paper recycling process on a personal level and a smaller scale. Each student will take home their own handmade paper!



6. Background: This program goes right to the heart of recycling by showing students exactly how the paper they recycle at home and at school gets made into new paper.

7. Application to real world situations: It teaches students the concept of “closing the loop” and gives them with their very own piece of handmade paper. We use paper everyday. This activity gives students a greater appreciation of trees as a natural resource and demonstrates the simplicity and importance of recycling to preserve that resource.

8. New Vocabulary: Recycle, Renewable Natural Resources, Waste Stream, Fiber, Pulp, Closing the Loop, Recycling Processes

9. Materials: Each student works with their own pre-assembled kit for this activity. Kits consist of 1 plastic coffee can, 1 cookie cutter or smaller metal can with both ends removed, 1 hardware screen, 2 window screens, 2 paper towels, 1 sponge, and 1 yogurt cup.

See specifics on each below.

- 1 or 2 cans depending on the desired shape of paper. A cookie cutter can be used in place of the smaller can. A 26-ounce coffee can works well as the base.

Tip! Plastic cans can be used over and over and they won't rust. The size of the other can will determine the size of your paper (a 13 ounce metal coffee can works well.) Cut both ends out of the smaller can. As an alternative to using a can for your mold, cookie cutters or other cut-out shapes can be used.

- An 8 oz. plastic cup such as a yogurt cup, sour cream, or butter container to hold pulp.
- 6 x 6-inch piece of hardware screening. This is a rigid wire screen sold at hardware stores. It often comes in 3 different sizes of openings (mesh)- I would recommend a size larger than window screen, but smaller than chicken wire, but any size works. Use duct tape to edge the screen for safety.
- Two 6x6-inch pieces of non-metal (for safety) window screen for each station. Again, tape edges. You can use plastic mesh sheets for this as well.
- A sponge that absorbs well. A cheap kitchen sponge is fine too.
- Good quality, heavy duty paper towels – They will get wet from use but can be used again, just let them dry and reuse again as often as possible
- Newspaper to cover work area.
- Blender - any old kitchen blender will do.
- Shredded Paper (via shredder or hand shredded)
- Glitter or flower seeds (optional)

10. Preparation: Have individual kits assembled (See materials list for details). Pre-make paper pulp in various colors (see directions below)

11. Pre-Activity Questions: Where does the paper you **recycle** at home and at school go? Walk through the steps of the truck picking it up, to taking it to the recycling center, and finally where it gets made into new paper. What is the problem with using trees to make paper. What was the 1st paper made from? What did the U.S. make paper from? This leads into the history of papermaking.

12. Directions/Procedure:

- The first paper was made from insects, such as wasps and silkworms.
- Give them the brief papermaking timeline:
 - 200 BC – paper made in China (cloth);
 - 1450s - Johannes Gutenberg invents the printing press with movable type;
 - 1494 – paper in Europe;
 - 1690s – paper in American Colonies;
 - 1860s – paper starts to be made from trees using wood.
- Trees are a valuable natural resource like land, air, and water.
- Have the students explain why trees are important to people and the environment (oxygen, habitat for animals, shade for us/houses, making paper products).
- People can conserve trees by planting new ones when one is old or cut down, and also by recycling paper that already exists. Explain that now if paper mills need new paper, they grow entire forests specifically set aside for papermaking.
- Show examples of types of paper products that can be recycled.
- Out of all the material in the **waste stream** (things people use-up and get rid-of), about 28% is paper products that could be recycled.

Directions/Steps for making your paper pulp:

- A. Have the children shred scraps of paper. Using colored scrap paper with lettering will make the project more interesting because the students can find the lettering in their finished paper.
- B. Add the scraps to the blender (1/4 to 1/2 cup). A little paper goes a long way.
- C. Add water to the blender about 2/3 full
- D. The blending of this mixture separates the paper into individual **fibers** and blends them with water to make a liquid called **pulp**. Put the lid on and blend (about 30 seconds to 1 minute and until the pulp is uniformly mixed and assumes the color of the paper shreds), explaining that the paper recycling plants use giant industrial shredders and blenders to make their pulp. (It is time saving to make up batches of different colors of pulp ahead of time. Store in pails with lids for later use)

Create your piece of paper:

1. Place your plastic coffee can as the base, open end up. This will be used to catch the water drained off the pulp.
2. Place the 6x6-inch hardware screen over the can's open end.
3. Place one 6x6-inch piece of non-metal window screen on top of the hardware cloth.
4. Put the tin can (with both ends cut out) or cookie cutter on top of the window screen. The top can and/or cookie cutter must be smaller than bottom can.
5. Each student will need a yogurt cup-full of pulp. Have them bring their cups to the front to be filled and scoop pulp into a container using a cup or ladle. Generally, it takes about 1 cup of pulp per student. Having several colors available for them to choose from also adds fun to the project.
6. Just for fun, they may also add either a few shakes of glitter or flower seeds to their pulp. If they add seeds the paper can be planted when they are done with it and it may grow flowers.
7. Pour the pulp into the top can, covering the screen inside the shape.
8. Let water drain into the bottom can. Have them listen to the dripping which keeps them attentive.
9. Raise the top can straight up and off.
10. Top the pulp with your second 6X6 window screen and press down with hands, pressing the water out and into the plastic coffee can.
11. Use sponge to press out and absorb more water. Once they have absorbed as much water as they can, have them lift up the two window screens with the pulp in the middle, leaving behind the hardware screen and the coffee can with water. Explain that the liquid left over in the coffee can is a waste product generated by the recycling process. On a small scale (here), our waste water is managed by screening the liquid left over in the coffee can to remove stray paper fibers before it goes down the sink. On a larger scale, the waste water must be managed properly by the recycling company.

12. Keeping it in layers (screen, pulp, screen), place it on a paper towel on a flat surface.

13. Top it with the second paper towel.

14. Apply pressure over the entire sheet until the new paper pops off the screens.

15. The paper is complete, but still needs to dry. It is recommended that they let it dry overnight at school. Once dry, then they can cut it, write on it or turn it into a cool bookmark. Let towels dry to re-use in future papermaking.

13. Discussion/Follow-up - Think about how often people use paper and paper products. Have the children name off ways in which they use paper daily (homework assignments, school newsletters, food packaging, etc...). Even though trees are a renewable resource, imagine how many trees it takes to make the Sunday paper (500,000+ or an entire forest). Making paper from recycled paper saves resources and energy and since paper is such a vital part of our lives, it makes sense to use recycled paper.

14. Extensions/Related Activities (optional): Tour a paper recycling facility

15. Resources: adapted from *Tin Can Papermaking* by Arnold Grummer (ISBN 0-938251-01-5), IPG Publishers, Appleton, Wisconsin.

Renewable is Do-Able

1. Category: Renewable and Nonrenewable Natural Resources
2. Grade(s): 2-5
3. Correlation to State Standards: SCI.3.2.5, SCI.3.2.6, SCI.4.2.4, SCI.4.2.5, SCI.4.2.6, SCI.5.3.1, SCI.5.3.2
4. Description/Purpose: This lesson creates awareness of natural resources and the differences between **renewable and nonrenewable resources**. Students will gain an awareness for the importance of using renewable resources for energy and manufactured products. During this activity students will: identify natural resources and distinguish if they are non-renewable or renewable, think critically about an environmental issues, and discover the environmental impact that mining causes to the Earth.
5. Duration: 40-45 minutes
6. Background Information: From the earliest historical record, we know that people have used the Earth's resources to make their lives better: Wood and peat for fuel and building; plants and animals for food and clothing; tree sap, tar and pitch for making vessels watertight; wax and rendered animal fat for candles and lamps; and plant fibers for papyrus and scrolls. As populations of people have grown, developed cultures, and passed on knowledge to future generations, we have discovered and invented thousands of ways to use the Earth's resources to make our lives more comfortable, more convenient, safer, and more enjoyable.
Natural resources can be classified as **renewable or nonrenewable**. Resources are considered "renewable" if they can be replenished within a relatively short period of time. A "**renewable**" resource is a material or energy source that can be replaced through natural, non-destructive processes, or which exists naturally and cannot easily be diminished by human activity. These include energy sources such as the sun, water, wind, biomass (plant materials converted into energy), and heat from below the Earth's crust. Renewable resources also include materials we derive from plants and animals for use as food and consumer products, which can be produced again and again through nondestructive, sustainable farming and cultivation methods.
"Non-renewable" resources are materials or energy sources that exist in nature, but it is not easily replaced through sustainable practices. These resources must be considered gone forever once used up because they take millions of years to regenerate. These resources also include materials and energy sources developed by human manipulation, which cause long term problems due to the creation of toxins, pollution, and hazardous by products. Some non-renewable resources are **fossil fuels** including oil, coal, and natural gas. Oil or petroleum is drilled and extracted from the Earth. The resulting crude oil is refined into hundreds of petroleum products including fuel for cars, plastics, household cleaning and personal care products. Minerals such as aluminum, iron and silica are also mined from the Earth, extracted and used as components in manufacturing products such as aluminum, steel and glass.
(Note to Educator: When age appropriate, this could be discussed. Water can be considered a non-renewable resource as well. The water we use and enjoy today is the same water that has been used on Earth for billions of years. Water is non-renewable because we cannot make more water. When it becomes polluted or we use more water than can be replenished this natural resource is depleted.)
7. Application to real World Situations: Students encounter products each day that are made with renewable and nonrenewable resources. They will gain valuable information about resources in this program that will enable them to understand the difference between the types of resources, and to become more informed consumers. They will also gain an appreciation for the concept of supply and demand.
8. New Vocabulary: Natural resource, Renewable resources, Non-Renewable resources, Fossil fuel, Conservation, Supply and Demand
9. Materials: *Note: Some of the materials for this program are under copyright; It is the responsibility of the presenter to ensure adherence to said copyright. Information is available through Go Natur'l Studios, LLC.*
 - a. Whiteboard or Projector Screen
 - b. Document Camera or smart board (most schools have these available, but if not a transparency and overhead can be used)
 - c. Red and Green Dry Erase Markers
 - d. Rustle the Leaf: Renewable is Do-Able Matching activity sheet (1 Copy or Transparency) (available in the extra materials at the end of this lesson plan)

e. Rustle the Leaf: Renewable is Do-Able Word Search and Classroom Comic Sheets found in the extra materials at the end of this lesson plan and at www.rustletheleaf.com/lessonplans/RustleLesson0410.pdf

f. “Small items” for “Pass the Bag” natural resource game (2 per student). These items should be small, expendable and replaceable, such as paper clips, stones, pieces of cut wood, buttons, pieces of cut straws, bottle tops, etc. Or, they can be consumable, such as pieces of wrapped candy with labels of different natural resources on them. The items represent different types of non-renewable resources. See the extra materials at the end of this lesson plan for examples.

g. One (1) paper, plastic, or cloth bag

10. Preparation: Gather enough “small items” to play the “Pass the Bag” game. You will need 2 items per student. If using a document camera, one copy of the “Rustle the Leaf” Renewable is Do-Able! Matching activity (found in the extra materials at the end of this lesson plan and at: www.rustletheleaf.com/lessonplans/RustleLesson0410.pdf) will be needed. Or, if an overhead projector will be used, a transparency of the page will need to be made ahead of time. Make copies of the “Rustle the Leaf Classroom Comic” (1 per student)

11. Pre-activity questions: Write the word “renewable” on the board. Ask if anyone knows what this word is and what it means. After discussing, the term “renewable,” add the letters “non” to make the word “non-renewable”. Repeat the question/answer process for this new word and compare the difference between the two types of resources.

12. Instructions / Procedure: After the pre-activity questions and discussion about the differences between renewable and nonrenewable resources, to get the students engaged students will participate in completing the “Rustle the Leaf” Renewable is Do-Able! Matching activity (available at the end of the lesson plan).

Using a document camera or overhead projector, color the circles with the corresponding colors for renewables and non-renewables. Explain that the students will take turns drawing lines with the corresponding colors, from the appropriate circle to the pictures to indicate what type of resource they are. Complete the activity together as a group. See further instructions on the activity page.

Next, use the Energy Sources Slides (below the lesson plan) to describe the different energy sources and give them a visual of some of the processes for how the energy is created.

“Pass the Bag” Activity

The Activity is started without directions other than to pass a bag filled with the “small items” that have previously been collected. Instruct students to take as many of whatever item they wish. They do not have to show what they chose or how many they chose.

While the bag is being passed around occasionally add 1 or 2 items (from the box) to it, but do not explain why you are doing so. Do not add more than 4 items during the entire activity. It is predicted that the bag should be empty before it reaches all of the students.

After the activity is completed, and all students have been passed the bag, follow up with discussion questions.

13. Discussion /Follow Up questions: “For those of you who are holding items from the bag, how did you choose the items you took? Why did you select certain items and not others that were in the bag? How many items did you take?

For those students who got the bag when there weren’t any items left when you got the bag, how do you feel? What do you think about the actions of the students who have items?

Did the items in the bag represent renewable or nonrenewable resources? They were non-renewable. Why?

Why do you think I occasionally added a couple pieces to the bag? (These items represented the occasional replenishment of a non-renewable resource over a long period of time.)

There was one item in the bag for each student. Why do you think the bag was empty of items before some students were able to remove at least one? (Because **demand** for each resource was greater than the **supply** that was available and the resources were not managed. No rules were provided regarding the use and distribution of these resources.) Ask the class if anyone can explain what the terms “**supply**” and “**demand**” mean. Clarify the meaning of this term with them.

Ask the class if anyone can explain what the term “**conservation**” means. Clarify the meaning of this term with them. (**Conservation** is preserving our environment and carefully managing our natural resources).

14. Extensions/Related Activities (optional): Time, 15-20 minutes, Review terms: natural resource, renewable resources, non-renewable resources, fossil fuel, conservation, eco-friendly

As an alternative to the “Pass the Bag” activity, use pennies to represent coal. Hide \$3.00 worth of pennies around the classroom or outdoor area prior to beginning the lesson.

(Tip: have a teacher's aid hide the pennies for you while the children are out of the room. If you can go outside, great!)

Divide the class into small groups and explain to students that they will be “mining” for coal. Each group will be given 3 small cups labeled #1, #2, and #3. They will need to “mine” or find as much “coal” or pennies as they can in 30 seconds. They should place the pennies they find in their groups’ cup #1. Repeat this process for cups #2 and #3. At the end of round #2 have them stop and count the number of pennies collected in round #1, then round #2. Ask the students why they found less in round #2 than round #1. Students will notice that it is more difficult to find enough coal to mine. Have them predict what will happen in round #3. They are depleting the natural resources. Talk about various kinds of natural resources including solar, hydro, geo, etc. Trace electricity and A/C to talk more about resources.

Another side activity is the Energy Source Matching game. Match up each energy to see the materials at the end of this lesson plan.

“Renewable Resources” activity page Classroom Comic: (available in Additional Resources and Program Extensions and at www.rustletheleaf.com/lessonplans/RustleLesson0410.pdf) Read it together and ask them to consider/explain what Rustle is talking about in the last panel of the comic. Ask students to explain what Rooty, Paige and Dandy were doing while Rustle was reading to them.

Rustle the Leaf: Word Search Page: (available at www.rustletheleaf.com/lessonplans/RustleLesson0410.pdf in the extra materials at the end of this lesson plan) Explain that the word search and Maze can be completed in their free time. It will remind them how to be eco-friendly and how to protect our Natural Resources.

Students can watch the *Safety Smart® Science with Bill Nye the Science Guy®: Renewable Energy* video. Students can explore energy sources and safety interactively on one of the websites from the following link to Alliant Energy Kids at: www.alliantenergykids.com/FunandGames/OnlineGames/index.htm.

Alternative/ Extra:

Matching Game - Divide the children up into two sets. Pass out cards of natural resources to one group and cards of energy types to the other group. Have the children walk around and match up their natural resources with the particular types of energy they create. See the instructions at the end of the lesson plan on the Energy Source matching game activity page.

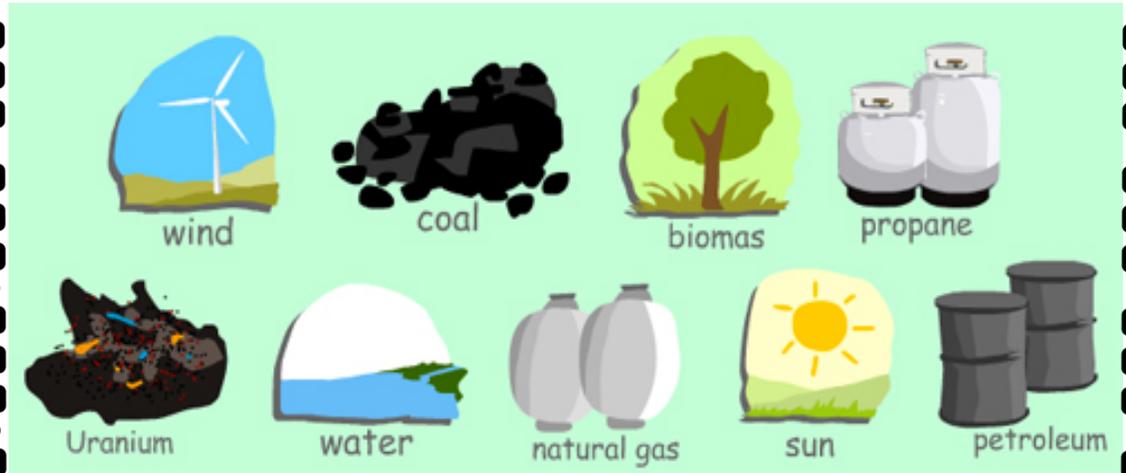
15. Resources:

www.rustletheleaf.com/lessonplans/RustleLesson0410.pdf,

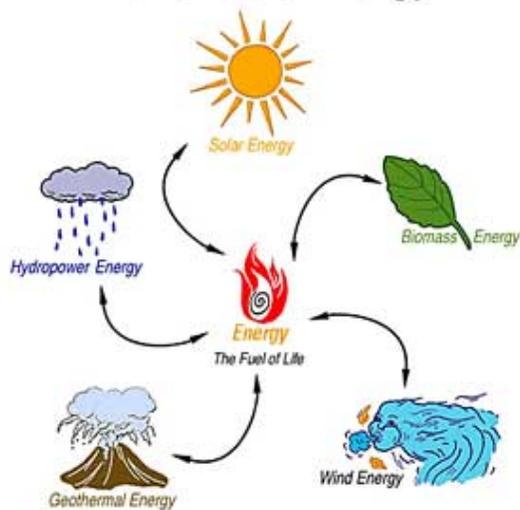
www.nj.gov/dep/seeds/hthtr/renew.pdf,

www.alliantenergykids.com/FunandGames/OnlineGames/index.htm

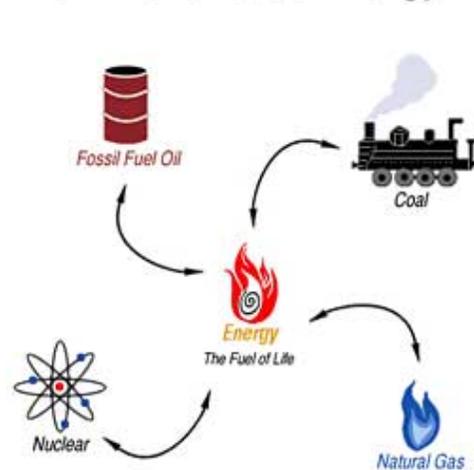
Sources of Energy



Renewable Energy



Non-Renewable Energy



Solar Energy



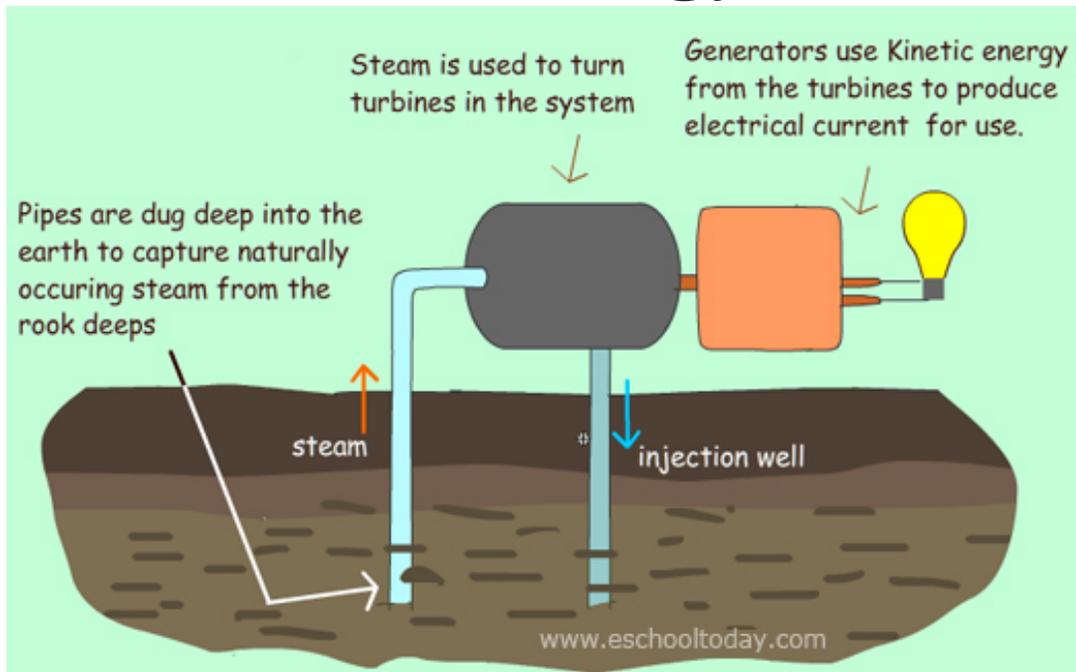
Wind Energy



Geothermal Energy



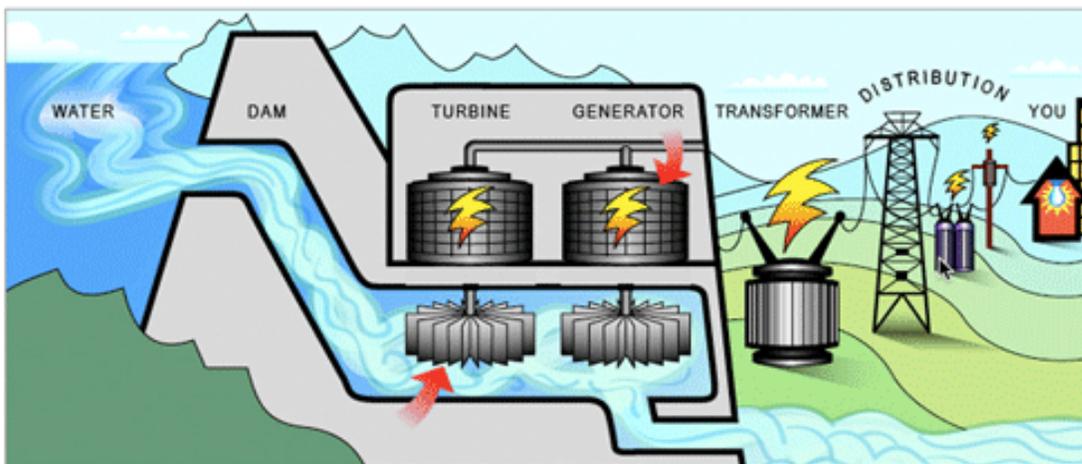
Geothermal Energy



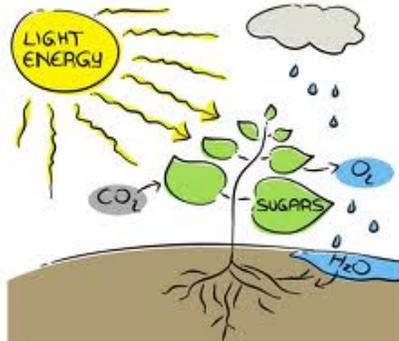
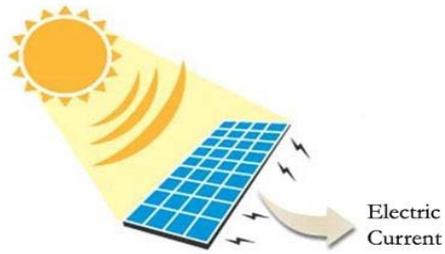
Hydro Electric Energy

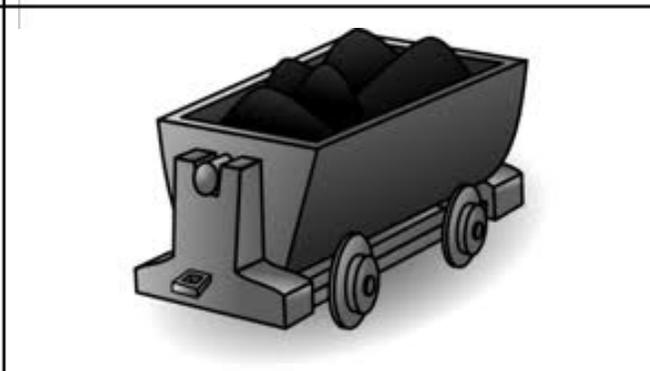
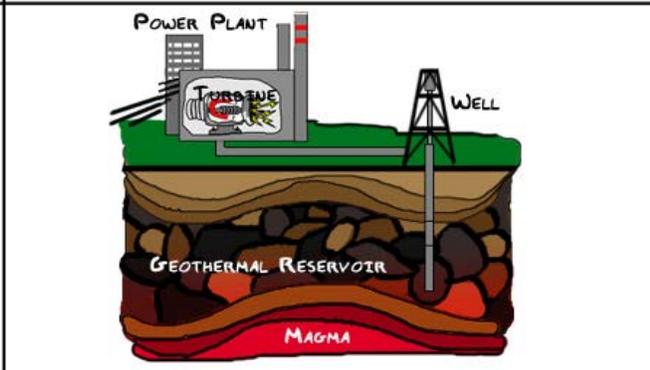
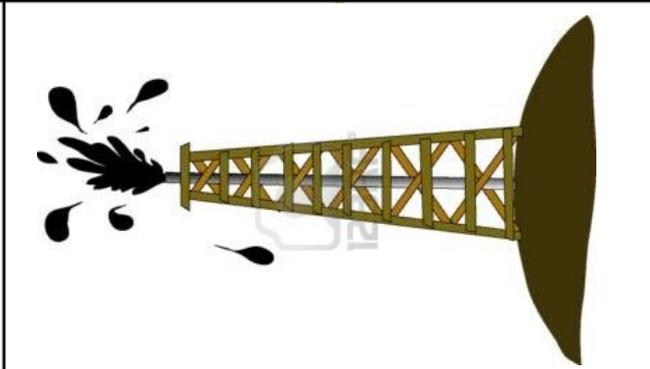
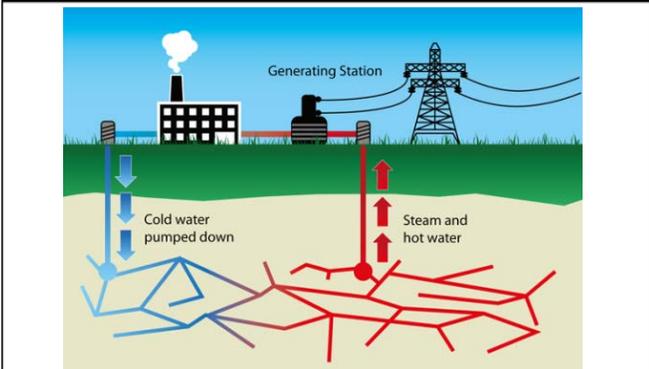
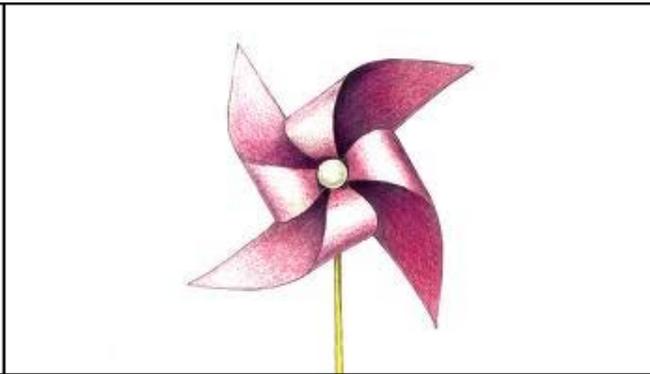
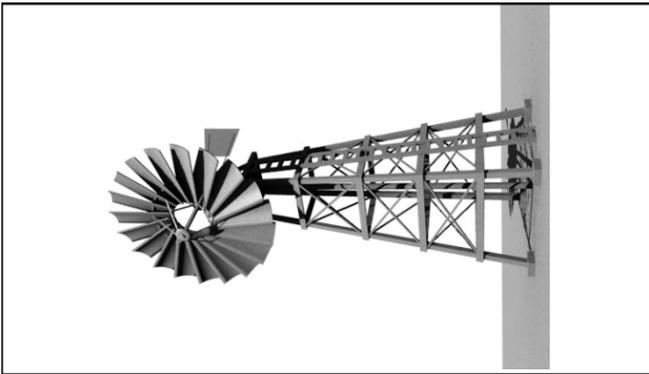


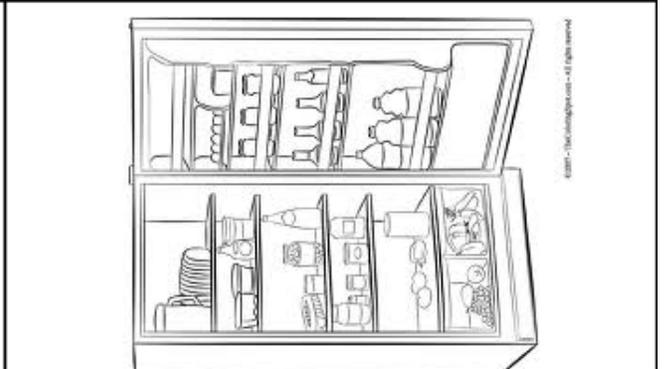
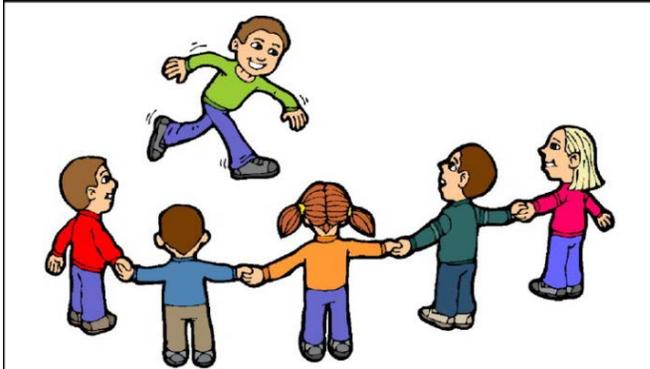
Hydro Electric Energy



1. Water backs up in a river...
2. then falls through tubes in a dam...
3. to turn the blades of huge turbines...
4. which spin generators to create electricity.
5. A transformer increases the voltage to send electricity over...
6. distribution lines. Then local transformers reduce the voltage...
7. for you to use.









Lesson Plan 040110

Renewable is Do-Able! (Target: Grades 2-4)

Time Requirements:

1 (45-minute) period (Science/Earth Science Class)

Objectives:

1. Create awareness of the differences between renewable resources and nonrenewable resources
2. Create awareness for the importance of using renewable resources for energy and manufactured products
3. Create “environment awareness” dialog between students and parents/guardians

Materials:

1. Rustle the Leaf “Renewable Resources” Word Search Puzzle page
2. Rustle the Leaf “Renewable Resources” Classroom Comic and Maze page
3. Rustle the Leaf “Renewable Resources” Matching page
4. Chalkboard, marker board or overhead projector
5. Paper and pencils, red and green crayons for students

Methods:

1. (3-5 minutes) Write the word “RENEWABLE” on chalkboard or large marker board. Ask students if they know what the word means. Take answers from class, then write the definition for the word on the board below the word. Next, write the letters “NON” in front of the word “RENEWABLE,” and ask students what “NONRENEWABLE” might mean.
2. (15-20 minutes) Review the Lesson Information on this page with class as follows: on a separate part of the chalkboard or marker board, write the words “RENEWABLE” AND “NONRENEWABLE” side by side at the top of the board. Draw a vertical line down the board between the words to make two columns. As you review lesson information, write examples of each type of resource in the appropriate column. Have students duplicate what is being written on the board on their own sheets of paper.
3. (10-15 minutes) Pass out “Renewable Resources” activity pages: Matching page, Word Search Page, Classroom Comic/Maze page. Have students complete each page.
4. (5-10 minutes) After students have completed the activities, discuss the “Rustle the Leaf” Classroom Comic with them. Ask them to consider/explain what Rustle is talking about in the last panel of the comic. Ask students to explain what Rooty, Paige and Dandy were doing while Rustle was reading to them.

Lesson Information:

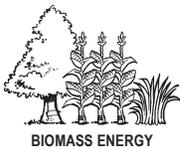
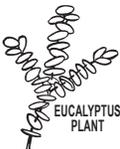
1. From the earliest historical records, we know that people have been using the Earth’s resources to make their lives better: Wood and peat for fuel and building, plants and animals for food and clothing, tree sap, tar and pitch for making vessels watertight, wax and rendered animal fat for candles and lamps. Plant fibers for papyrus and scrolls. As populations of people have grown, developed cultures, and passed on knowledge to future generations, we have discovered and invented thousands of ways to use the Earth’s resources to make our lives more comfortable, more convenient, more safe, and more enjoyable.
2. For thousands of years, the way people used the Earth’s resources didn’t make much of an impact on the health of the planet. Compared to human populations, the Earth was large and the vast majority of it was undeveloped. However, as human populations have grown, and technologies such as motors and electrical devices have become common, the way people use the Earth’s resources is affecting the Earth, and could also affect how future generations of people are able to live. This is because many of the resources upon which we now depend are not easily or safely replaceable; they are not “renewable.”
3. A **“renewable” resource is a material or energy source that can be replaced through natural, nondestructive processes, or which exists naturally and cannot be easily diminished by human activity.** These include energy sources such as the sun, wind, flowing water and waves, biomass (plant materials converted into energy), and heat from below the Earth’s crust. Renewable resources also include materials we derive from plants and animals for use as food and consumer products, which can be produced again and again through nondestructive, sustainable farming and cultivation methods.
4. A **“nonrenewable” resource is a material or energy source that exists in nature, but is not easily replaced through sustainable practices. Nonrenewable resources also include materials and energy sources developed through human manipulation, which cause long term problems due to the creation of toxins, pollution, and hazardous by-products.** Some examples of nonrenewable resources are fossil fuels (petroleum products and other materials such as gasoline, oil, natural gas, coal), minerals (metals, radioactive materials), petroleum and mineral-based chemical derivatives (plastics, lubricants, fertilizers, pesticides, industrial and household cleaners, personal care products, etc.).
5. Today, many scientists, sociologists, civic leaders, elected officials, inventors and business leaders believe people must change the ways they use nonrenewable resources for the long term health of the Earth, and for the long term viability of human populations. They are inventing and investing in ways to use renewable resources to replace nonrenewable energy resources: solar power, wind power, water power, geothermal (heat from beneath the Earth’s surface) power, biomass (plant-based materials) energy. Also, they are inventing and investing in ways to use renewable materials to replace nonrenewable materials in the production of consumer products and packaging materials.
6. As responsible, educated citizens of the Earth, we have the opportunity to help our leaders change the way we use nonrenewable energy and materials. We can learn more about renewable energy and resources, we can encourage our parents and other grown-ups to find ways to reduce their use of nonrenewable energy and resources, we can tell them about alternatives to nonrenewable products they buy for use at home. We can also do our part to reduce what we use, to re-use things we already have and to recycle things for which we no longer have a need. Together, we can help protect the Earth for ourselves and for future generations.

WORD SEARCH: RENEWABLE & NON-RENEWABLE RESOURCES

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

Use your GREEN CRAYON to circle renewable resources. Use your RED CRAYON to circle nonrenewable resources.

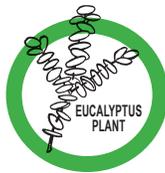
WORD KEY (Puzzle contains no word spaces): Wind, Solar, Wave, Biomass, Geothermal, Nuclear, Forests, Soybeans, Corn, Citrus Peels, Olive Oil, Lavender, Petroleum, Gasoline, Diesel, Minerals, Bamboo, Animals, Eucalyptus, Mint



Color this circle GREEN, then use your GREEN CRAYON to draw lines from this circle to the pictures of all the **RENEWABLE RESOURCES**

Color this circle RED, then use your RED CRAYON to draw lines from this circle to the pictures of all the **NON-RENEWABLE RESOURCES**

Answer Key



Color this circle GREEN, then use your GREEN CRAYON to draw lines from this circle to the pictures of all the **RENEWABLE RESOURCES**

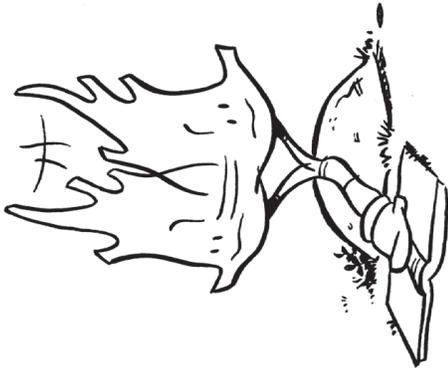
Color this circle RED, then use your RED CRAYON to draw lines from this circle to the pictures of all the **NON-RENEWABLE RESOURCES**



RUSTLE THE LEAF™

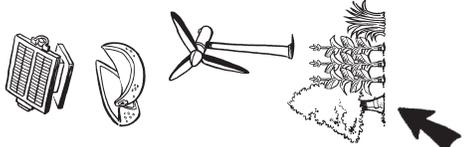
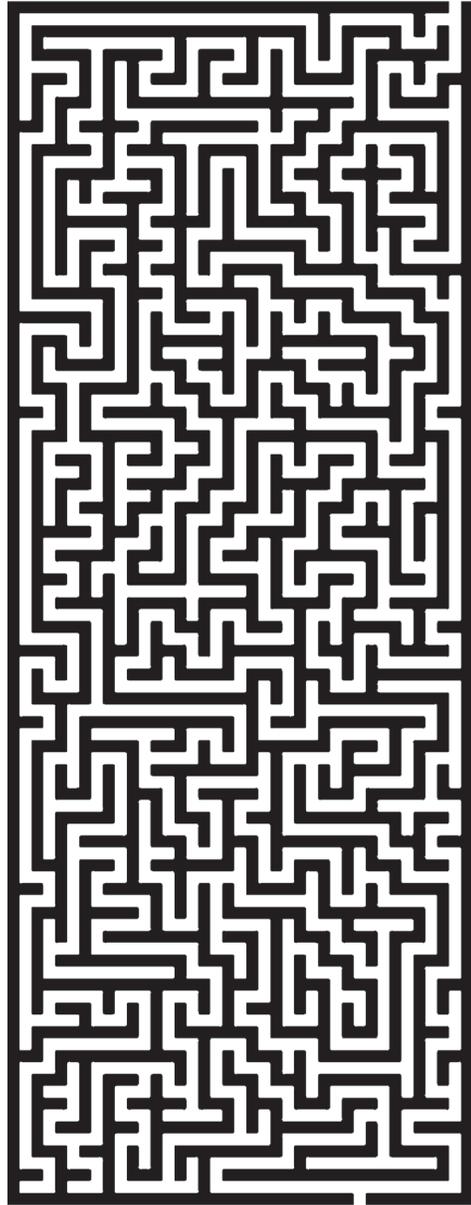
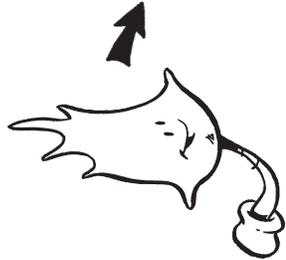
BY PONCÉ & WRIGHT

CLASSROOM COMIC



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**HELP RUSTLE
FIND THE WAY TO
RENEWABLE
RESOURCES**



Pollution

Litter Bugs

1. Category: Pollution
2. Grade(s): K-2
3. Correlation to State Standards: SCI.K.1.1, SCI.K.1.2, EL.K.1.2, EL.K.1.3, EL.K.1.4, EL.K.1.12, EL.K.1.22, EL.K.2.1, EL.K.2.2, EL.K.2.3, EL.K.2.5, EL.K.3.1, EL.K.3.3, EL.K.3.5, EL.K.7.1, EL.K.7.2, EL.K.7.3, SS.K.2.4, SS.K.2.5, SS.K.3.7, SCI.1.1.1, SCI.1.4.1, EL.1.2.1, EL.1.2.3, EL. 1.2.5, EL.1.2.6, EL.1.2.7, EL.1.3.1, EL.1.3.3, EL.1.3.4, EL.1.3.5, EL.1.7.1, EL.1.7.2, EL.1.7.3, SS.1.2.4, SS.1.2.5, SS.1.3.9, SS.1.4.2, SCI.2.4.2, SCI.2.4.3, EL.2.2.2, EL.2.2.5, EL.2.2.6, EL.2.2.9, EL.2.3.2, EL.2.3.6, EL.2.3.7, EL.2.7.1, EL.2.7.2, EL.2.7.3, SS.2.2.5, SS.2.4.2
4. Description/Purpose: This lesson introduces the concept of litter as pollution. It also introduces recycling as a way to reduce trash and conserve resources. It teaches students about the importance of being good stewards of the Earth through discussion of litter as a type of pollution and how it affects the feelings and actions of people as well as the environment.
5. Duration: 45 minutes
6. Background Information: *This program was previously called Wartville Wizard.*
7. Application to real world situations: Students encounter solid waste every day. This program helps create a connection between their actions and the greater health of the community and environment. Students easily identify littering as a negative behavior. This program teaches them how to connect the negative behavior of littering with the positive behavior of recycling and proper waste disposal as alternatives. Their future actions will impact the Earth and they become aware of that fact through this program. They also become motivated to incorporate positive recycling behaviors into their lives and classrooms.
8. New Vocabulary: Litter, Pollution, Environment, Common good, Stewardship, Preservation, Slob, Litter Bug
9. Materials: *The Wartville Wizard* by Don Madden, (or scan the book to use a digital presentation, saving as images or a Powerpoint file of the story), projector (check for onsite availability or plan to bring your own if necessary), waste items (1 per student), recycle bin, and trash can
10. Preparation: Before students enter the room, litter the classroom with waste items, being sure to include recyclable and non-recyclable items. Put these in a place where the students can't touch them and be distracted by them while you're educating. As they enter, allow them to look around before calling them all to a meeting area where they will sit for the story.
11. Pre-activity questions: Ask the students who made the mess in their classroom. Does it look like litter? What is **litter**? It is waste items that are left on the ground, or in the water instead of a waste container or landfill. Littering adds to pollution in our environment. Our **environment** (the place where we live, including the land, water and air) can be hurt by **pollution** (materials or things that change the environment in a negative way by making it unfit for people, animals and plant life). Point out that you (the presenter) polluted their environment with litter. Have they heard of a litter bug? **Litter bugs** are people who do not put their waste in the right place, they litter! How does it make them feel to have such a polluted environment? Tell them that you are going to read a story about another messy place. Ask them to pay careful attention to the way the characters feel in the story, and the way the feelings change, as well as why. You will talk about all of this when the story is over. Read the book (it takes approximately 18 minutes). Talk about how their actions affect the community.
12. Directions/Procedure: Read the story, then ask the questions from #13. After #13, do the sorting activity: Tell the students that they need to clean up the mess in the room by sorting and recycling. Why should we separate the recyclables? Where would the items go if we put them in the trash? Have each student pick-up an item nearby and bring it to the front to decide whether it belongs in the recycling container or the trash can. They should do this one at a time. Ask the student first if they know where the item belongs, and ask the class for help if he/she is not sure. Use this time to explain what the materials are, from what they are made of and what other items they could be recycled into.

13. Discussion/Follow Up questions: Why was the old man upset? What does **slob** mean? It is someone who is messy and who lets their mess affect others. What happened to make him feel differently? What is the magic and where did he get it? What is the **common good** and what is **stewardship** or being a good **steward** of the Earth? The common good is what is best for everyone as a community and being a good steward means taking care of the Earth for ourselves, but also for the people of the future.

Keeping the Earth in the best condition is called **preservation**. One person can't take care of everyone, but everyone can help. Point out the people who were still littering (note the picture from the town hall meeting). Why were the people of Wartville upset? What happened to make the townspeople change their feelings? What does "Your trash has come home to you" mean? Do you think the townspeople will go back to being "slobs"? What was the common good in the story? Was he a good steward of the Earth? Were the townspeople? Ask whether they think they have a trash problem within their school or local community? If they do, or if they don't, discuss some non-magical things everyone can do for the common good of decreasing pollution and litter? What man-made inventions help to reduce litter and pollution? Talk briefly about Solid Waste Management Districts, landfills, incinerators and waste-to-energy. What kinds of problems does it cause? In the book, the people promise to clean up.

Then have the class clean up the litter. Stand at the front of the class with a large recycling bin and a small trash bin (both labeled). Have the children come up individually or in pairs. Have them give an answer for which bin their item goes in: recycling or trash. Then have the class vote (silently) with a thumbs up or down.

(Tip: Bring laminated labels of sorted recyclables (or what can be recycled) on your drop-off bins in your county/district and show them to the class.)

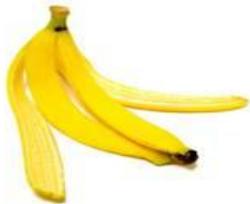
(Tip: Add "recycle bin" to the section where the people promise to not litter.)

14. Extensions/Related Activities (optional): Worksheet available for K, another for 1st and 2nd grades (available in the extra materials at the end of this lesson plan).

15. Resources: *The Wartville Wizard*, Don Madden. Aladdin, 1993.

Kindergarten Litter Bugs Worksheet

Help clean up the litter by drawing a line to put each waste item into the correct container.



Litter Bugs Worksheet (1st & 2nd)

1. Why was the old man upset when he went outside and down the road?

2. The old man talks to _____ in the middle of the woods about the litter?
3. After the old man received _____, where did he send the litter?

4. What happened when the doctor drove to the next town for help?

5. The people of Wartville wore strange outfits to hide all of the _____ that was stuck to them.
6. Instead of throwing ALL of their trash away, like bottles and cans, what could the people of Wartville have done? _____!!!

Match the words on the left to the definitions on the right

- | | |
|-------------------|--|
| a. Reduce | ___ To use materials over again, sometimes in new ways |
| b. Reuse | ___ A person who routinely does not clean-up after him or herself |
| c. Recycle | ___ The idea that all people benefit in the same way from certain actions |
| d. Slob | ___ To use fewer materials to begin with, so that less waste is created |
| e. Philanthropist | ___ A person who gives time, talent, or treasure or takes action for the common good |
| f. Common Good | ___ Disposing of used materials in a special way so that they can be made into new items |

Freddy Fish

1. Category: Pollution

2. Grade(s): K- 5

3. Correlation to State Standards: SCI.K.3.1, SCI.K.3.2, SCI.K.3.3, SCI.1.3.1, SCI.1.3.3, SCI.1.3.4, SCI.1.3.5, SCI.2.2.5, SCI.3.2.5, SCI.3.2.6, SCI.4.2.4, SCI.4.2.5, SCI.4.2.6, SCI.5.3.1, EL.K.1.22, EL.K.2.3, EL.K.3.3, EL.K.3.5, EL.K.4.3, EL.K.4.6, EL.K.5.1, EL.K.7.1, EL.K.7.2, EL.K.7.3, EL.1.2.4, EL.1.3.3, EL.1.5.2, EL.1.7.1, EL.1.7.2, EL.1.7.3, EL.1.7.5, EL.1.7.7, EL.1.7.10, EL.2.1.6, EL.2.2.4, EL.2.2.5, EL.2.2.6, EL.2.3.2, EL.2.3.5, EL.2.3.7, EL.2.5.7, EL.2.7.1, EL.2.7.2, EL.2.7.3, EL.2.7.6, EL.2.7.12, EL.3.1.3, EL.3.3.8, EL.3.5.7, EL.3.7.1, EL.3.7.2, EL.3.7.3, EL.3.7.11, EL.4.1.1, EL.4.7.1, EL.4.7.2, EL.4.7.15, EL.4.7.16, EL.5.1.1, EL.5.7.1, EL.5.7.2, EL.5.7.3

4. Description/Purpose: This lesson is intended to raise awareness of water pollution. Students will learn hands on about water pollution and its effect on the environment and ecosystems as the story about a fish named Freddy travels downstream. Objectives: Students will describe a fish habitat and explain how contaminants, including mercury, pharmaceuticals, and other pollutants such as Household Hazardous Waste, can enter the water and affect ecosystems through carelessness, **illicit discharge** (discharge into a storm drain system this is not composed entirely of stormwater), and **run-off** (that flows from rain or snowmelt, over land). Students will identify pollution and possible sources. Students will learn how to properly dispose of potentially harmful items at the local Household Hazardous Waste collection facility, if your county has one. Students will give examples of ways to prevent aquatic pollution.

*(Note to Educator: When age appropriate, this could be discussed. Water can be considered a **non-renewable resource** as well. The water we use and enjoy today is the same water that has been used on Earth for billions of years. Water is non-renewable because we cannot make more water. When it becomes polluted or we use more water than can be replenished this natural resource is depleted.)*

5. Duration: 30-40 minutes

6. Background Information: This is a narrative reading of Freddy the Fish. Grades 2 or older can read the part of Freddy from the Primary version. For older students, use the Intermediate version of the Freddy Fish Story found below this lesson plan.

7. Application to real world situations: This program teaches students about the impact that they can have on their environment and how that affects other creatures. They will make a connection between their actions and the impacts of irresponsible environmental practices. Talk with students about starting a classroom/school recycling procedure or city clean up. Discuss how household hazardous waste and mercury can get into the water system if pollution happens.

8. New Vocabulary: Pollution, Litter, Run-off, Household Hazardous Waste, Toxic, Non-Renewable Natural Resources, Illicit Discharge

9. Materials:

- a. Fish bowl or small aquarium
- b. A few rocks and a small twig for the fish bowl water
- c. Stick or rod that reaches across the top of the fish bowl
- d. Fishing lure that looks like a small fish or small plastic fish
- e. String
- f. Small cups (or opaque canisters like camera film containers) to hold:
 1. Raisins = Manure
 2. Dirt = Dirt
 3. Green liquid = Fertilizer (green food coloring, powdered drink mix or powder gelatin mixed in water)
 4. Pancake Syrup or Soy Sauce = Oil
 5. Parts of a Styrofoam cup, paper, a broken plastic spoon, etc = Litter
 6. Sand or bits of limestone = Salt from run-off
 7. Dish Washing Soap = Industrial Pollution
- g. Script for "Freddie Says" cut apart, laminated, strung on a necklace for student volunteers to wear while reading. (This can be found at the end of this lesson plan.)

10. Preparation: Gather all materials needed for this lesson and prepare accordingly. Have copies made of the Freddy Fish Template for students to color (found in the extra materials at the end of this lesson plan).

11. Pre-activity questions: Raise questions with students about the natural world. Why is water important? Who needs water? Where does water come from? Can we make more water? What lives in the water? What is **pollution**? Where does pollution come from (humans)?

12. Directions/Procedure: Place Freddy Fish into the bowl with clean water. (All other materials should be nearby for quick/easy access.) Students will be asked for their participation (depending on the maturity level of the students). This will help with attention and listening.

- Use a fish bowl or small aquarium with clean water, a few rocks on the bottom and a stick in the water to represent some vegetation. Using a rod or ruler and string, suspend the lure about mid-way down in the water. This is Freddie.
- Ask for volunteers. You need some who like to read out loud and some who like to be messy. For large groups use 10 volunteers, two for each stop along the way, with one student playing Freddie and the other to pour in the pollution on your signal. Be sure to line the students up in order with their scripts and cups of pollution. Encourage the rest of the students to react as Freddie would react during the story.
- Tell the students that they are about to go on an imaginary journey with Freddie the Fish. Introduce Freddie, and let the children know that the volunteers will be talking for Freddie.
- “Imagine that we’re at the beginning of <name your local river or stream>. There are trees all along the banks (sides of the river/stream). The water is cool and clean. This is where Freddie the Fish lives. Freddie has lived in this stretch of the river all his life. But now he is going on a big adventure! He’s going to travel downstream!”

Begin the Freddy Fish Journey: Read the Story [The Adventures of Freddy Fish](#) (see the extra materials at the end of this lesson plan). After the story, excuse student volunteers to their seats for a discussion and more activities. Then discuss: What could have been done to keep Freddy’s stream a healthy place to live?

1. Leave shrubs and trees along the stream.
2. Don’t use too much fertilizer on the lawn.
3. Do not use too much salt on roads near rivers and streams.
4. Don’t be a LITTERBUG! Remove **litter** (trash on the ground or in the water) from streams.
5. Tell others about how important it is to keep our environment clean.
6. Make sure we know how to dispose of hazardous materials. (HHW Drop-Off)
7. RECYCLE (Curb-Side or Drop Off)

13. Discussion/Follow Up questions: What do you think about the water Freddy is in now? How did it get so dirty? Does this happen in real life? How can we keep the water clean for Freddy and other fish that live in our rivers and streams? How does **pollution** affect the environment/habitats (such as water, air, animals, land)? A discussion about ways to keep our environment clean and healthy will wrap up this lesson. Include in the discussion the potential dangers of mercury, **toxic** materials, and **household hazardous waste** (HHW) pollution and how they can prevent this type of pollution by carefully reading labels and taking hazardous materials to proper disposal sites, such as Solid Waste Management District programs. A Freddy Fish Party complete with goldfish shaped crackers or gummy candy fish can complete the activity.

14. Extensions/Related Activities (optional) – Students can write or draw about Freddy the Fish and tell how they think Freddy the Fish feels. Does this really happen? What other animals or plants would be affected by pollution? What can we do to improve the situation? When closing this lesson, students may be asked to share their drawings with the class.

For Grades 3-5, have students work in groups to rewrite Freddy’s story to make a happy ending instead of a bad one. Students can then present their new Freddy Fish story to the class. Standards met with this modification include: EL.3.1.3, EL.3.7.5, EL.3.7.6, EL.3.7.7, EL.3.7.8, EL.3.7.12, EL.3.7.13, EL.3.7.14, EL.4.1.1, EL.4.7.5, EL.4.7.5, EL.4.7.7, EL.4.7.8, EL.4.7.9, EL.4.7.11, EL.4.7.17, EL.5.1.1, EL.5.5.5, EL.5.5.6, EL.5.7.4, EL.5.7.5, EL.5.7.6, EL.5.7.13, EL.5.7.9, EL.5.7.15

15. Resources: Additional supplies needed for this program can be found in the extra materials at the end of this lesson plan. This program is adapted from The Story of Freddie Fish.

www.earthsciweek.org/forteachers/freddyfish_cont.htm

www.texasstateofwater.org/screening/pdf_docs/FreddieTheFish.pdf

Freddie Fish K-2 *Story/Script*

Narrator		Freddie Says (child volunteer)
1	<p>Here he goes! (Wiggle Freddie.) As Freddie swims downstream, he comes to a place where people will be building new, big houses. Big bulldozers knocked down trees to make way for building. <Read Freddie Says> It begins to rain. There are no tree roots to hold the soil in along the river bank and dirt slides down into the water. (Dump soil in into Freddie's jar.) Oh, no, Freddie! How is Freddie? ("Yuck!")</p>	<p>It's getting sunny and hot. What happened? All the trees are cut down!</p>
2	<p>Freddie swims on down the river. See if you can guess where he is now. <Read Freddie Says> (Pour raisins into the water.) Where is Freddie? (<i>pasture, ranch or farm</i>) Are these good presents for Freddie?</p>	<p>Look! There are some big, brown animals with horns coming down to visit me! One of them said, "Moo!" Oh, look – he's leaving me some presents!!</p>
3	<p>Freddie swims farther on down the river. He comes to a new place. <Read Freddie Says> (Pour in green liquid) Oh, no, Freddie! Where is Freddie? (<i>next to a golf course</i>) Some golf courses put lots of fertilizer on the grass to keep it green. Extra fertilizer runs off into the river, especially when it rains. This hurts our rivers and streams. How is Freddie?</p>	<p>I see a bunch of people hitting a little ball with a stick! Look at that green, green, GREEN grass! Hey, here's a little stream running off of that grass. Oh, no – it's sticky, green stuff!</p>
4	<p>Freddie swims beside a house. Someone is changing the oil in his car. Wait – is he pouring the oil down the storm drain along the street?? <Read Freddie Says> (Pour pancake syrup into Freddie's jar.) How is Freddie? That man doesn't know that storm drains go straight into the river! Anything we pour into the street goes straight into our streams and rivers!</p>	<p>Oh, no! Oil is coming out of that pipe! The oil is heading right for me! My gills are getting covered in oil!!!</p>
5	<p>Poor, Freddie! Off he swims. <Read Freddie Says> (Pour sand or rock dust into the water) Oh, my! All that sand and rock dust is blowing into the water. What do you think of the water Freddie is in now? How is Freddie?</p>	<p>Wow, there are big trucks digging in the dirt over there. What's all that stuff blowing into the water?</p>
6	<p>Freddie swims past the city park. Some picnickers didn't throw their trash into the garbage can. The wind is blowing it into the river. <Read Freddie Says> (Sprinkle parts of a Styrofoam cup, paper, a broken plastic spoon, etc. into the water.) How is Freddie?</p>	<p>Ahh, look. People are having a picnic. Oh, no! What's all this junk in the water?? I can – hardly – get – through – all – this – litter! Yuck!</p>

Freddy Fish K-2 Script (Cut Apart for student volunteers)

<p>1. It's getting sunny and hot. What happened? All the trees are cut down!</p>	<p>4. Oh, no! Oil is coming out of that pipe! The oil is heading right for me! My gills are getting covered in oil !!!</p>
<p>2. Look! There are some big, brown animals with horns coming down to visit me! One of them said, "Moo!" Oh, look – he's leaving me some presents!!</p>	<p>5. Wow, there are big trucks digging in the dirt over there. What's all that stuff blowing into the water?</p>
<p>3. I see a bunch of people hitting a little ball with a stick! Look at that green, green, GREEN grass! Hey, here's a little stream running off of that grass. Oh, no – it's sticky, green stuff!</p>	<p>6. Ahh, look! People are having a picnic. Oh, no! What's all this junk in the water?? I can...hardly... get...through...all...of... this...litter! Yuck!</p>

1

Freddy Fish *Rewrite the story to make it have a happier ending. Be sure to include details!*

Narrator		Freddie Says (child volunteer)
1		
2		
3		
4		
5		
6		

Freddy Fish Use these boxes to write the script for your “new” Story. Cut apart.

1.	4.
2.	5.
3.	6.

Freddy Fish 3-5 *Story/Script*

The Adventures of Freddy Fish

(Narrator) Freddy is a happy and healthy fish. This stream is the perfect home for him. Freddy has everything he needs right here. The water is cool; which is good because cool water holds more oxygen. This helps Freddy breathe easily.

(Freddy Says) "I love swimming in the cool clear water!"

(Freddy Swims around happily)

(Narrator) The trees and shrubs along Freddy's stream shade the water and keep it from getting too warm. Food for Freddy, like insects and leaves fall off the shrubs so Freddy always has something good to eat.

(Freddy Says) "Mmmmmmy favorite , a Mayfly!"

(Freddy quickly swims to the surface of the water leaps up and eats the Mayfly.)

(Narrator) Even though Freddy likes his stream, he's a very curious fish and wants to go on an adventure. Freddy decides to leave the shady, cool waters and heads downstream on his adventure...

(Freddy Says) "I love my home but I wonder what else is out there beyond my stream. I think I need an Adventure!"

(Freddy starts to swim.)

(Narrator) As Freddy swims through farm country he sees a lot of new things. The first thing he notices is that the sun is shining and it's no longer so cool in the water. He looks out of the water and notices that all of the trees and shrubs have been cut down.

(Freddy Says) "Whew! It sure is warm in here! There isn't any shade. Where did all of the trees go?"

(Freddy looks tired and starts to fan himself with his fin.)

(Narrator) As Freddy swims through farm country hears a strange sound. *Moo...*

(Freddy Says) "What was THAT?"

(Narrator) Freddy looks around and sees big brown cows grazing in a farmer's field near the edge of the stream. All of a sudden Freddy notices that something is falling into the water and REALLY doesn't like it!

(Freddy Says) "Oh look, they are giving me a present! YUCK! That's so gross!" ***(Freddy swims away fast trying to dodge the falling cow patties.)***

(Narrator) Freddy doesn't see anymore cows and decides that the coast is clear. He looks out of the water and notices there are no buildings or houses all along the stream. ***Sprinkle some dirt into the water and allow it to settle over Freddy***

(Freddy Says) "Whoa! What just happened? *Where did all of that dirt come from?*"

(Narrator) When we cut down all of the (vegetation) trees/shrubs to build stores and houses, the soil can't doesn't have anything to keep it in place. This causes the soil to (erode) or wash away when it rains.

(Freddy Says) " OH NO! It covered the rocks on the bottom of the stream where those other fish laid their eggs."

Freddy is having trouble breathing. The dirt is getting into his gills.

(Narrator) Freddy wants to get out of here. He keeps swimming. He notices a golf ball on the bottom of the stream. He pokes his head out of the water and sees a golf course with beautiful green grass.

(Freddy Says) "Wow, this place is beautiful! Maybe I can stay here and live in this part of the stream?"

(Freddy is smiling while looking out of the water at the beauty of the golf course.)

(Narrator) Fertilizer is used to make lawns beautiful but too much fertilizer is harmful and it's bad news for Freddy's Stream.

(Narrator) It has now started to rain. The fertilizer from the golf course is running off into the stream.

(Sprinkle some green kool-aid into the water.)

(Freddy Says) " Cough, Cough. What is all of this green stuff? Cough, Cough".

(Freddy can't quit coughing and swims away.)

(Narrator) The fertilizer will make the plants in the stream grow too. Too many plants in the stream use up the oxygen in the water that Freddy needs to breathe. He keeps swimming....

(Narrator) Freddy is still having trouble breathing because of all of the soil, and now the fertilizer, not to mention the surprise the cows left behind. But now he feels something very sticky in the water.

(Drizzle in the syrup)

(Freddy pokes his head out of the water again to see what's out there.)

(Narrator) Freddy sees nothing but what looks like a black, shiny lake. But there are cars and trucks parked on it. It's a parking lot. It's still raining and Freddy think that maybe the rain will help clean out the water and make it easier to breath. But he was wrong. The Rain washes motor oil from the parking lot into the stream.

(Freddy Says) "Ugh...NOW what's in the water?" Oh no this stuff is sticky! It's oil. There is oil all over me and it's getting into my gills!"

(Freddy is swimming very slowly now.)

(Narrator) This journey has not turned out like Freddy thought but he has to keep going. He comes along a city park. He hears children playing and laughing.

(Freddy Says) “Oh boy! A park.

There can't be anything here to hurt me. A park is a fun place where kids can play and have picnics. I'll be safe here!” **(Freddy says with excitement in his voice jumps up out of the water in celebration.)**

(Narrator) A family is having a picnic near the stream. They are singing and playing, having a great time.

Then all of sudden the wind starts blowing. But when they get up to leave, they don't pick up their trash. The wind is blowing the trash everywhere, even into the stream.

(Sprinkle in the paper confetti dots.)

(Freddy Says) “Yikes! That almost hit me! What is this stuff? I'd better be really careful not to swim near that trash.”

(Freddy tries to dodge all of the trash that is now floating in the water.)

(Narrator) The temperature outside has dropped and the rain has turned into ice. The road crews are spraying a salt and sand mixture onto the roads to help melt the ice so the cars don't slide.

(Sprinkle in the sand and salt)

(Freddy Says) “Yuck this water tastes funny! Is that salt? This is not my idea of a great adventure!” **(Freddy keeps swimming)**

(Narrator) Freddy makes it past all of the litter and trash in the stream. He thinks he's finally going to get to clean water so it will be easier to breathe, so he keeps going. He sees tall smoke stacks in the distance. It is a factory.

(Add dish-washing soap and red food coloring to the water)

(Narrator) There is more pollution in the stream. Factories dump their industrial waste, oil, chemicals, animal waste and plant matter into the stream and may not realize they are polluting the water and harming the wildlife.

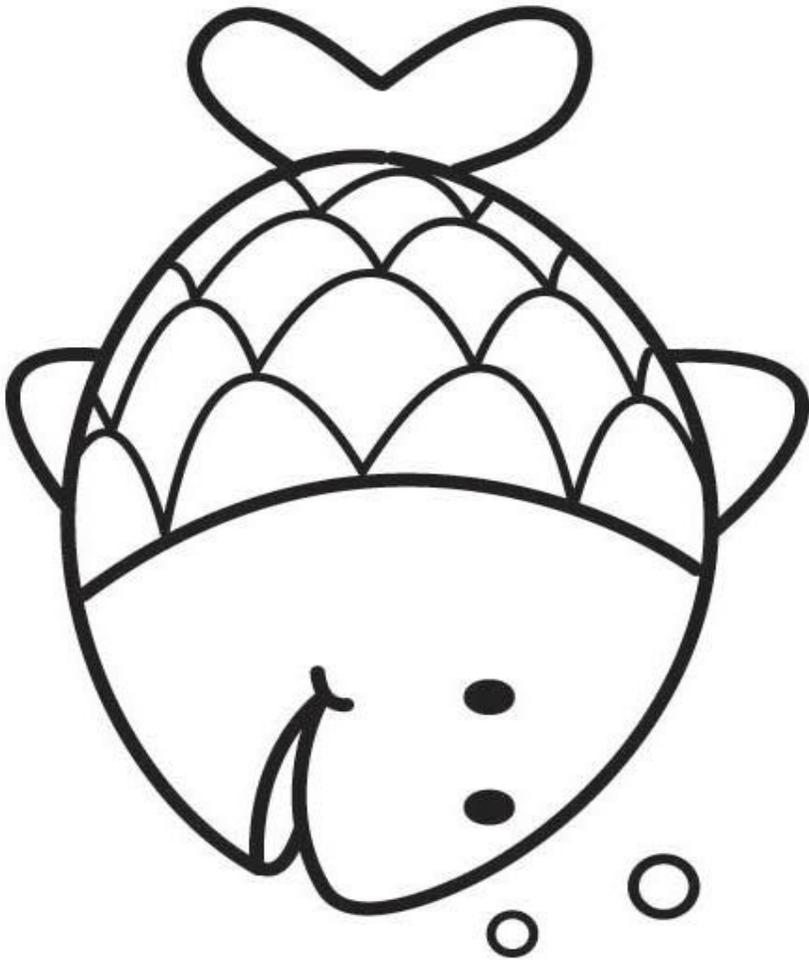
Poor Freddy has had all he can handle. He gives up on his adventure. He just can't swim any farther. **(It is getting REALLY difficult for Freddy to breathe now.)**

(Freddy Says) “I don't know how much more of this I can take! I started on this adventure thinking that every other stream and river were just as beautiful and safe as mine. I guess I was wrong. I wish there was a way to keep the water clean and safe!”

(Freddy is moving very slowly and eventually comes to a stop.)

(Narrator) What will happen to Freddy? How can we help Freddy?

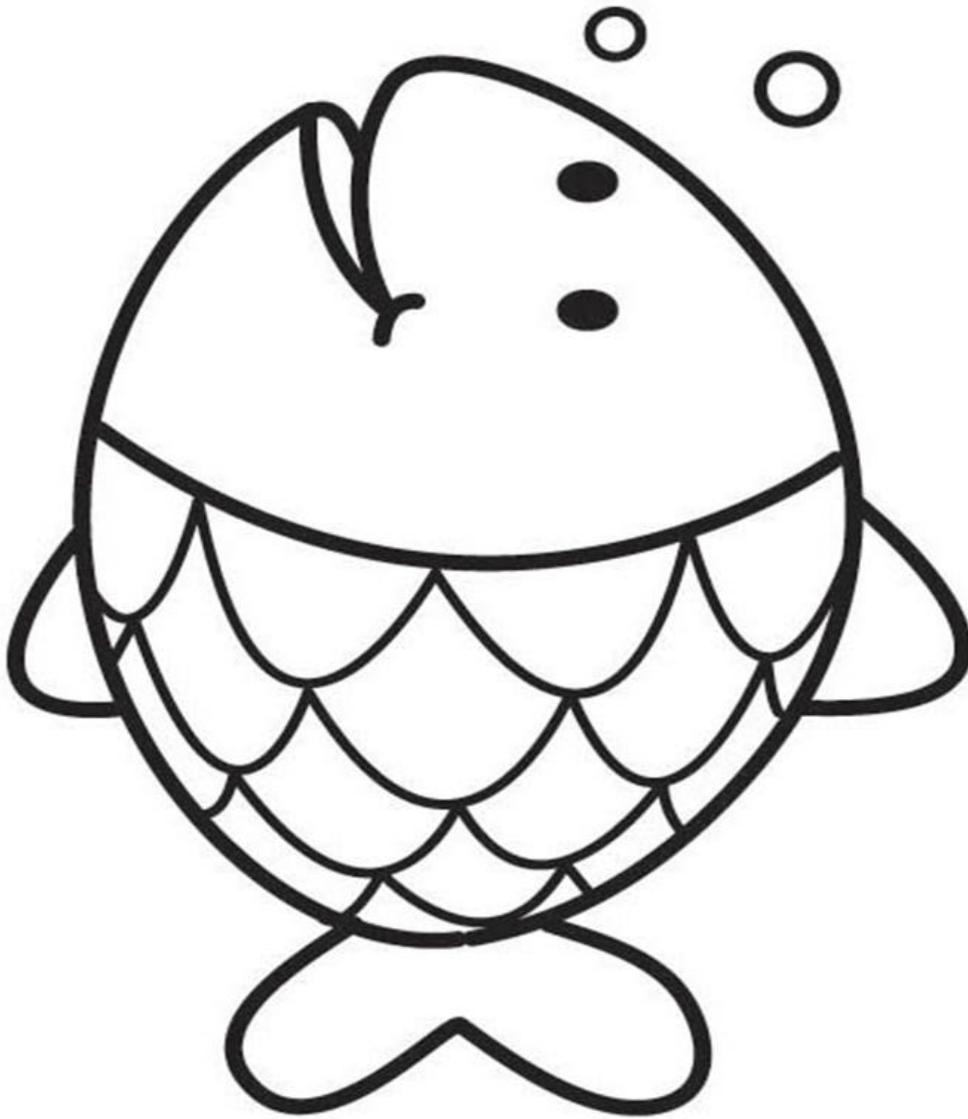
How can we SAVE Freddy Fish?



Name _____



Name _____



The Adventures of Freddy Fish Script

Narrator	Freddy Says
<p>Freddy is a happy fish. This stream is the perfect home for him. Freddy has everything he needs right here. The water is cool; which is great because cool water holds more oxygen. This helps Freddy breathe easily.</p> <p>(Read Freddy Says)</p>	<p>“ I love swimming in the cool clear water! “</p> <p><i>Freddy swims around happily</i></p>
<p>The trees and shrubs along Freddy’s stream shade the water and keep it from getting too warm. Food for Freddy, like insects and leaves fall off the shrubs so Freddy always has something good to eat.</p> <p>(Read Freddy Says)</p>	<p>“Mmmmm my favorite , a Mayfly!</p> <p><i>Freddy quickly swims to the surface of the water and eats the Mayfly.</i></p>
<p>Even though Freddy likes his stream, he’s a very curious fish and wants to go on an adventure. Freddy decides to leave the shady, cool waters and heads downstream on his adventure...</p> <p>(Read Freddy Says)</p>	<p>“I love my home but I wonder what else is out there beyond my stream. I think I need an Adventure!”</p> <p><i>Freddy starts to swim.</i></p>
<p>As Freddy swims through farm country he sees a lot of new things. The first thing he notices is that the sun is shining and it’s no longer so cool in the water. He looks out of the water and notices that all of the trees and shrubs have been cut down.</p> <p>(Read Freddy Says)</p>	<p>“Whew! It sure is warm in here! There isn’t any shade. Where did all of the trees go?”</p> <p><i>Freddy looks hot and starts to fan himself with his fin.</i></p>

Narrator	Freddy Says
<p>Freddy keeps going through farm country and hears a strange sound. Moo... (Read Freddy Says) Freddy looks around and sees big brown cows grazing in a farmer’s field near the edge of the stream. (Drop in a few raisins) All of a sudden Freddy notices that something is falling into the water and REALLY doesn’t like it!</p> <p style="text-align: right;">9</p>	<p>“What was THAT?” (narrator) “Oh look, they are giving me a present! YUCK! That’s so gross!” Freddy swims away fast trying to dodge the falling cow patties.</p> <p style="text-align: right;">10</p>
<p>Freddy doesn’t see anymore cows and decides that the coast is clear. He looks out of the water and notices there are no buildings or houses all along the stream. When we cut down all of the (vegetation) trees/shrubs to build stores and houses, the soil doesn’t have anything to keep it in place. This causes the soil to (erode) or wash away when it rains. Sprinkle some dirt into the water and allow it to settle over Freddy (Read Freddy Says)</p> <p style="text-align: right;">11</p>	<p>“Whoa! What just happened? <i>Where did all of that soil come from?</i> “OH NO! It has covered the rocks on the bottom of the stream where those other fish laid their eggs.” Freddy is coughing. He is having trouble breathing. The dirt is getting into his gills.</p> <p style="text-align: right;">12</p>
<p>Freddy wants to get out of here. He keeps swimming. He notices a golf ball on the bottom of the stream. He pokes his head out of the water and sees a golf course with beautiful green grass. (Read Freddy Says) Fertilizer is used to make lawns beautiful but too much fertilizer is bad news for Freddy’s Stream.</p> <p style="text-align: right;">13</p>	<p>“Wow, this place is beautiful! Maybe I can stay here and live in this part of the stream?” Freddy is smiling while looking out of the water at the beauty of the golf course.</p> <p style="text-align: right;">14</p>

Narrator	Freddy Says
<p>It has now started to rain. The fertilizer from the golf course is running off into the stream.</p> <p>(Sprinkle some green kool-aid into the water.)</p> <p>(Read Freddy Says)</p> <p>The fertilizer will make the plants in the stream grow too. Too many plants in the stream use up the oxygen in the water that Freddy needs to breathe. He keeps swimming....</p> <p style="text-align: right;">15</p>	<p>“Cough, Cough. What is all of this green stuff? Cough, Cough”.</p> <p>Freddy can't quit coughing and swims away.</p> <p style="text-align: right;">16</p>
<p>Freddy is still having trouble breathing because of all of the Stuff that has polluted the water. But now he feels something very sticky in the water.</p> <p>(Drizzle in the syrup)</p> <p>Freddy sees what looks like a black, shiny lake. But there are cars and trucks parked on it. It's a parking lot. It's still raining and Freddy thinks that maybe the rain will help clean out the water and make it easier to breath. But he was wrong. The Rain washes motor oil from the parking lot into the stream.</p> <p>(Read Freddy Says)</p> <p style="text-align: right;">17</p>	<p>Freddy pokes his head out of the water again to see what's out there.</p> <p>“Ugh...NOW what's in the water?” Oh no this stuff is so sticky! It's oil. There is oil all over me. It's stuck to me! I can't get it off! Oh no, ugh, its in my gills!”</p> <p>Freddy is swimming very slowly now.</p> <p style="text-align: right;">18</p>
<p>This journey has not turned out like Freddy thought but he has to keep going. He comes along a city park. He hears children playing and laughing.</p> <p>(Read Freddy Says)</p> <p>Then all of sudden the wind starts to blow.</p> <p style="text-align: right;">19</p>	<p>“Oh boy! A park. There can't be anything here to hurt me. A park is a fun place where kids can play and have picnics. I'll be safe here!”</p> <p>Freddy says with excitement in his voice jumps up out of the water in celebration.</p> <p style="text-align: right;">20</p>

Narrator

A family is having a picnic near the stream. They are singing and playing, having a great time.

But when they get up to leave, they don't pick up their trash. The wind is blowing the trash everywhere, even into the stream.

(Sprinkle in the paper confetti dots.)

(Read Freddy Says)

21

Freddy Says

"Yikes! That almost hit me! What is this stuff? I'd better be really careful not to swim near that trash."

Freddy tries to dodge all of the trash that is now floating in the water.

22

The temperature outside has dropped and now the rain has turned into ice. The road crews are spraying a salt and sand mixture onto the roads to help melt the ice so the cars don't slide.

(Sprinkle in the sand and salt)

(Read Freddy Says)

23

"Yuck this water tastes funny! Is that salt? This is not my idea of a great adventure!"

Freddy keeps swimming

24

Freddy makes it past all of the litter and trash in the stream. He thinks he's finally going to get to clean water so it will be easier to breathe, so he keeps on going. He sees tall smoke stacks in the distance. It is a factory.

(Add dish-washing soap and red food coloring to the water)

There is even more pollution in the stream now. When factories dump their industrial waste, oil, chemicals, animals waste and plant matter into the stream they may not realize that they are polluting the water and harming the wildlife.

Poor Freddy has had all he can handle. He gives up on his adventure. He just can't swim any farther.

What will happen to Freddy?

How can we help Freddy?

25

It is getting REALLY difficult for Freddy to breathe now.

"I don't know how much more of this I can take! I started on this adventure thinking that every other stream and river were as beautiful as mine. I guess I was wrong. I wish there was a way to keep the water clean and safe!"

Freddy is moving very slowly and eventually comes to a stop.

26

These next two pages can be used to have students write an alternate ending the Adventures of Freddy Fish.

Narrator	Freddy Says
1	2
3	4
5	6

Narrator	Freddy Says
7	8
9	10
11	12

Who Polluted the River?

1. Category: Pollution
2. Grade(s): K-5
3. Correlation to State Standards: SCI.K.3.1, SCI.1.3.1, SCI.1.3.3, SCI.1.3.4, SCI.1.4.1, SCI.2.3.2, SCI.2.1.3, SCI.2.1.2, SCI.3.2.5, SCI.3.2.6, SCI.4.2.2, SCI.4.2.6, SCI.4.3.2, SCI.4.3.4, SCI.5.3.1
4. Description/Purpose: Through an interactive story (available in the extra materials at the end of this lesson plan) students learn how the increase in human population and land use have caused many of our rivers to become polluted. If your local area doesn't have a river, draw a comparison between the river and the story and nearby body of water in your area. This activity demonstrates that, just as we each contribute to the problem, we must also be part of the solution. At the end of the program students will be able to: list the major pollutants in our nation's waterways; draw connections between individual action and results at the community level; develop strategies for minimizing and counteracting environmental problems.
5. Duration: 45 minutes
6. Background Information: This program started off with the Who Polluted? Curriculum, and was adapted for younger students who identified with an age-appropriate poem. "It Leaks to the Creek" was written for preschool and kindergarten classes. A third version is also available about a walk in a city park, a copy of which is available in the extra materials at the end of this lesson plan.
7. Application to real world situations: Most times pollution is not intentional, something people are completely unaware of, such as a leaky septic tank. People may not know that pouring household hazardous waste (HHW) down the drain is dangerous or they may not know how to dispose of household chemicals, mercury or electronics. Once the pollution occurs, though, it is very difficult to clean up. It may take years and many different methods to correct a polluted body of water. However, it isn't impossible. People play an important role in alerting authorities to possible problems.
What would provide an indication that a river is polluted? What should you do if you think a river is polluted? Encourage children to alert their parents if they notice that the river smells funny or if they notice dead fish or frogs in or near the water. If their parents think that there is a serious problem, they can call their local city, county or state officials. Those officials will disburse a team of people that will first figure out where the pollution is coming from, stop it, and then correct it.
8. New Vocabulary: Pollution, Bio-indicators, Mutations, Amphibian, Run-off, Illicit discharge, Septic tank*, Sewage*, Acid rain*, Smog* (*defined in story)

9. Materials:

- a. Clear gallon jar of water.
- b. Depending on how many classes and which version of the story you choose, you will need one canister per pollutant named in the story (likely 12-16). Film canisters should be labeled with the type of pollutant referenced within the story (Pollutants vary). You may also use larger canisters to accommodate more than one class.
- c. Plastic frog to float in the water.
- d. Pollutants: (This is a recommended list and can be altered for preference or availability. They can include mercury, pharmaceuticals, or electronics using rock candy to simulate a broken CFL bulb, candy to simulate medications, or small computer parts to simulate an electronic device. Using oil-based products is not recommended, as they are difficult to clean-up.)
 - Trees – leaves (The stories in the Resources all start with this simple and natural "pollutant" to get the kids thinking about things that get into water bodies. They will usually tell me that the frog (floating in the water) doesn't like leaves in its water. To which I reply - He's a frog. He doesn't mind leaves in the water. I think it helps establish that we didn't have to worry about pollution like we do now. It was a simpler time.)
 - Construction site- dirt
 - Farmers (herbicides/pesticides) – baking soda and green colored sugar sprinkles
 - Person fishing – fishing line and bobber left behind
 - Family picnicking – part of a straw, paper towel, piece of Styrofoam, pop tab
 - Gardeners (insecticide) – baking soda and blue colored sugar sprinkles
 - Beach party (left behind items) – confetti, ribbon, misc. trash
 - Electric power plant (acid rain) – vinegar

- Commuters (auto fluids on the road) – soy sauce and water
- Barnyard (manure) – crushed up oreo, water, soy sauce
- Motorboat (oil floating on the water) – soy sauce
- Coal mine (rain-drenched piles of coal) – water, soy sauce
- Washing cars (soap and water mixed with auto fluids)- water, couple drops of dish soap
- Homeowner (septic tank contents) – water, yellow food coloring, bits of toilet paper
- Mysterious liquid (HHW)– water, red food coloring
- Antifreeze – water, green food coloring.

Tools for clean-up (Those who don't pollute will have to clean it up):

- Strainer
- Sponge
- Test tube
- Small piece of Screen
- Eye dropper
- Dixie cup
- Paper towel
- Whatever else you want to use

10. Preparation: Have your clean water and pollution canisters ready (and labeled) before you go into class.

11. Pre-activity questions: What is **pollution**? What are the three (3) types of pollution? (Air, land, water) How does each occur in our environment? (cars, littering, sewer pipe leaks, smokestacks - give examples of each, and how each occurs). By what method does air, land, and water get polluted? Did you know that air and land pollution may eventually become water pollution? How does that happen? What happens to air and land pollution when rain or snow falls? What is Run-off and what happens to Run-off?

12. Directions/Procedure:

a. Pass out the pollutant canisters to students. Tell them not to shake, smell, or take the lid off their canister. Explain that if they did not get a pollutant container, they will have an even more important job to do at the end of this activity.

b. Read the following narrative: For many thousands of years, people have lived on the banks of the river. Native Americans hunted the forests, caught fish from the water, and used the water to drink and cook. It was a clean area, full of fish and wildlife.

Colonists began to arrive and realized it would be a great place to live. They also hunted the forests, fished the river and began to colonize the land. How do you think they used the river? Do we use our rivers the same way?

Pretend that this is a sample from a river. It was taken by a Native American 500 years ago. Our rivers have changed a lot in the last five hundred years. As people began to develop the land, pollution increased, and many people were careless in how they treated the air, land and water. By the 1960's and 1970's, pollution had hit an all time high and the earth and its resources were not in very good shape. Fortunately, concerned folks noticed what was happening and since then, have worked very hard to clean up past messes, better conserve natural resources, and provide safer and cleaner land, air, and water quality. Let's look at this water sample. How does the water look? Would you swim in it? What else might you use it for? Place your frog in it. Explaining that the frog is in his habitat-happy as can be. Have them name the frog.

Share one of the stories included in the extra materials at the end of this lesson plan . The story will depend on your audience age/grade level). Listen for the name of your pollutant canister. When your canister is called, shake your canister and dump it into the river and observe what happens.

c. Read one of the stories available in in the extra materials at the end of this lesson plan. (Choose the most age appropriate version.)

d. After your pollutants are all added, rescue your frog. Describe all the pollution that you see on him. I always try to make sure he's tangled in the fishing line and covered with bubbles and other debris. Discuss why frogs, as **amphibians** (live on land and in water, breathe through skin), are good **bio-indicators** (species that can be used to monitor the health of an environment or ecosystem) show pictures of frogs with pollution-induced **mutations** (developmental anomalies or problems caused by pollution) if you can find them. Discuss how a frog's cellular development changes and how pollutants can cause those cells to mutate and change the way tadpoles develop into frogs. What problems do these mutations cause?

e. Now move to clean up: Have the students that did not add pollution try to clean up the now-polluted water using several different tools and clean up methods (straining, mixing, removing). Explain what each tool does and let remaining students demonstrate cleaning the water. Explain that although each of these tools is helpful in cleaning up a portion of the pollution, it is almost impossible to get 100% of the pollutants out of a river. It may take many different clean-up techniques and often takes years to complete the cleanup process. Explain what a river clean up entails. Discuss how rain contributes to or can delay this process.

13. Discussion/Follow up questions: Who polluted the waterway? What effect did increasing population have on the health of the river? Did population increase help the river? Think about the pollution in the canisters. How could we prevent some of those pollutants from entering the water? Talk about illicit discharge. How do we get this pollution out of the water? Is it easier to prevent pollution, or clean it up later? What could we do to prevent pollution? How does run-off from rain and snowmelt contribute to the problem?

14. Extensions/Related Activities (optional): : Conduct your own river clean-up. Gather information about local waterways that it is relevant to your discussion. Some detail will help students to make connections between the clean-up program and their community. This information might include things such as:

- What groups check and monitor sections of your waterways regularly? When were the last tests for contamination and/or e-coli done?
- Have there been any “**illicit discharge**” problems in your waterways? Do they including e-coli and/ or impaired biotic communities?
- How does rain play a factor in making pollution worse? How could it make it better? Are there any specific events or places that has been affected and how were they addressed?

15. Resources:

“Who Polluted the River”, Population Connection, www.populationconnection.org/education; PopEd@populationconnection.org, 1400 16th Street NW, Suite 320, Washington DC 20036. (available in the extra materials at the end of this lesson plan).

“Away on the Bay”, author unknown (available in the extra materials at the end of this lesson plan)

“It Leaks to the Creek” written and adapted by Kim Schafstall (available in the extra materials at the end of this lesson plan)

Who Polluted the River?

It Leaks to the Creek

This is the story of boy named Shawn,
Who lived in a house with a fence and a lawn.
He was four and a half and went to a school
That thought that recycling was very cool.

His teacher, Ms. ???, had taught his whole class
That they could recycle paper, plastic and glass.
That pollution was hurting our frogs our fish.
That keeping the earth clean was her only wish.

Shawn and his family lived near a creek
And during the summer, they would go down to peek
At the fish and the frogs that were swimming within.
And with their parents, they would go for a swim.

Each fall, trees blew LEAVES right into the waves,
And the wind and the water would wash them away,
The neighborhood kids skipped ROCKS from the bank
The stones plopped and splashed, and to the bottom they sank.

Now, Shawn had a sister named Annie Kay
Who loved to eat candy and suckers all day.
When she was done she threw down her TRASH,
And away it would go with a plop and a splash.

Shawn's Grandpa Roger liked to fix cars
And he often had MOTOROIL in buckets and jars.
He would pour that oil down the hole in his road
And the sticky, black goop would get stuck on a toad.

Shawn's Grandma Gertie had beautiful plants
but she used BUG SPRAY to kill pesky ants.
And when she was done, she would pour out the rest
And off it would go, without leaving a mess.

Shawn's dad WASHED HIS CAR in the drive on his street.
And the soapy suds went down drains at his feet.
His mom found a bottle with a MR. YUCK STICKER
The stuff inside looked like kool-aid, only thicker.

Without really thinking, she poured it into the sink,
And washed it away with the rest of her drink.
And all of it went down the drains through a tunnel
That leaked into the creek through a giant funnel.

BEACH PARTIES and PICNICS by the creek were a treat
And Shawn's family sat on their blankets to eat.
But when they were done, they'd leave their all their trash
And away it would wash with a plop and a splash.

But Shawn started seeing that things weren't quite right;
Their creek had become a terrible sight.
The banks were covered with garbage and glop
That rolled in with the waves-and the waves didn't stop.

There was green goop everywhere-slimy and thick.
There were frogs with one eye or three legs. They were sick.
The birds near the creek were all sick too,
'Cause the fish they ate were covered with goo.

This made Shawn mad. He knew it was bad.
So he called for a meeting with his mom and his dad.
And his Grandma, and Grandpa, and even Annie Kay
And he said to his family that very same day.

"This family is polluting our beautiful land.
The trash around here is out of hand!
We've been naughty with our garbage and trash
And it's washing away with a plop and a splash.

Now the creek is a mess-full of trash, soap, and goop,
The water's turned green-like a bowl of pea soup.
And our frogs and our fish are sick from the grime;
This creek needs our help, right now while there's time."

His family was quiet-they knew it was true.
They realized now what they all had to do.
They agreed to stop littering and dumping their trash
Overboard and away with a plop and a splash.

They stopped pouring poison into the sink
And that made the water safer to drink.
They picked up their litter and cleaned up the stream
And Shawn's family learned that they made a great team.

And all of their work has made the creek clean.
And the frogs in the creek are all happy and green.
But it took months and months to clean up their slime
For cleaning up pollution takes a long time.

Remember a saying that's-simple and plain:
Nothing just goes away when it's washed down the drain.

LEAVES = Leaves
ROCKS = Gravel or Pebbles
TRASH = Candy Wrappers and sucker sticks
MOTOROIL = Soy Sauce
BUG SPRAY = Vinegar and Green food coloring
WASHED HIS CAR = Soap suds
MR. YUK STICKER = Red food coloring and water
BEACH PARTIES = Trash (straws, napkins, Styrofoam)
PICNICS = Trash (toothpick, pop tab, napkin)

By: Kim Schafstall

Who Polluted the River?

AWAY-ON THE BAY

This is the tale of a town called Away
A town that was built on the shore of a bay.
A town where the folks didn't think much about
what they dumped in their water day in and day
out.

Each fall, TREES blew leaves right into the bay,
And the wind and the water would sweep them
away,
CONSTRUCTION SITES moved dirt to make room
For buildings and houses and flowers to bloom.

The FARMERS would fertilize fields and crops,
And BARNYARDS were full of manure and glop.
Then the rain would come down and wash it
away,
Down the slopes of the banks, right into the bay.

The town's COALMINE sat on a hill up the road
And each time it rained, it soaked the whole load.
What drained from those piles of coal and debris,
Had a nasty smell, much like dirty old feet.

A HOMEOWNER nearby had a bad septic tank
All that was flushed ended up down the bank.
The GARDENER nearby had beautiful plants,
but she used insect sprays to kill pesky ants.

COMMUTERS drove to their jobs in the city
Their cars puffed exhaust and left the road gritty.
Oils and fluids leaked onto the streets
And puddles of ANTIFREEZE steamed in the heat.

The ELEC. POWER PLANT gave power to all
While its smokestacks shot gasses up a mile tall.
The gas mixed with moisture to make acid rain.
Which fell onto the ground and into the bay.

The folks WASHED THEIR CARS in their drives or
the street.
And the soapy debris washed down drains at
their feet.
MYSTERIOUS LIQUIDS found in the shed
Were poured down storm drains, which to the bay
fed.

MOTORBOATS raced back and forth in the bay,
Oozing oil and fluids that all spread away.
A PERSON FISHING threw out for a bass,
But his line tangled and broke on his very first
cast.

Summer BEACH PARTIES were always a treat
And PICKNICKERS sat on their blankets to eat.
But when folks were finished, they'd toss all their

trash
Overboard and away with a plop and a splash.

Then folks started seeing that things weren't
quite right;
The bay had become an unbearable sight.
Beaches were covered with garbage and glop
That rolled in with the waves-and the waves didn't
stop.

The algae was everywhere-slimy and thick.
There were frogs with one eye or three legs. They
were sick.
The birds near Away were all suffering too,
'Cause the fish they were eating were covered
with goo.

So a meeting was called to discuss the sick bay
And townspeople came from all parts of Away.
And during the meeting one person proclaimed,
"I know who's at fault: We all should be blamed."

"For years we've washed chemicals, dirt, and
debris
Down our sinks, off our streets, and out pipes-
so you see,
Although we all thought that our waste went away,
It all ended up going into the bay."

Now the bay is a mess-full of trash, soap, and
goop,
The water's turned green-like a bowl of pea soup.
And our wildlife is sick from the garbage and
grime;
The bay needs our help, right now while there's
time."

The folks were all silent-they knew it was true.
They realized now what they all had to do.
It was time to get busy-the bay couldn't wait.
If they didn't act now, it might soon be too late.

So they signed an agreement that very same
minute
To care for the bay and to stop putting in it.
The stuff that had made the bay icky and ill,
Like soaps that pollute- and the ooze from the
mill.

They also agreed to stop dumping their trash
Overboard and away with a plop and a splash.
And all of their efforts have been a success:
Today the bay's clean and no longer a mess.
But it took years and years to remove all the
slime,
For pollution removal takes a long time.
Remember a saying that's-simple and plain:

Nothing just goes away when it's washed down the drain.

Who Polluted the River?

Who Polluted (Your Waterway)?

Five hundred years ago early explorers hunted and fished along creeks, lakes, and streams in this area. They noticed an abundance of wildlife such as foxes, groundhogs, porcupines, deer, beavers, raccoons, and squirrels. They were able to catch plenty of fish to eat in the rivers and streams. The water looked so clean and clear. Do you think they drank it? Washed their clothes in it? Cooked in it? Took a bath in it? Why was it so clean?

Over the years, the land has developed to include all the things that we see today in (your city). The wide open plains and forests have given way to **construction sites** to make room for homes to accommodate the growth in population. Businesses were built to provide us with all the services we need and to make our lives more comfortable and convenient. (your city) is now a hustling, bustling city and a great place to live and raise a family.

(your city) also has several very nice parks and trails. The streams and creeks around (your city) look nice and clean. As you look around, you would never know that there are various forms of pollution occurring right here, right now in every stream, creek and ditch in (your city). I decided to take a walk in (your park) last week and this is a story about what I noticed on my walk.

As I drive toward the park, I see Mr. Green working in his fields. He owns a farm out past the interstate and has been a **farmer** all his life. I watch as he sprays fertilizer on his fields so that his crops will grow better. He also has cows that he raises for meat and milk. His cows graze in his fields, happily munching on grass. He has been so busy in his fields that he has not had a chance to repair the **barnyard** fence by the creek, and the cows are cooling off by standing in the creek. It crosses my mind that the cows are depositing lots of manure in the creek and in the field every day. Hmm...

As I get into town, I notice Mr. Smith **washing his car** in his driveway just downstream from the park. I waved to him and he waved back. I watched the soapy dirt and grime rinse off his car and wash down the storm drain in the street at the bottom of his driveway. The storm drain leads right into the creek, and I notice soap suds floating on top of the water at the base of the storm drain. This can't be good.

Mr. and Mrs. Sanders are **homeowners** that live in the subdivision behind the park. The creek runs near their back yard and they love to take their grandchildren down to the creek to fish, swim, and catch crawdads in the creek during the summer. They are sitting on their porch enjoying the weather. What they don't know is that sewer line is leaking raw sewage right behind their house. How would they know this? What kinds of problems could result from this leak?

Mr. and Mrs. Hall have been busy working *in* their garden. The **gardeners** have spent hours planting and weeding their garden and it is full of yummy vegetables that they sell at the local Farmers Market. They have had some trouble with insects, so they spray the garden with pesticides (bug killer). I am not a big fan of bugs, so I can certainly identify with them not wanting to lose their crops to insects. What problems can insecticides cause?

I stop on the bridge and watched two guys **fishing** in the creek. They try for a long time to catch fish. One of them casts out and his line gets tangled in a tree. He pulls on it for quite a while, but couldn't free it. He finally cuts it off and lets the tangled mess fall into the creek. I shake my head as I watch it float downstream. What will happen to the wad of fishing line? What are the potential problems from just letting it float away?

As I cross under the bridge, I notice the Benson family is busy cleaning out their garage. I briefly stop to chat with them and I notice that they have set aside some rusty, old cans filled with several types of chemicals. One in particular has no label and contains a **mysterious liquid**. They aren't sure what it is, but the rusty can looks dangerous and they don't want to keep it in the house any longer. "We need to rid of it" says Mrs. Benson. Her son, Billy walks over to the side of the driveway and dumps it onto the grass. The red liquid creeps downhill into the drainage ditch and heads for the creek. I don't have a good feeling about that, but I don't want to say anything. They are nice people and I don't want to make them feel bad. What's a better thing to do with poisons and toxic materials if you have them?

To the northwest, there are several businesses that sit near the creek as well. As I pass, I notice that a small area of **oily residue** is sitting on top of the water. I wonder if anyone knows about this. Is it coming from the factory or did someone dump something in the creek? Could this cause a problem? Whom should I call? Hmmm...

A lady and her son are walking a small dog nearby. The dog uses the bathroom in the grass by the creek bank. The lady is chasing after her son and does not stop to pick up the **doggy doo**. I have noticed doggy doo bag stations at several places along the trail, but she must have missed them. I am a little bit disgusted, but I don't pick it up. After all, it's not my dog.

As I leave the park, I notice a smoky haze floating in the air above the local factory. The **smoke stacks** are puffing clouds of smoke into the air and it's hazy above and around the plant. This can't be good. I hear thunder rumbling in the distance. Clouds are moving in and it's starting to look like rain. I wonder what happens to those gasses when the rain knocks them down to the earth? What is that called? Does it affect the fish and wildlife that use the creek? I turn and head back, hoping to beat the rain.

As I hurry back, I see a huge family reunion at one of the shelters. Families are **picnicking** at tables and on blankets scattered all around. Everyone is smiling and laughing and having a good time and they haven't noticed the clouds moving in. It starts to rain and everyone takes cover. One family is in a hurry to get to their car and leaves some trash and garbage behind. As the wind picks up, the trash swirls around and lands in the creek.

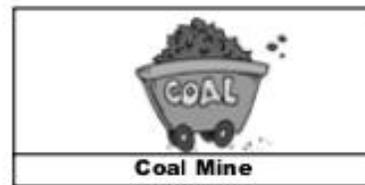
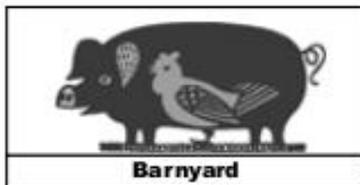
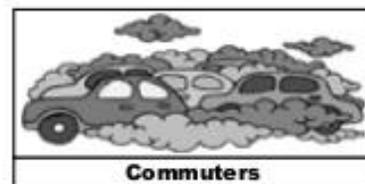
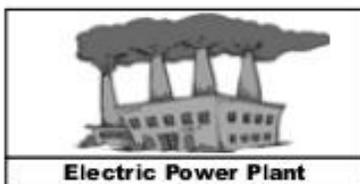
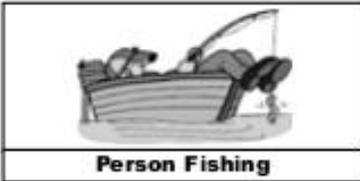
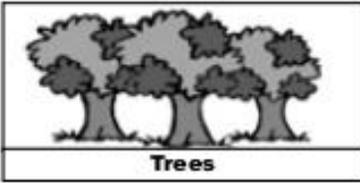
The family runs to their car and as they pull away, I notice a large puddle of green **antifreeze** has pooled where their car was parked. The rain hits the puddle and carries the toxic liquid into a nearby ditch that feeds to the creek. They probably don't even know their car is leaking fluids.

I put up my umbrella and head back toward my car. The **trees** are swaying and leaves are blowing all over the place. Some of them are blowing into the creek. What kinds of problems will that cause?

As I get to my car, I sit for a minute and watch the rain coming down. I think about how pretty the park is and what a nice walk I had. And I am reminded about how lucky I am to live near a city that has such a clean creek. But then I think about all the things I saw that affected the creek...and I wonder...

How clean is this water, really? Would you drink from it? Would you cook with it? Who polluted the creek?

Who Polluted? Canister Labels



Composting and Vermicomposting

Compost Stew

1. Category: Composting and Vermicomposting
2. Grade(s): K-2
3. Correlation to State Standards: SCI.K.1.1, SCI.K.3, EL.K.1.22, EL.K.2.2, EL.K.2.3, EL.K.7.1, EL.K.7.2, SS.K.2.4, SS.K.2.5, MA.K.3.1, SCI.1.1.1, SCI.1.1.2, SCI.1.2.1, SCI.1.2.4, SCI.1.3.4, SCI.1.4.1, EL.1.2.3, EL.1.2.5, EL.1.2.7, EL.1.7.1, EL.1.7.10, EL.1.7.2, EL.1.7.3, SS.1.2.4, SS.1.2.5, SS.1.3.9, SS.1.4.2, SCI.2.1, EL.2.2.4, EL.2.2.5, EL.2.7.3, EL.2.7.4,
4. Description/Purpose: This interactive program is an introduction to the Earth's natural method of recycling yard waste, food waste and other organics. Using a rhyming story book, it introduces students to the merits of waste reduction through composting as well as the benefits of composting in green gardening and fertilizing. Participants witness compost in action, and work together to create a healthy compost system through an interactive model. Tip: see-through composting bins can be purchased online. These education tools allow for students to see the composting stages.
5. Duration: 45 minutes
6. Background Information: The time requirement for this program can be flexible, as can the time spent on different parts of the lesson. It is extremely easy to add time to one element if the students need more time to learn it, or to shorten an explanation if the opposite occurs.
7. Application to real world situations: Students can easily relate the concepts of diverting waste and feeding the Earth. They feel empowered to explain waste diversion to adults.
8. New Vocabulary: Compost, Decompose, Organics, Inorganics, Fertilize, Waste Diversion, Synthetic
9. Materials:
 - a. Chalk board/White board
 - b. Book - *Compost Stew: An A to Z Recipe for the Earth* by McKenna Siddals
 - c. Example of finished compost, or compost in action (see #15)
 - d. Bin marked "COMPOST"
 - e. Bin marked "TRASH"Use f-k or laminated pictures of all the items listed. (available in the extra materials at the end of this lesson plan)
 - f. Wooden food toys (variety of compostable and non-compostable items)
 - g. A few laminated leaves
 - h. A few sticks
 - i. Baggie/container of shredded newspaper
 - j. Baggie/container of straw/hay
 - k. Baggie/container of fresh grass (or shredded green paper)
10. Preparation: Be sure to turn/aerate your see-through composting container before beginning this lesson to help heat the materials for temperature demonstration at the end of the program. This can be done anytime within 24 hours of the program.

Tip! Find out what the school served for breakfast so you can prod the children as to what they ate that morning, whether those items are renewable or non-renewable. Gather all necessary materials for the number of students participating. Ensure that you have access to a whiteboard or chalkboard. You should also have easy access to the items and bins for sorting.
11. Pre-activity questions: Is there anyone in this class who uses things up and throws them out? Everyone does! Well, who has heard of recycling? What is it? Did you know that Earth has her own special way of recycling? It is called **composting**. We are going to talk about something called **waste diversion** and explore how we can be friendly to the Earth by making her special compost snacks.
12. Directions/Procedure: Begin by asking the students to list some things that they use up and get rid of. As they list them, start to create two lists (without titling them). One list will be for compostable (nature) items and the other will be non-compostable (man-made) items. Be sure to draw little pictures if you need to. Ask about what they threw away at lunch yesterday or today.

If you can, find out what was for lunch so you can ask specifically, Did you eat all your peaches (or whatever)? From there you should have two good lists.

Stop and ask them to look at the difference in the lists. Look briefly at the non-compost list, noting anything that can be recycled and pointing out what goes in the trash. Then focus on the other list, noting that another option is Composting, which is the best way to dispose of the items on this list.

Explain that these things come from nature, they are called **organics**. Composting is really simple because Earth does it on its own. Ask: when you walk through the woods, do you have to dig through huge piles of leaves from all the years of leaves falling in autumn? What happens to leaves and twigs in nature? How do they go AWAY? Rotting or **decomposing** is what happens to them. Tiny bacterium that we can't see interact with bugs, worms and natural elements to turn nature's waste items back into natural food for the ground. This nutritious material is a **fertilizer**, a material that feeds the Earth. Then talk about which man-made items can be recycled.

People can interact with this natural process and help to make really yummy and healthy food for Earth. We can use all the things on our compost list and the sticks, leaves and grass from our yards. There are lots of other items as well. We are going to read this short book about making Compost Stew, a delicious treat for Earth to learn about the things that go into compost and then something that do not belong.

Read the story – Make sure to read the “Chef’s Note” at the end (this identifies what shouldn’t be put into a compost bin and why).

After the story go back to your lists and relate them to the story. Ask this students: What kinds of things can go into compost? What do those things have in common/ how are they alike? What doesn't belong in compost? (meats, bones, dairy, fish, etc.) Why? They smell, attract animals and they don't rot/ decompose the same way other things from nature do. Why doesn't Earth want recyclables, **synthetics** (man-made things) etc.? These things are not made by nature, they are called **inorganics**. We should do different things with them, such as recycle.

Activity – Pass out the compostable and non-compostable items, one item per student. Give the directions: Look at your item. Ask the Compost or Not questions: Is my item from nature? Does nature make it? Would it be a good ingredient for Compost Stew or not? Why? Make your choice and I will be walking around with my bins to help you sort.

As you approach each student ask them to hold up the item and name it before they decide which bin to put it in. Use each one to remind them of which kinds of things go in and which don't. After everyone has gotten a turn -

Talk about Waste Reduction: discuss how people should only take as much food as they know they can eat. They can always go back for seconds if they are still hungry.

Demonstrate Compost – use either a sample in a container, or a three bin clear system designed for composting demonstration (see #15). Make sure to tell the students what was in the compost before, or be sure to have a small identifiable item so that they can see that it has gotten smaller (decomposed). If the see-through composter comes with thermometers, point out that the temperature differences (the most active section will be hottest) or the overall temperature (if there is only one bin). A wooden skewer can be inserted so that the bacteria will grow on it and be visible to the students. Make sure to remind students that the finished compost can be put in potted plants, in flower beds or in yards to help fertilize the soil.

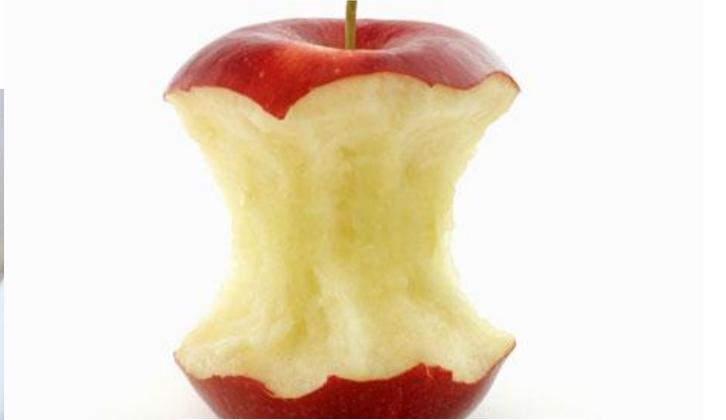
ASK – why shouldn't we put all of our waste into the trash? Will Earth get a snack from our waste if we put it into the trash? Part of why we compost is also to divert waste, which means we reduce the use of other resources.

13. Discussion/Follow Up questions: Why should we compost? What does it do for us? What does it do for our Earth? Do you think composting is something that you could do at your house? How can you explain composting to the adult at your house?

14. Extensions/Related Activities (optional): : If there is time you can redistribute items and “play” again or put items into a pile and have a relay to clean-up and sort the pile.

15. Resources: McKenna Siddals, *Compost Stew: An A to Z Recipe for the Earth*, Tricycle Press, 2010 and a see-through compost container, available through many educational supply sources

Compost Stew (images to be laminated)



Compost Stew (images to be laminated)



Compost Stew (images to be laminated)



Compost Stew (images to be laminated)



Squirmy Wormy Composting Made Easy

(Vermicomposting)

1. Category: Composting/Vermicomposting
2. Grade Level(s): K-5
3. Correlations to State Standards: SCI.K.3.1, SCI.K.3.2, SCI.1.2.4, SCI.1.3.1, SCI.1.3.2, SCI.1.3.3, SCI.1.3.4, SCI.1.4.2, SCI.1.4.3, SCI.2.3.1, SCI.2.3.2, SCI.2.1.4, SCI.3.2.5, SCI.3.2.6, SCI.4.3.1, SCI.4.2.5, SCI.4.2.6, SCI.4.3.2, SCI.4.3.4, SCI.5.3.1, SCI.5.3.2
4. Description/Purpose: By bringing a working **vermicompost** bin into the classroom, students will learn the importance and benefit of decomposers in a natural environment. This program also introduces an interactive and educational organic waste disposal and reduction option to the classroom, thus reiterating the importance of the 3R's (reduce, reuse, recycle). Students will learn the following about vermicomposting: worm anatomy, digestive and reproductive systems of the worm, how worms help decompose food waste/ yard waste in nature and in the bin, worm habitat, and dietary requirements, as well as seeing the vermicomposting process in action. Classes can also set up a working vermicompost bin and monitor it year-round if desired.
5. Time: 45 minutes
6. Background: Worms play an important role in nature's composting system and they are a cool disposal option for **organic waste** in the home or classroom.
7. Application to real world situations: Decomposers are always doing their jobs whether we pay attention to it or not. The organic matter (**castings**) they leave behind is important for natural **fertilization** and the continuation of natural processes.
8. New Vocabulary: Compost, Habitat, Castings, Prostomium, Anus, Gizzard, Mucus, Organic Waste, Segment, Fertilization, Red Wigglers, Hermaphrodite, Setae, Magnifying Glass, Vermicompost, Cocoon, Decomposers, Clitellum
9. Materials: Working vermicompost bin (see setup instructions available in the extra materials at the end of this lesson plan), sample of castings, a long red sock (optional), magnifying glasses (one per student), examination dishes (coffee can lids work well), slinky (optional to demonstrate how worms move).
10. Preparation: Establish a working vermicompost bin (See Build your own Worm Bin (instructions available at the end of the lesson plan). Gather examination dishes and magnifying glasses. Write the key vocabulary words on the board.
11. Pre-activity Questions: Talk about the 3 R's (Reduce, Reuse and Recycle), then discuss where our trash goes and the importance of reducing the amount of waste we make. Then tell the children about creatures that also practice the 3R's - they are called decomposers! Did you know that worms are decomposers and, like people, they can help reduce, reuse and recycle by eating organic material and turning it into fertilizer? Worms help with reducing trash we make by eating it, they recycle it by pooping it out (castings), and then we can reuse their poop in the garden as fertilizer. What else do you know about worms? What is composting? Why is composting important? What is vermicomposting?
12. Directions/Procedure: Always start off by discussing why **decomposers** are beneficial to the Earth. Depending of the age group, start them out on the floor. Read a story about worms to get the students thinking. Some favorites are listed under Resources below.
 - 1) Anatomy (*Note - Adult Red Worm image follows the Resources section*)

Using a red sock on your arm, represent a red wiggler worm (optional), then talk about worm anatomy (no bones, eyes, nose, ears, arms and legs; has a mouth, but no teeth or tongue, etc.). Use the image of a worm with labeled parts for reference (available in the extra materials at the end of this lesson plan).

Go over the parts of worm anatomy (**prostomium**, mouth, **segments**, **clitellum**, **cocoon**, cilia or **setae** (bristles), **gizzard**, etc.). We talk about digestion and the end product (**castings**) and the benefit to the earth and to us by providing free, natural fertilizer. (Tip: Use a slinky to describe the segments of the worm.)

Mucus helps worms move through dirt. Most of it sticks to the worm's body, but some of it comes off on the tunnel walls to hold them together so the tunnels or burrows don't collapse as they move through them. It also keeps their bodies moist. The mucus assists the worm to breathe through its skin, which is good because they don't have a nose. They also don't have ears, but they can "hear" by feeling vibrations (hit the table lightly for the students to feel vibrations). Older worms have the **clitellum** (reproductive part). They reach adulthood by 6 weeks, breed often, and have to have a mate to reproduce. The bigger the worm bin, the bigger the worms can grow.

Explain how Red Wigglers compost faster than Earth Worms. If they are confused about Earth vs. Red Wiggler worms, compare them to dog or cat breeds.

2) Habitat

Discuss their natural habitat and the worm bin **habitat**, and their dietary needs (see the extra materials at the end of this lesson plan s for a list of "What to Vermicompost) , as well as the process in which vermicompost is made. Talk about the movement of a worm being like a slinky, not like a snake and how the segments, setae, and mucus all work together to make them move. Explain that worms are **hermaphrodites** with both male and female reproductive organs. Depending of the age, one may discuss the reproductive process including the hatching of the **cocoon**. If they are younger, just say the worms are both male and female.

Then show them your vermicompost bin, explaining air holes, damp newspaper for bedding, food scraps (what to add and what not to add), castings, etc. Explain that vermicomposting involves providing the proper conditions necessary for worms to live, reproduce, and successfully produce compost. Explain that **red wigglers** are better for at-home bins but that earthworms and other worms do the same process in nature. You have to get your hands in the compost pile or else they'll be afraid.

3) Become Scientists

It may be necessary to discuss the handling of the worms (Some want to rip them apart. Others are terrified of them!). After a brief discussion about how the worms are pets and the rules on how we treat pets, move to the tables and get out the worms.

Each student gets a worm on a plate/lid and a magnifying glass to study it. First identify the head and tail, then look at all of the parts that were discussed earlier (prostomium, segments, clitellum, cilia/ setae, slime, how they move, etc.). Then they can hold them, watch their slime trails, or just watch them move! Find a cocoon in your worm bins to show them (look for little white parts that look like seeds on hamburger buns). If children follow the tail, they can sometimes see the food working its way through the body.

Encourage them to hold them if they are comfortable with it. The class can be left with their own working bin, instruction manual, and record sheet if desired.

After the worms are safely collected, begin the follow-up discussion.

13. Discussion/Follow up questions: Classes can keep track of their own working bin using information and supplies provided by the district. Educator is also available for questions or troubleshooting. Show fake foods and identify which ones worms can eat (they don't eat meat, dairy, or fats - they'll only eat a little bit of citrus at a time). If you put meat into your vermicompost bin, it would smell like road kill. Show the casting and pass the bin around for the children to smell. It smells like an old basement.

(Tip: it takes approximately 3 months to get roughly one pint-quart of castings in the bin.)

Explain again that the castings and tea (brown liquid bi-product) are fertilizer.

14. Extensions/Related Activities (optional): Set up a bin at the beginning of the year and let the class monitor it throughout (See Build your own Worm Bin in the extra materials at the end of this lesson plan). Put enough water in the starter bin so that the shredded paper is damp, but not dripping. Shredded paper helps prevent fruit flies.

15. Resources: There are many websites available from which to purchase red wigglers or red worms. You can also purchase small amounts of red wigglers from your local bait shop.

Websites to buy worms: www.worms.com or (1-800 COMPOST), www.wormwoman.com, www.wormguys.com

Books:

Doreen Cronin, *Diary of a Worm*, Scholastic Inc., 2003.

Michelle Eva Portman, *Compost, by Gosh*, Flowerfield Enterprises, 2003.

Binet Payne, *The Worm Café*, Flower Press, 1999

Mary Appelhof, *Worms Eat My Garbage* , Flower Press, 1997. (Teacher's guide also available.)

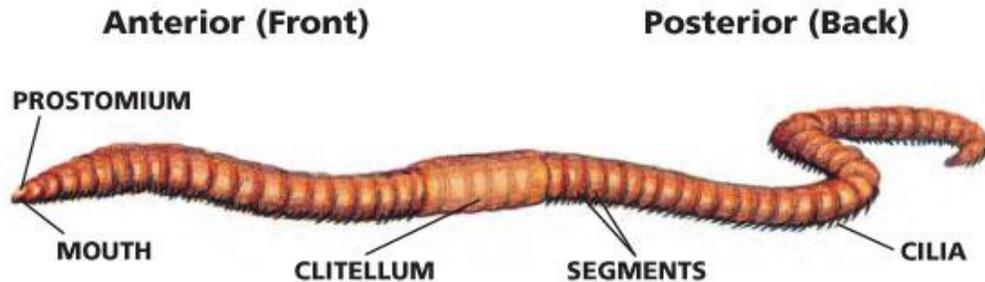
Nancy Loewen, *Garden Wigglers*, Picture Window Book, 1964

Linda Glaser, *Wonderful Worms*, Milbrook Press, 1992

Wendy Pfeffer, *Wiggling Worms at Work*, HarperTrophy, 2004

Squirmy Wormy Vermicomposting

Adult Red Worm (*Eisenia Fetida*)



Build your own Worm Bin

(For additional information, consult *Worms Eat My Garbage* by Mary Appelhof, Flower Press, 1997. (Teacher's guide and classroom activities also available.)

The easiest bin set-up is a plastic tub which I often provide to the classroom. The container you choose should be shallow (8-12" deep) and provide at least 2-square feet of surface area.

Redworms or red wigglers, which are the worms used in vermicomposting, tend to be surface feeders and can vermicompost very quickly. For this reason, red wigglers are a better choice for a vermicompost bin than regular Earth worms. These can be purchased by a bait store online (see Additional Resources and Program Extensions).

The only "construction" required for a vermicompost bin is to drill holes in the top of the lid for ventilation.

Next add bedding, such as damp, shredded newspaper, to your bin. The bedding should be as moist as a damp sponge and should fill the bin $\frac{3}{4}$ full. You may either run it through a shredder or shred it by hand making sure that the strips are not more than about 1"-2" wide. Mix it with water to moisten it.

Next, add food waste by dividing it up and burying it in different sections of the bin (See the Do's and Don'ts of what to vermicompost below). The worms eat the food faster if it is cut into small pieces rather than large chunks. The amount of food you add weekly depends on the size of the bin and number of worms.

Scatter the red worms over the top of the bedding (one pound of worms is a good amount with which to start). They will eventually migrate downward away from the light and toward the buried food waste.

You may also drill small holes in one concentrated location in the bottom to catch your compost tea. This can be caught using a bucket or can placed underneath the holes.

Harvesting and changing bedding

As the worms eat their way through the food waste in the bin, the worm castings in the bin take up more space, so the bedding must be changed about every 2-3 months. You can just dump out the contents on newspapers and divide the compost into several small piles.

Fill the bin with new “bedding” and food scraps.

The worms will migrate down to the bottom of each dumped pile so they are fairly easy to pick out and place into the new bedding. You can expedite this process by shining a bright light over the piles and wait a few minutes for the worms to travel to the bottom of the pile.

Remove the tops and sides to be used as compost. Repeat as necessary. Lift plastic sheet or newspaper with worms and place back in the bin with new bedding.

Save any vermicompost for the garden or houseplants.

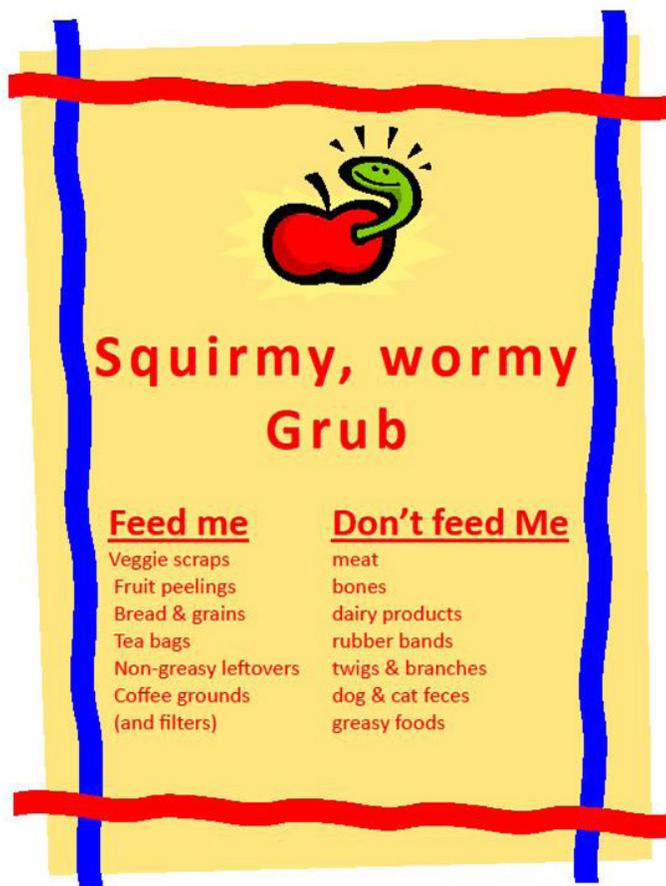
WHAT TO VERMICOMPOST

DO vermicompost:

- Vegetable scraps
- Fruit peelings
- Bread and grains
- Coffee and tea filters
- Non-greasy leftovers
- Eggshells

DON'T vermicompost:

- Meat and bones
- Dairy products
- Rubber bands
- Twigs and branches
- Dog and cat feces
- Greasy foods



Warning: Vermicomposting is not an exact science. Although red worms are small creatures that need your tender loving care, a successful bin is really based on one thing—observation! There are many variables from bin to bin, so take the time to get to know how your bin works. There is not one right way to make and maintain a worm bin. Use your own judgment and common sense. The troubleshooting information in this section lists problems you may encounter and remedies you may want to try. If all else fails, worm counseling is available! Call the Office of Integrated Environmental Education at (916) 341-6769 and ask for assistance from your county representative.

Troubleshooting The Worm Doctor

Troubleshooting is based on experimentation, so getting to know your bin becomes very helpful when trying to remedy a problem. If a problem does occur and you think you've found a solution, don't stop there. Continue to give your bin daily check-ups until you see—or, in many cases, smell—an improvement. You may encounter some of the common problems listed below.

<u>Symptom</u>	<u>Diagnosis</u>	<u>Remedy</u>
Strong, Bad Smell	Not enough air circulation.	Fluff bedding. Make sure bedding or compost is not blocking the airholes.
	Too much food in bin.	Feed worms less food and/or less often.
	Improper food added.	Remove meat, dairy, and oily products.
	Food exposed.	Bury food completely.
	Anaerobic conditions.	Add bedding to absorb moisture.
Fruit Flies	Food exposed.	Bury food completely. Place bin outside in colder weather (temperature must not be below 50°F).
	Too much food.	Don't overfeed worms.
Ant Infestation		Place ant traps near, not in, your bin. Immerse bin feet in liquid. A barrier of chalk or petroleum jelly may repel the ants. If bedding seems dry, add water.
Mite Infestation	Mite population is high.	Avoid adding foods with high moisture content, such as fruits and vegetables.
Overly Moist	Too much water added to bedding.	Stop adding water. Add paper to soak up extra moisture.
	Too much food with high moisture content.	Put in less fruit and vegetable waste.

Be sure to keep in contact with your school grounds staff. Let them know you have a worm bin and request they notify you ahead of time of any pesticide spraying that may take place, whether it is in the classroom or outside. If spraying will be done for ants or other reasons, remove your bin from the premises to avoid worm fatalities.

Take your bin home during extended vacation periods, unless you plan to visit your classroom at least every few weeks for feeding purposes. You may want to have a parent or another teacher adopt the bin while you are gone.

Household Hazardous Waste

Hazardous House of Horrors

1. Category: Household Hazardous Waste
2. Correlation to State Standards: SCI.K.1.1, SCI.K.1.2, SS.K.3.7, SCI.1.1.1, SS.1.2.4, SS.1.3.9, SCI.2.4.2,
3. Grade Level(s): K-2
4. Description/Purpose: To teach students what household hazardous waste is, how to identify it and safe handling/disposal of these products.
5. Duration: Approximately 45 minutes
6. Background Information: Many accidental poisonings and pollution come from items that we use every day. These are called Household Hazardous Waste or Household Hazardous Materials. It is important to know how to identify, use and store them as well as how to dispose of them properly when we no longer need them.
7. Application to real World situations: Household Hazardous Wastes are in the homes of most students, and they may therefore encounter them regularly. Teaching students to identify and correctly react to them will help create safer home environments and generate awareness about the threats posed to human and environmental health
8. New Vocabulary: Household Hazardous Waste, Caution*, Warning*, Danger*, Poison*, Toxic*, Corrosive*, Flammable* (*terms used in activity)
9. Materials: Dollhouse, furniture and props for doll house, label cards, toxic/non-toxic picture cards, and labeled bags (Toxic and Non-toxic). (see the extra materials at the end of this lesson plan)
10. Preparation: Print out pictures of different household items. You will need approximately 60 pictures. Be sure to include some items that are toxic and some that are non-toxic. Cut them down to smaller sizes and laminate the pictures. Gather two paper grocery bags and label one "toxic" and one "non-toxic". In preparing the room, place the dollhouse on a table in the front of the room along with some examples of empty and clean HHW containers. These containers will be a great visual aid for some of the labels and products you are discussing. Place the bags at the front of the room and keep the cards easily accessible to be passed out during the program.
11. Pre-activity questions: Begin the activity by asking, "what is **Household Hazardous Waste (HHW)**? HHW is a category of materials that are used and disposed of by households instead of businesses and that are harmful to humans, animals and the environment. Where would you find Household Hazardous Waste at your home? HHW can be found in many places, one of the most common is under the kitchen sink. Bathrooms and garages are also places where HHW can be found. These are all places where people store chemicals. Where should Household Hazardous Waste products be kept in your home? HHW products should always be stored in their original containers or if not in original containers, clearly labeled. Containers should be unbroken and child-proof. They should also be stored in hard to reach places so that children do not have access to them.
12. Directions/Procedure: Intro – Hold up a bottle of cleaner... Is it hazardous?
What does that mean? Hazardous means dangerous. It could be bad for you, animals or resources outside like creeks, ponds, rivers, soil or air. How do you know if something is dangerous?
LOOKING - Do you see a sign or a word that would tell you it's dangerous? SHOW POISON SYMBOL AND/OR STOP SIGN. Show students and explain the words that are found on a product's label such as Caution, Warning, Danger, Poison, Toxic, Flammable. Why is it important to read labels and to be able to recognize and understand these words?
SMELLS BAD - You should never put something up to your nose and smell it if you don't know what it is. But, if you smell something yucky from far away, it could be something hazardous. Sometimes hazardous things smell good too, so if you don't know what something is don't smell it and ask a parent for help.
FEELS- You should not feel something if you don't know what it is.
LISTEN- Maybe Mom and Dad have told you about some things in your house that might be hazardous. These are all very good ways to know if something in your house might be hazardous.
TEACH POEM – *"IT MAY LOOK PRETTY, IT MAY SMELL GOOD. BUT BEFORE I TOUCH IT, I'LL ASK IF I SHOULD". (adapted by Indiana Poison Control Center)*

Hazardous things in our houses are things that could make people, animals, or the environment sick. So it is very important that we make sure these types of items are kept up high (out of the reach of students) and in locked cabinets.

So...we are going to pretend we live in this house/visit this house and we are going to see if this house has anything in it that might be Hazardous.

GO THROUGH EACH ROOM – SHOW EXAMPLES OF CONTAINERS FOUND IN EACH ROOM.

There are 5 ways that hazardous stuff can get into your body –

Drinking it, Eating it, breathing it, touching it, or getting them into your eye or a cut, etc. Did you see some examples of things in the house that could have gotten into a family member's body any of these ways?

MATCHING GAME –

Give each student something that they would find at home. They need to decide...Is it yucky or not yucky. – HAVE TWO BAGS – ONE MARKED WITH A SKULL AND CROSSBONES AND ONE MARKED WITH A HAPPY FACE.

Which bag is for YUCKY stuff (stuff that is **toxic**)?

How do you know?

Which bag is for NON-YUCKY stuff (stuff that is **non-toxic**)?

How do you know?

What should you do if you don't know if your item is YUCKY?

Ask an Adult! Remember the poem?

Go through the answers

TEACH THE SONG: TO THE TUNE OF 3 BLIND MICE

(adapted by Indiana Poison Control Center)

*"We ask first, we ask first
What we may taste
What we may touch"
"When something looks like it's good to chew
And may even smell like it's yummy too
it could be a poison, so here's what we do...
We ask first, we ask first"*

13. Discussion/Follow Up questions: At the end of the program review and summarize the main points of the program - What is household hazardous waste? How can you identify if something is hazardous? What are some common household hazardous waste items at home? Thermometers, thermostats, and compact fluorescent light bulbs all contain mercury. Where should it be kept in your home? How do we dispose of something safely if it is hazardous? Advise students to talk to their parents about calling the local Solid Waste Management District for disposal options for HHW in their area.

14. Extensions/Related Activities (optional): Provide Household Hazardous Waste worksheets through HHW Taskforce.

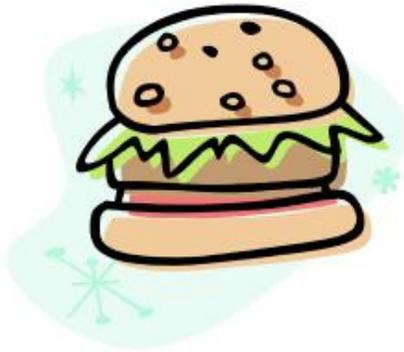
15. Resources: Additional resources and information can be retrieved by contacting:

- Indiana Poison Control Center - <http://iuhealth.org/methodist/poisoning/>
- Indiana Household Hazardous Waste Taskforce - www.indianahhw.org/educators-toolkit

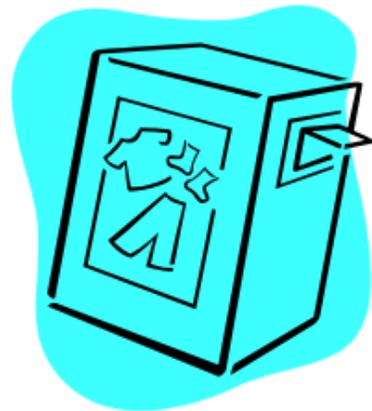
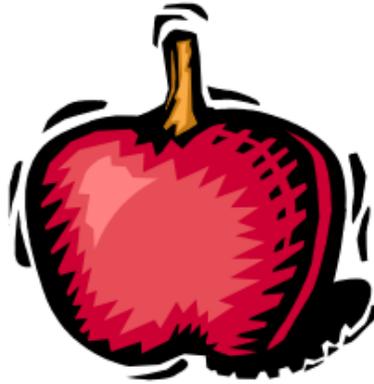
Household House of Horrors – Tox Cards



Household House of Horrors – Tox Cards



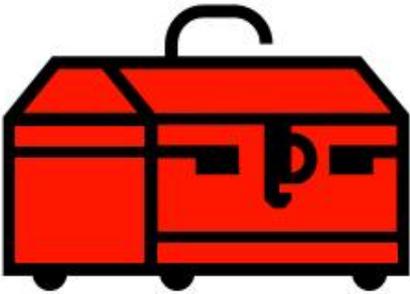
Household House of Horrors – Tox Cards



Household House of Horrors – Tox Cards



Household House of Horrors – Tox Cards



Household House of Horrors – Tox Cards



Household House of Horrors – Tox Cards



Household Hazardous What?

1. Category: Household Hazardous Waste (HHW)
2. Grade(s): 4-5
3. Correlation to State Standards: SCI.4.2.6, SCI.4.3.4, SCI.5.3.1
4. Description/Purpose: Students will identify a number of household products and learn how they are used as well as how to sort. They will sort items into the various types of household hazardous waste. Students will discuss how the improper use and disposal can affect people in their community and environment as well as learn alternatives.
5. Duration: 1 hour
6. Background Information: Disposal of HHW in municipal solid waste management facilities such as landfills, incinerators, and waste-to-energy facilities is believed to represent a potential threat to air and water quality *if* not maintained correctly. Also, HHW can pose threats to residents of the household if used or disposed of incorrectly. Therefore it is most important for individuals to be aware of the proper handling and disposal practices for HHW in their county. Landfills are equipped to safely contain hazardous waste if necessary. However, landfills are not the best waste destination for HHW. HHW should always be disposed of through local and reputable hazardous waste collections (such as Solid Waste Management Districts). The practice of proper HHW disposal minimizes the health risks to sanitation and landfill workers.
7. New Vocabulary: (HHW) Household Hazardous Waste, Toxic, Corrosive, Reactive, Combustible/Flammable, Leachate
8. Application to real world situations: The products used in this program are real world examples of HHW. These are items that are encountered frequently and their disposal affects all residents. Also, alternatives are real world choices that individuals can make.
9. Materials: Label cards, product examples for label reading (drain cleaner, air freshener, bleach, bug killer, pesticide, weed killer, pool cleaner, window cleaner), laminated- data label recording sheets, dry-erase markers, bingo cards, bingo keys, bingo markers, bingo prizes, (labels, data label recording sheets and bingo cards are available in the extra materials at the end of this lesson plan).
10. Preparation: Laminate the Data Label Recording Sheets, bingo cards, and bingo keys
11. Pre-activity questions: What is Household Hazardous Waste (HHW)? It is a category of materials that are used and disposed of by households instead of businesses and that are harmful to humans, animals and the environment. Show examples of empty and clean HHW items (e.g. cleaners). Other common HHW items are compact fluorescent light bulbs, and some older thermostats and thermometers. These have mercury in them.
12. Directions/Procedure: There are four categories of Household Hazardous Waste; the best way to identify them is to read the labels. Show examples with each category. Law requires that any HHW product be labeled according to a rating system. Show products with each label type below.

Label Notice Types- **Poisonous, Danger, Warning, and Caution** (*show label cards* - these are provided at the end of this lesson plan). Products have information on the label about what harmful effects they can have if improperly used. Point out how dangerous these are. Discuss what the warning words means and write them on the board for reference throughout the activities.

1. **Toxic**- Can cause illness (headache-cancer)or death, many can even be absorbed through the skin, Ex. Weed killers, pesticides
2. **Corrosive**- Capable of chemically wearing substances away or destroying them, can eat through metal or burn human skin, Ex. Acids in batteries
3. **Reactive**- Capable of exploding or releasing poisonous gas when mixed with other substances or chemicals, Ex. Bleach and Ammonia produce a poisonous gas
4. **Flammable/Combustible**- Capable of bursting into flames, pose a fire hazard, can irritate skin/eyes/lungs, Ex. Gas, paint, or furniture polish

Begin Label Reading Activity - Pass out various HHW examples to small groups. Give each group the Data Label page to record the label information. Have each group talk about one product going over each detail recorded on the sheet. Ask - How can we dispose of HHW? Discuss the disposal options for HHW.

Match up the product examples of the Data Chart. Read the labels of products, then list what they are used for. Look at what warning is on the label of the product. Which harmful effect do they have?

- a. Reuse- If product is only partially used and in good condition with the label on it, you can share it with your neighbor.
- b. Recycle- Some HHW can be recycled (oil can be cleaned and used again).
- c. Give Tox-A-Way options – are there free events in our area to dispose of HHW? Note where they take place and what happens to them for disposal (be specific to your area).
- d. Landfill- We do not want HHW to end up in the landfill due to the hazards they pose to the landfill workers and potential for contamination if landfill issues arise. Although, most landfills are now equipped and capable of dealing with HHW to prevent **leachate** (liquid produced from waste, “garbage juice”) from contaminating the environment, we still should not put HHW in landfills. Why? Because, workers could be harmed due to accidental exposure to HHW.
- e. Do Not Pour Down Drains or Outside- We do not want most HHW to end up flushed or poured down the drain because they can contaminate drinking water. If HHW is poured on the ground it could be exposed to animal/plant life can cause illness/death or reach the local streams/ rivers contaminating the system or contaminate soil/air.

What is the best way to prevent HHW misuse or mis-disposal? Not using hazardous products.

Play Safe Alternatives Bingo: What are alternatives for HHW? Use examples from the Toxic-free Bingo Page ;Yellow Jacket Trap vs. Yellow Jacket Poison or Chlorine Bleach vs. Chlorine Free Bleach.

Pass out Bingo Cards, Bingo Keys, and bingo markers.

Call out potentially hazardous products, allowing time for the students to find the safe alternatives on their bingo card. Play until a student calls bingo with four in a row vertically, horizontally, or diagonally. Play as many rounds as time allows.

13. Discussion/Follow Up questions: There are two ways to reduce your use of hazardous products;

- 1) Choose safer, less hazardous products, and/or
- 2) Use less of a product.

Not every job can be done with a safer product, but most can. Some safer products have been around for years such as borax, baking soda, and vinegar. Other products are the result of sophisticated research to find less hazardous replacements to toxic products (alternative, eco-friendly products). Some alternatives may require more effort, but they do work, and they may cost less. Also, be sure to dispose of HHW properly by taking it to your local HHW collection facility.

14. Extensions/Related Activities (optional):

www.lhwmp.org/home/educators/documents/SY_Concentration.pdf

15. Resources:

- Household Hazardous Waste- Recycling & Waste Reduction District of Porter County, <http://your.kingcounty.gov/solidwaste/education/hazwaste.asp>, www.calrecycle.ca.gov/Education/curriculum/ctl/46Module/Unit4/Unit4.pdf
- Indiana Poison Center website: www.indiana.poisoncenter.org
(Tip: free samples of magnets, pencils, etc. are available to students for educational purposes.)

Household Hazardous Waste Additional Supplies

GROUP CHART FOR COLLECTING HHW LABEL DATA

Type of Product	Product Use	Hazardous Substance(s)	Warning Label	Toxic	Corrosive	Reactive	Flammable
1.							
2.							
3.							
4.							
5.							

WARNING

POISON

CAUTION

DANGER

Moderate Hazard

If eaten, absorbed through the skin, inhaled, or it causes moderate eye or skin irritation

Mild/Moderate Hazard

If eaten, absorbed through the skin, inhaled, or it causes slight eye or skin irritation

Highly toxic (highest hazard level)

Can cause injury/death if ingested, inhaled, or absorbed through the skin

Extremely flammable, corrosive, or highly toxic

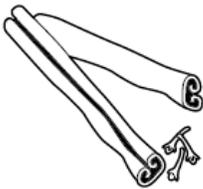
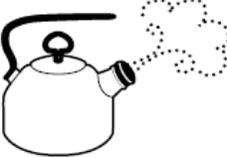
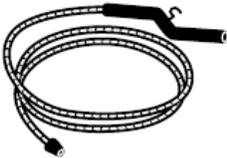
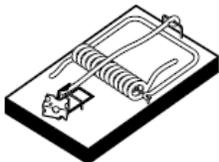
Maybe corrosive (causing irreversible damage to the skin or eyes), Maybe highly toxic if eaten, absorbed through the skin, or inhaled

TOXIC-FREE BINGO KEY

Potentially Hazardous Products	Safer Alternatives	Potentially Hazardous Products	Safer Alternatives
Aerosol spray	 Pump spray bottle	Rat or mouse poison	 Rat or mouse trap
Air freshener	 Simmer cinnamon and cloves	Roach poison	 Roach trap
Antifreeze marked with WARNING	 Antifreeze with no C-W-D-P	Rubber cement	 White glue or glue stick
Aphid poison	 Spray with water three times weekly. Or squirt with soapy water.	Scouring powder	 Use baking soda and scrub
Chlorine bleach to whiten clothes	 Non-chlorine bleach	Shower cleaner with WARNING or CAUTION	 Shower cleaner with no C-W-D-P
Dishwashing soap marked with CAUTION	 Dishwashing soap with no C-W-D-P	Slug poison	 Slug trap
Drain opener with lye	 Pour a kettle of boiling water down the drain. Or, use a plumber's snake.	Spot remover	 Blot with club soda
Flea collar	 Flea comb	Toilet bowl cleaner with DANGER	 Bon Ami
Oil based paint	 Latex or water-based paint	Weed poison	 Weed puller
Oven cleaner with lye	 Bon Ami	Yellow jacket poison	 Yellow jacket trap

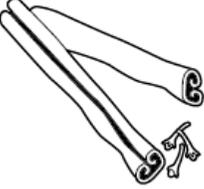
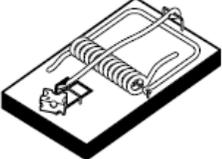
TOXIC-FREE BINGO

Sheet 1

 <p><i>Pump spray bottle</i></p>	 <p><i>Cinnamon & cloves</i></p>	 <p><i>No C-W-D-P</i></p>	
 <p><i>Soapy Water</i></p>	 <p><i>NON-CHLORINE BLEACH</i></p>	 <p><i>Dish Soap</i></p> <p><i>No C-W-D-P</i></p>	 <p><i>Boiling water</i></p>
 <p><i>Plumber's snake</i></p>	 <p><i>Flea comb</i></p>	 <p><i>LATEX PAINT</i></p>	 <p><i>Bon Ami CLEANSER</i></p>
 <p><i>Rat or mouse trap</i></p>	 <p><i>Roach trap</i></p>	 <p><i>Glue Stick</i></p>	 <p><i>Baking Soda</i></p>

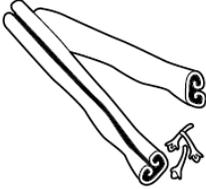
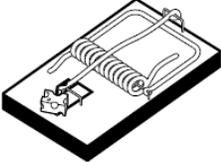
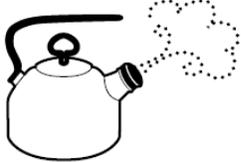
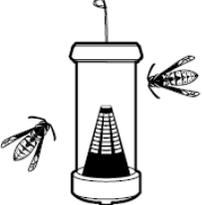
TOXIC-FREE BINGO

Sheet 2

 <p><i>No C-W-D-P</i></p>	 <p><i>Yellow jacket trap</i></p>	 <p><i>No C-W-D-P</i></p>	 <p><i>No C-W-D-P</i></p>
 <p><i>No C-W-D-P</i></p>	 <p><i>No C-W-D-P</i></p>	 <p><i>Roach trap</i></p>	 <p><i>No C-W-D-P</i></p>
 <p><i>Weed puller</i></p>	 <p><i>Baking Soda</i></p>	 <p><i>Flea comb</i></p>	 <p><i>Club Soda</i></p>
 <p><i>Cinnamon & cloves</i></p>	 <p><i>Rat or mouse trap</i></p>	 <p><i>Non-Chlorine Bleach</i></p>	 <p><i>Glue Stick</i></p>

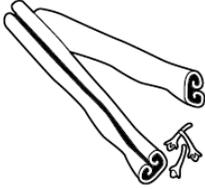
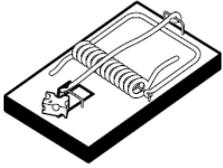
TOXIC-FREE BINGO

Sheet 3

 <p>Slug trap</p>	 <p>No C-W-D-P</p>	 <p>LATEX PAINT</p>	 <p>Cinnamon & cloves</p>
 <p>Rat or mouse trap</p>	 <p>Soapy Water</p>	 <p>Soapy Water</p>	 <p>Boiling water</p>
 <p>Yellow jacket trap</p>	 <p>NON-CHLORINE BLEACH</p>	 <p>Baking Soda</p>	 <p>Flea comb</p>
 <p>Pump spray bottle</p>	 <p>Bon Ami CLEANSER</p>	 <p>SAFETY FREEZE</p>	 <p>Roach trap</p>

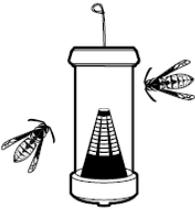
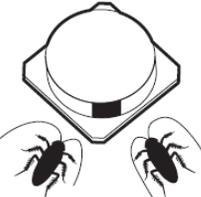
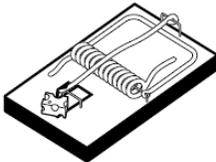
TOXIC-FREE BINGO

Sheet 4

 <p>Baking Soda</p>	 <p>Slug trap</p>	 <p>No C-W-D-P</p>	 <p>Pump spray bottle</p>
 <p>Cinnamon & cloves</p>	 <p>No C-W-D-P</p>	 <p>LATEX PAINT</p>	 <p>No C-W-D-P</p>
 <p>NON-CHLORINE BLEACH</p>	 <p>Soapy Water</p>	 <p>Weed puller</p>	 <p>CLUB SODA</p>
 <p>Flea comb</p>		 <p>Bon Ami CLEANSER</p>	 <p>Rat or mouse trap</p>

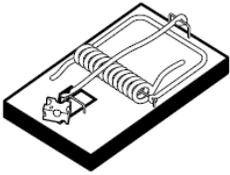
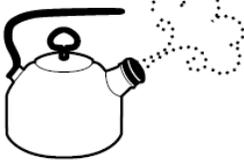
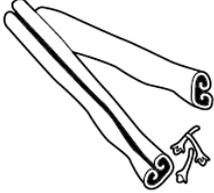
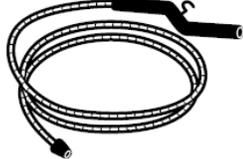
TOXIC-FREE BINGO

Sheet 5

 <p>CLUB SODA</p>	 <p>Boiling water</p>	 <p>Yellow jacket trap</p>	 <p>Bon ami CLEANSER</p>
 <p>Pump spray bottle</p>	 <p>Glue Stick</p>	 <p>CLEAN SHOWER</p> <p>No C-W-D-P</p>	 <p>Flea comb</p>
 <p>NON-CHLORINE BLEACH</p>	 <p>SAFETY FREEZE</p> <p>No C-W-D-P</p>	 <p>Slug trap</p>	 <p>Weed puller</p>
 <p>Baking Soda</p>	 <p>Roach trap</p>	 <p>LATEX PAINT</p>	 <p>Rat or mouse trap</p>

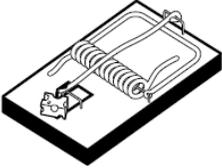
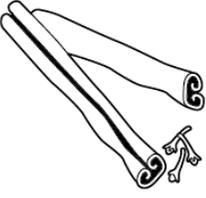
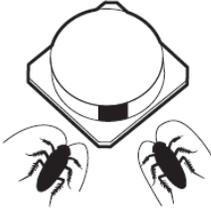
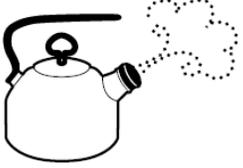
TOXIC-FREE BINGO

Sheet 6

 <p>Baking Soda</p>	 <p>NON-CHLORINE BLEACH</p>	 <p>SAFETY FREEZE</p>	 <p>Rat or mouse trap</p>
 <p>Pump spray bottle</p>	 <p>Bon ami CLEANSER</p>	 <p>LATEX PAINT</p>	 <p>CLEAN SHOWER</p>
 <p>Boiling water</p>	 <p>Dish Soap</p>	 <p>Glue Stick</p>	 <p>Soapy Water</p>
 <p>Cinnamon & cloves</p>	 <p>Roach trap</p>		 <p>Plumber's snake</p>

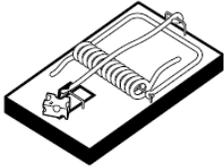
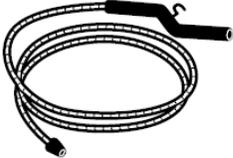
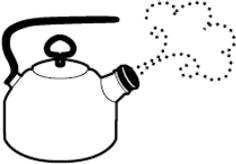
TOXIC-FREE BINGO

Sheet 7

 <p><i>Rat or mouse trap</i></p>	 <p><i>Cinnamon & cloves</i></p>	 <p><i>Glue stick</i></p>	 <p><i>Bon Ami CLEANSER</i></p>
 <p><i>NON-CHLORINE BLEACH</i></p>	 <p><i>Pump spray bottle</i></p>	 <p><i>Roach trap</i></p>	 <p><i>SAFETY FREEZE</i></p> <p><i>No C-W-D-P</i></p>
 <p><i>Handheld sprayer</i></p>	 <p><i>Soapy Water</i></p>	 <p><i>CLEAN SHOWER</i></p> <p><i>No C-W-D-P</i></p>	 <p><i>Dish Soap</i></p> <p><i>No C-W-D-P</i></p>
 <p><i>Boiling water</i></p>	 <p><i>Baking Soda</i></p>	 <p><i>Flea comb</i></p>	 <p><i>LATEX PAINT</i></p>

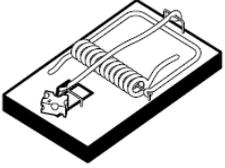
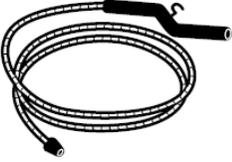
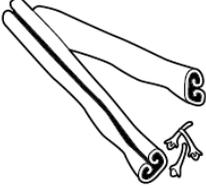
TOXIC-FREE BINGO

Sheet 8

 <p><i>No C-W-D-P</i></p>	 <p><i>Rat or mouse trap</i></p>	 <p><i>Soapy Water</i></p>	 <p><i>NON-CHLORINE BLEACH</i></p>
 <p><i>No C-W-D-P</i></p>	 <p><i>LATEX PAINT</i></p>	 <p><i>Plumber's snake</i></p>	 <p><i>Flea comb</i></p>
 <p><i>No C-W-D-P</i></p>	 <p><i>Bon Ami</i> CLEANSER</p>	 <p><i>Spray nozzle</i></p>	 <p><i>Roach trap</i></p>
 <p><i>Yellow jacket trap</i></p>	 <p><i>Slug trap</i></p>	 <p><i>Boiling water</i></p>	 <p><i>CLUB SODA</i></p>

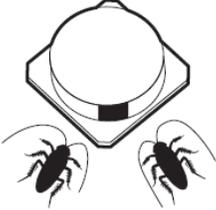
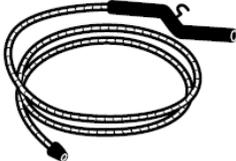
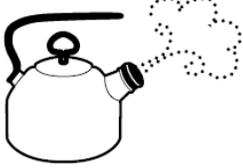
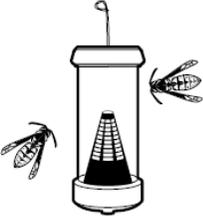
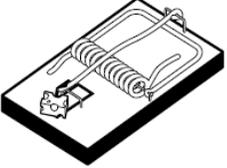
TOXIC-FREE BINGO

Sheet 9

 <p><i>Rat or mouse trap</i></p>	 <p><i>Flea comb</i></p>	 <p><i>No C-W-D-P</i></p>	
	 <p><i>Plumber's snake</i></p>	 <p><i>Cinnamon & cloves</i></p>	 <p><i>Pump spray bottle</i></p>
	 <p><i>No C-W-D-P</i></p>		
	 <p><i>No C-W-D-P</i></p>	 <p><i>Boiling water</i></p>	 <p><i>Slug trap</i></p>

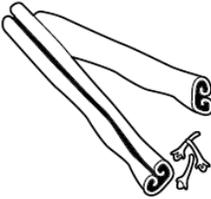
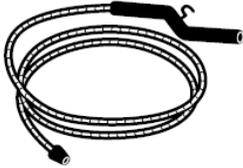
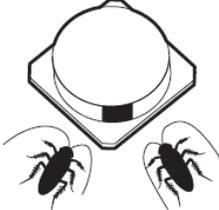
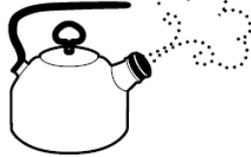
TOXIC-FREE BINGO

Sheet 10

 <p>Roach trap</p>	 <p>Plumber's snake</p>	 <p>Pump spray bottle</p>	 <p>Boiling water</p>
 <p>LATEX PAINT</p>	 <p>Yellow jacket trap</p>	 <p>Weed puller</p>	 <p>CLUB SODA</p>
 <p>Slug trap</p>	 <p>CLEAN SHOWER</p> <p>No C-W-D-P</p>	 <p>Flea comb</p>	 <p>Rat or mouse trap</p>
 <p>SAFETY FREEZE</p> <p>No C-W-D-P</p>	 <p>Glue Stick</p>	 <p>Soapy Water</p>	 <p>NON-CHLORINE BLEACH</p>

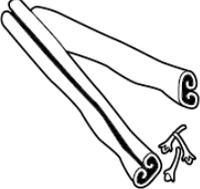
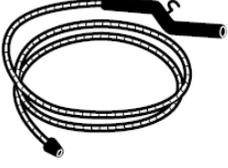
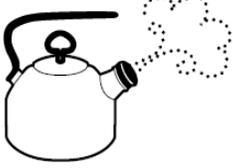
TOXIC-FREE BINGO

Sheet 11

 <p><i>No C-W-D-P</i></p>	 <p><i>Club Soda</i></p>	 <p><i>Slug trap</i></p>	 <p><i>No C-W-D-P</i></p>
 <p><i>Yellow jacket trap</i></p>	 <p><i>Cinnamon & cloves</i></p>	 <p><i>Plumber's snake</i></p>	 <p><i>Spray nozzle</i></p>
 <p><i>Roach trap</i></p>	 <p><i>Glue stick</i></p>	 <p><i>Weed puller</i></p>	 <p><i>Boiling water</i></p>
 <p><i>No C-W-D-P</i></p>	 <p><i>Flea comb</i></p>	 <p><i>LATEX PAINT</i></p>	 <p><i>Bon Ami CLEANSER</i></p>

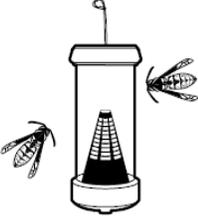
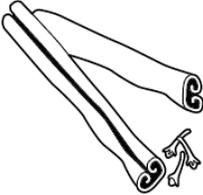
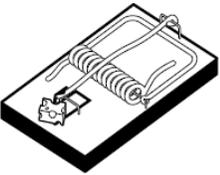
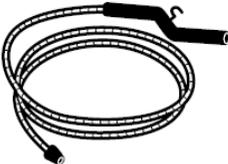
TOXIC-FREE BINGO

Sheet 12

 <p>Yellow jacket trap</p>	 <p>Weed puller</p>	 <p></p>	 <p>Slug trap</p>
 <p>No C-W-D-P</p>	 <p>Pump spray bottle</p>	 <p>Cinnamon & cloves</p>	 <p>Plumber's snake</p>
 <p>CLUB SODA</p>	 <p>Soapy Water</p>	 <p>NON-CHLORINE BLEACH</p>	 <p>Dish Soap</p> <p>No C-W-D-P</p>
 <p>Boiling water</p>	 <p>SAFETY FREEZE</p> <p>No C-W-D-P</p>	 <p>Flea comb</p>	 <p>LATEX PAINT</p>

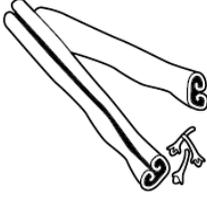
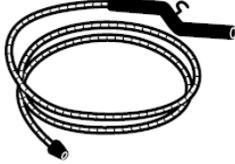
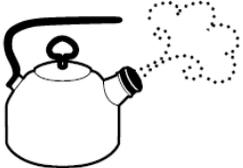
TOXIC-FREE BINGO

Sheet 13

			
<i>LateX paint</i>	<i>Yellow jacket trap</i>	<i>Weed puller</i>	
			
<i>Slug trap</i>	<i>No C-W-D-P</i>	<i>Pump spray bottle</i>	<i>Cinnamon & cloves</i>
			
<i>No C-W-D-P</i>	<i>Flea comb</i>		<i>Non-chlorine bleach</i>
			
<i>Glue stick</i>	<i>Rat or mouse trap</i>	<i>Plumber's snake</i>	

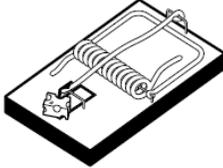
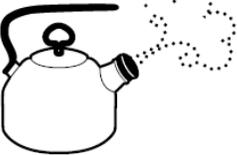
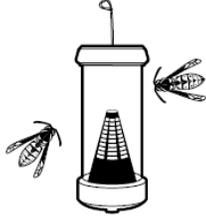
TOXIC-FREE BINGO

Sheet 14

 <p><i>Flea comb</i></p>	 <p>LATEX PAINT</p>	 <p><i>Cinnamon & cloves</i></p>	 <p><i>Plumber's snake</i></p>
 <p><i>Slug trap</i></p>	 <p>CLUB SODA</p>	 <p>SAFETY FREEZE</p> <p><i>No C-W-D-P</i></p>	 <p>CLEAN SHOWER</p> <p><i>No C-W-D-P</i></p>
 <p><i>Roach trap</i></p>	 <p>NON-CHLORINE BLEACH</p>	 <p><i>Weed puller</i></p>	 <p><i>Boiling water</i></p>
 <p>Baking Soda</p>	 <p>Bon ami CLEANSER</p>	 <p><i>Dish Soap</i></p> <p><i>No C-W-D-P</i></p>	 <p><i>Boiling water</i></p>

TOXIC-FREE BINGO

Sheet 15

 <p><i>No C-W-D-P</i></p>	 <p><i>Slug trap</i></p>	 <p><i>Rat or mouse trap</i></p>	 <p><i>No C-W-D-P</i></p>
 <p><i>Soapy Water</i></p>	 <p><i>NON-CHLORINE BLEACH</i></p>	 <p><i>Dish Soap</i></p>	 <p><i>No C-W-D-P</i></p>
 <p><i>Boiling water</i></p>	 <p><i>Flea comb</i></p>	 <p><i>Plumber's snake</i></p>	
 <p><i>Weed puller</i></p>	 <p><i>Pump spray bottle</i></p>	 <p><i>Yellow jacket trap</i></p>	

Got Household Hazardous Waste?

1. Category: Household Hazardous Waste
2. Grade(s): 2-4
3. Correlation to State Standards: SCI.2.4.2, SCI.3.2.6, SCI.4.2.5, SCI.4.2.6
4. Description/Purpose: This is a two-part program. It works best to explain to students initially that they will be learning about household hazardous waste through two activities. Part one teaches students about warning words on household products. They will learn how labels explain possible hazards and the safe storage and use of HHW products. Part two demonstrates safer alternatives to several of the household hazardous waste products used in the home. These two sections together create a cohesive and highly interactive program. Point out that people should keep chemicals in their original containers.
5. Duration: 45 minutes to 1 hour
6. Background information: This is a highly interactive program that exposes students to the idea of eco-alternatives and proper management and uses of household hazardous waste.
7. New Vocabulary: *Caution, *Combustible, *Corrosive, *Danger, *Explosive, *Flammable, *Hazardous, *Poisonous, *Reactive, *Toxic, *Warning, *Pest management (*these are the words of warning)
8. Application to real world situations: Students encounter HHW in their daily lives. Practical information about how to properly handle and dispose of it is relevant to their safety.
9. Materials:
 - a. Small variety of empty plastic household cleaner bottles (such as glass cleaner, disinfectant, floor cleaner, etc.) Be sure that these bottles have their original labels containing some of the warning words.
 - b. Small variety of natural cleaner empty bottles (such as vinegar, lemon juice and baking soda box, etc.)
 - c. Cards with words of warning printed on them and their definitions for the charades game (available in the extra materials at the end of this lesson plan).
 - d. Cards with pictures of examples of HHW (available in the extra materials at the end of this lesson plan)
 - e. Cards with pictures of natural cleaners and HHW alternatives (available in the extra materials at the end of this lesson plan)
10. Preparation: Make sure there is an open space at the front of the classroom and that all the students can see this area. Write out all the warning words on the board and explain them.
11. Pre-activity questions: What is HHW? It is a category of materials and products that are used and disposed of by households instead of businesses and that are harmful to humans, animals and the environment. How do we use these types of products? Do you think they harm humans or the environment? What types of pollution can be a result of HHW? Has your family ever used chemicals in their yards to prevent weeds or to kill certain bugs? Explain how dangerous HHW items can be.
12. Directions/Procedure: Explain a bit about HHW and how sometimes the way they are used and the way they are disposed of affects our environment and us. You can either choose different students for Part 1 & Part 2 or make enough cards for all the students to participate in both.

(Part 1) Ask the students about playing charades and quickly go over the rules (no speaking, create an action for the word given and students have to guess which word is being demonstrated). Students will identify the warning (precaution) words through acting and observing. Let them know that in general, HHW products have words of warning to signify that there is a possible danger. These words are, **Caution, Combustible, Corrosive, Danger, Explosive, Flammable, Hazardous, Poisonous, Reactive, Toxic, Warning and Pest Management**. After each turn, explain how the word describes the hazard, as well as some products on which it could be found. (For example, Bleach is a product that says, **Danger**, this is because it is harmful to humans if it gets on the skin or is ingested.) After playing charades a few times (switching cards around each round played) reorganize the students to start a new activity.

At this point in the lesson, the students should have a good understanding of the warning words and they will be ready to move on to alternative products.

(Part 1)

1. Break into groups
2. Have groups pick a word
3. Each group picks who will act out the warning word
4. Each group presents this to the entire class
5. After the warning word is acted out, read the definition and discuss

(Part 2) Explain how there is more than one way to clean and that we don't always have to use certain types of HHW. Pass out the cards and explain that the class is to move around and find their match. Some students will have the more harmful HHW product and some will have the more natural alternative. Once the class moves around finding their match, pick a few to ask why they picked their particular match. Explain how some of these items are used to clean and that they are easily found in stores.

(Part 2)

1. Print out and cut up the matching cards with the standard cleaner and the environmentally friendly cleaner options
2. Pass the cards around class
3. Have students walk around to match up the standard cleaner with the environmentally friendly cleaner

13. Discussion/Follow-up questions: Cleaning our homes and bodies, as well as pest management (keeping bugs from being pests, or harming us), are needed processes. However, we do not always have to use harmful chemicals as there are often many healthier options. Also, reading labels on products helps us know how to safely use, store, and dispose of chemicals we use in our homes and gardens. Do you think you can help your family identify the HHW warning words on containers to help with properly using, storing, and disposing? Do you want to help your family find healthier ways to clean and deal with weeds and bugs? Discuss how there are "good" bugs and "bad" in your garden. The good bugs help keep the pest bugs out of the garden without using pesticides.

*Remind students to ask for permission and/or assistance from their parents before handling or using any of the items learned here.

**Explain about the local recycling programs which accept HHW and give each student a copy of the flyer for the nearest center.

14. Extensions/Related Activities (optional): Would work great as a follow-up or prelude to a water pollution activity.

15. Resources: See your local HHW collection or recycling site for more information about locally accepted items and or specific issues.

Got Household Hazardous Waste?
Warning Word Cards

Caution

Care taken to avoid danger or
mistakes

Combustible

Able to catch fire and burn easily

Corrosive

Substances that will destroy or
damage other things it comes in
contact with

Danger

Exposure or vulnerability to harm
or risk

Explosive

Tending to explode

Flammable

Easily ignited and capable of
burning rapidly

Hazardous

Involving great risk

Poisonous

Capable of harming or killing

Got Household Hazardous Waste?
Warning Word Cards

Reactive

Tending to be responsive or to react to other things and chemicals

Toxic

Capable of causing injury or death, especially by chemical means

Warning

A threat, or sign of impending danger or evil.

Pest Management

Using common sense practices to manage pests in an environmentally sensitive way.

Got Household Hazardous Waste?
Cards for matching game



**Rat or Mouse
Poison**



Rat or Mouse Trap



**Scouring
Powder**



Baking Soda



Oil Based Paint



**Latex Paint
(Water Based)**



Weed Killer



Weed Puller

Got Household Hazardous Waste?
Cards for matching game



Acknowledgements

Thank you to all Districts for submitting programs for this guide and the individuals whose work made it possible.

A special thank you to:

Katie Archer
Susan Eichhorn
Debbie Hackman
Shelly Heckert
Jennifer Lawrence
Angela Petyko
Lisa Perez
Elisa Pokral
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The programs contained in this booklet were contributed freely by representatives from Indiana Solid Waste Management Districts.



Compiled by Indiana Solid Waste Management District Educators in conjunction with the Association for Indiana Solid Waste Management Districts and the Indiana Department of Environmental Management.

