



ALLIED WASTE

Recycle Rosie Curriculum: Understanding the Waste Cycle



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Dear Educators,

Welcome to **Allied Waste's Recycle Rosie Curriculum: Understanding the Waste Cycle**. Designed for grades four through six, the lessons and activities aim to help you teach your students how to become better environmental citizens. After all, we each have an active role to play in dealing with waste issues, from reduction to disposal.

Each chapter includes a chapter summary, clear objectives, an outline of concepts and skills addressed, materials needed, lesson procedure and teacher-background information. The chapters are designed to be easily integrated into your current curriculum, and apply to a variety of subject matters areas (e.g. math, social studies, language and fine arts).

The Recycle Rosie Curriculum is "teacher-driven." During its development, selected teachers from across North America contributed their ideas and tested the effectiveness of the lessons in the classroom. Their early assistance and ongoing feedback has helped ensure the curriculum's continuing integrity.

Throughout the lessons, you'll meet Recycle Rosie, a special mascot, who serves as a fun-loving guide for the children as they discover more about recycling. The character, adapted from recycling trucks children would commonly see in their communities, is there to help students understand that the future of the planet will someday rest on their shoulders.

By learning about an integrated waste disposal system and the 3 R's of recycling (Reduce, Reuse, Recycle) your students will realize that through their own actions and individual choices, they can make a positive difference in the world. Perhaps this is the Recycle Rosie Curriculum's most valuable lesson.

Thank you,



Dear Parent:

Your child is participating in a school curriculum to learn about the importance of an integrated solid waste disposal system, which includes recycling, composting, waste-to-energy and landfilling. The program is sponsored by Allied Waste, one of the world's largest recycling and solid waste services companies.

Did you know that each American generates approximately 4.5 pounds of waste each day? You only have to briefly think about this in the terms of your home, community, state and country to see that managing our waste is a serious matter.

The Allied Waste Recycle Rosie Curriculum:

Understanding the Waste Cycle is geared to provide up-to-date lessons on all of the current methods of managing waste. Special emphasis has been placed on The New 3 R's: Reduce, Reuse and Recycle. Your children will learn practical ways that they can take action and make choices to help tame the waste stream.

Reducing, reusing and recycling are part of the solution to a cleaner planet. We can **reduce** waste by avoiding products that are excessively packaged or are for single-use consumption only. We can **reuse** waste by finding other uses for items we normally throw away (tin foil, plastic bags, shoe boxes, etc). Additionally, we can **recycle** waste by separating our recyclable materials, such as paper, metals, glass and plastic from other trash and taking our recyclables to a recycling center or participating in a curbside recycling program if available in your community. Other parts of the waste solution include using waste as fuel to produce energy and composting yard waste and food scraps.

We encourage you to support your child's efforts to learn about managing the waste stream. Environmental education will help create a better world for you and your children, and for the generations to come.

Thank you,





Note to Teachers:



To conserve paper, most curriculum pages have been printed on both sides. For the earth's sake, please double-side print all photocopies of the resources.

It is also important to explain to your students that the availability of recycling centers and curbside collection programs vary widely in different parts of the country.

Teacher Overview

Recycle Rosie Curriculum Objectives:

- To introduce students to solid waste management systems and the problems that arise when waste is not managed effectively
- To help students learn the cyclical nature of our environment
- To teach The 3 R's of the solid waste disposal solution: Reduce, Reuse, Recycle
- To encourage students to participate in creating individual and community-wide solutions to managing the waste stream



Chapter One

Applicable to the core subjects science, mathematics, social studies and language arts



Included are:

- A pre-quiz to test students' current level of knowledge
- Information on the advantages and disadvantages of the major methods of waste disposal: waste-to energy, sanitary landfills, composting and recycling
- Activities that help students see their lesson "come to life," including constructing a miniature landfill
- Simple diagrams that help make the lessons easy to understand

Chapter Objectives

During class discussion, students will be asked to demonstrate their knowledge of recycling and the environmental cycle. In this lesson, students will also learn more about landfills, waste-to-energy plants, composting and the role each plays in managing solid waste. Students will be encouraged to discuss these methods of managing the waste stream and explore the ways in which people, as individuals, can have a positive impact on reducing waste.

Chapter Outline



I. Lesson One: Recycling 101

- a. Pre-Quiz
- b. Teacher Answers

II. Lesson Two: Where Does Our Trash Go?

- a. Sanitary Landfills: Teacher Background
- b. Waste-to-Energy: Teacher Background
- c. Composting: Teacher Background
- d. Class Discussion Questions

III. Lesson Three: Recycling is Not the End; It's Only the Beginning

- a. Recycling: Teacher Background
- b. Class Discussion Questions

IV. Lesson Four: Build Your Own Sanitary Landfill



Chapter One

Lesson One

Recycling 101

Concepts and Skills Addressed

Vocabulary
Interpersonal Communication
Class Discussion

Materials Needed

Pen or Pencil

Materials Supplied

Pop Quiz Questions
Teacher Answer Sheet

Procedure

Students will demonstrate their existing knowledge of the waste system and recycling by taking a pop quiz then discussing the results in class.

Administer the quiz to students individually or in pairs/groups. The quiz can be set up in two ways:

1. Individual: Allot students a block of time to answer all 20 questions and then discuss each answer.
2. Pairs/Groups: Allow 1-2 minutes for students to discuss and complete each answer and then discuss the correct answer with whole class.



Recycling 101

Can you answer these questions about recycling? You may know more than you think!

- 1.) Which country creates the most waste every year?
 - a) China
 - b) Australia
 - c) United States
 - d) Canada
- 2.) How much trash does each person in the United States create daily?
 - a) 1 pound
 - b) 3.2 pounds
 - c) 4.5 pounds
 - d) 9 pounds
- 3.) Which of the following items is taking up the most room in our landfills?
 - a) Aluminum cans
 - b) Paper
 - c) Plastic bottles
 - d) Car Tires
- 4.) Which of the following items can a recycled milk jug NOT be made into:
 - a) Shopping Cart
 - b) Backpacks
 - c) Car parts
 - d) Light bulbs
- 5.) How many plastic bottles do Americans go through every hour?
 - a) 250
 - b) 2,500
 - c) 250,000
 - d) 2,500,000
- 6.) When I see someone throw a recyclable item away, I



- 7.) Compost is:
- a) The recycling of food scraps and yard trimmings
 - b) The recycling of aluminum
 - c) Plastic that cannot be recycled
 - d) A person who does not recycle
- 8.) What are the 3 R's of recycling?
- a) Remove, Redo, Renew
 - b) Renovate, Retry, Rethink
 - c) Reduce, Reuse, Recycle
 - d) Recycle, Random, Regrow
- 9) How many million newspapers are printed everyday in the U.S?
- a) 2
 - b) 12
 - c) 32
 - d) 62
- 10) To me, recycling means:

- 11) What's the best choice for taking groceries home?
- a) Paper bag
 - b) Reusable canvas bag
 - c) Plastic bag
 - d) Balanced on top of your head
- 12) Where does most of our garbage go?
- a) To the moon
 - b) It's burned in incinerators
 - c) To landfills
 - d) It's recycled
- 13) Should we put all our waste in landfills?
- a) Yes, get it out of sight and out of mind
 - b) No, bury it in my backyard
 - c) No, sink it to the bottom of the ocean
 - d) No, as much waste as possible should be recycled



- 14) What should I do with a soda can when I finish drinking it?
- a) Bury under a pile of leaves and let it decompose or rot
 - b) Toss it in the trash bin
 - c) Place it in a recycling bin with other aluminum cans
 - d) Hide it under my bed
- 15) If people in California recycled ALL the aluminum cans they bought in one day, they could:
- a) Build 17 jets
 - b) Stack them higher than the Statue of Liberty
 - c) Make the world's largest soup can
 - d) Fill up 20 landfills
- 16) What is the highest point in Ohio?
- a) Mount Everest
 - b) Longs Peak
 - c) Mount Rumpke
 - d) Mount Wellington
- 17) What is one thing that does not happen when you recycle?
- a) Save landfill space
 - b) Save money and create jobs
 - c) Cut down trees
 - e) Save clean air and clean water
- 18) Every day businesses create enough paper to:
- a) Circle the world 20 times
 - b) Cover a football field
 - c) Stretch from Disneyland to New York City
 - d) Produce one thousand comic books

19) Sometimes recycling is hard because:

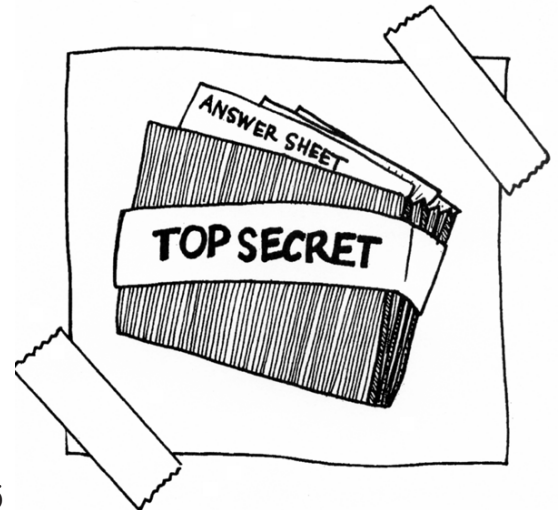
20) As I grow older, I hope recycling:



Teacher Answer Sheet

Teacher Answer 1: (C) America. As a country we create far more garbage than any other country. In a lifetime, the average American throws away 600 times his or her adult body weight in trash.

Teacher Answer 2: (C) 4.5 pounds (2.05 Kilos). According to the latest statistics, every American creates about 4.5 pounds of trash per day. That is 31.5 pounds (14.27 kilos) a week! *Recycle Rosie Question: What does 31.5 pounds look like?*



Teacher Answer 3: (B) The item most frequently encountered in a landfill is plain old paper. On average, it accounts for more than 40 percent of a landfill's contents. Newspapers alone can take up as much as 13 percent of the space in U.S. landfills. Did you know that paper is very resistant to decomposition when it is compacted beneath the earth in a landfill? Research had shown that 1960s newspapers excavated from a landfill were discovered to be intact and actually readable!

Teacher Answer 4: (D) Light bulbs. The material used to make plastic soda bottles (polyethylene terephthalate or PET) is recyclable. The plastic used in one-gallon milk and water jugs (high density polyethylene or HDPE) is also recyclable. Many useful materials can be made from recycled plastic such as trash cans, sleeping bag insulation, containers for non-food items and even clothes! *Recycle Rosie Tip: When recycling plastic make sure to rinse the container, remove caps and rings and flatten the bottles to save space!*

Teacher Answer 5: (D) 2.5 million. That's 22 billion plastic bottles every year! Most of these bottles are thrown away rather than recycled.

Teacher Answer 6: Ask students to read their answers and discuss.

Teacher Answer 7: (A) The recycling of food scraps and yard trimmings. Composting is basically backyard magic! When leaves fall from trees, they slowly decay into humus, a type of soil that is full of nutrients. Anything that was once alive will eventually decompose. You can recycle food scraps and plant material at home by setting up a compost container that can create a soil that is great for the garden. *Recycle Rosie Tip: Meat, fish and dairy products are food scraps that are bad for a compost pile*

Teacher Answer 8: (C) Reduce, Reuse and Recycle. Reduce the amount of trash your throw away. Reuse containers and try to fix things that break rather than throwing them away. Recycle at home and school as much as possible, and try to buy items made with recycled material.

Teacher Answer 9: (D) 62 million newspapers will be printed today in the U.S. and 44 million will be thrown away. That is the equivalent of 500,000 trees being dumped in the landfill each week.

Teacher answer 10: Ask students to read their answers and discuss.

Teacher Answer 11: (B) Bringing bags to the grocery store will reduce the need for your purchases to be bagged in "disposable" shopping bags. This small action can help the environment by reducing the amount of paper and plastic waste in landfills. *Recycle Rosie Tip: You can even save money, as some stores give you a discount for using your own bag!*

Teacher Answer 12: (C) Landfills. Over 72% of garbage goes into the ground in landfills. A landfill is a special pit that has been dug in the ground to hold garbage. Once the pit is full, dirt is used to cover the trash. The landfill becomes a place where waste will be kept for hundreds of years. Only about 13% of trash is recycled currently.

Teacher Answer 13: (D) No! As much waste as possible should be recycled. Many communities are not allowing landfills to be built because land is in demand for housing and recreational use.

Teacher Answer 14: (C) Place it in the recycling bin. Recycling starts with you! Ask your parents or school to start a recycling program if they are not already doing so. Encourage friends not to waste the earth by tossing their recyclable garbage into the trash can.

Teacher Answer 15: (A) 17 jets. Lots of things that we consider trash can be recycled into useful materials.

Teacher Answer 16: (C) Mount Rumpke. Mount Rumpke is a "mountain" made up of trash—a landfill! If we choose not to recycle and throw all our trash away it will become harder and harder to find room for that garbage. *Recycle Rosie Question: How much trash do you think is buried in Mount Rumpke that could be recycled?*

Teacher Answer 17: (C) Cut down trees. Remember that when we don't recycle than we have to cut down trees to make paper. Recycling one ton of paper saves 17 trees!

Teacher Answer 18: (A) Circle the world 20 times. Every day enough paper is recycled in America to fill a 15 mile long train of boxcars. That's a lot but we can still reduce, reuse and recycle much more! *Recycle Rosie Tip: When you print paper from the computer, print on both sides to reduce the amount of paper you are using!*

Teacher Answer 19: Ask students to read their answers and discuss.

Teacher Answer 20: Ask students to read their answers and discuss.

Chapter One

Lesson Two

Where Does Our Trash Go?

Concepts and Skills Addressed

Vocabulary

Interpersonal Communication

Class Discussion

Materials Needed

None

Materials Supplied

Teacher background information on

- Sanitary Landfills
- Waste-to-energy plants
- Composting
- Diagrams suitable for copying or overheads

Students will learn the benefits and limitations of three of the four methods of solid waste disposal: sanitary landfills, waste-to-energy plants and composting. The fourth approach, recycling, is discussed at length in subsequent lessons.

Primary learning points include:

Sanitary Landfills:

- a) Most common form of waste disposal
- b) Sanitary landfills are constructed on carefully chosen sites and lined with durable plastic and clay to prevent trash coming into contact with the earth, particularly groundwater
- c) Waste deposited in landfills is covered daily with soil or a special fabric cover. This covering seals the compacted trash from the air and prevents pests (birds, rodents, etc.) from getting into the trash
- d) There is a big difference between a sanitary landfill and a dump. A dump is a big hole or pile of garbage that does not prevent waste from coming in contact with the ground, has many pest problems and stinks. A landfill is a specially engineered system designed to contain garbage in a more sanitary way.



- e) As garbage in a landfill decomposes it creates gas. Forty-five to sixty percent of the gas is composed of methane and the rest is mostly carbon dioxide. Do you know that landfill gas can be burned to create energy?

Waste-to-Energy

- a) This is a modern, safe method of burning waste to produce a useful product-energy
- b) Burning trash to create energy reduces the volume of waste by 80-90%
- c) The ash from a waste-to-energy plant is generally disposed of in landfills but if it's clean enough it can be used in construction materials such as concrete and asphalt additives
- d) Modern waste-to-energy plants should not be confused with incinerators that do not remove hazardous or recyclable material before burning



Composting

- a) Compost is made from decomposed plant and animal material
- b) Composting is a controlled decomposition of plant material to create humus
- c) The composting process is a carefully regulated system of combining oxygen, nitrogen, carbon and water...plus some microbes, who love to eat waste
- d) Landfill space is saved when people recycle plant materials (yard trimmings, food scraps) through composting

Procedure

1. Read the background information on landfills, waste-to-energy plants and composting.
2. Use the provided diagrams to explain the primary learning points listed above.
3. Consider a field trip to see a nearby landfill or waste-to-energy plant. Can your school create a working compost system?
4. Using the discussion questions, check the students' knowledge about landfills, waste-to-energy plants and composting.

Background on Landfills

Today the majority of North America's trash is buried in sanitary landfills. This trash is known as municipal solid waste (MSW) and includes items such as candy bar wrappers, shoestrings, leftover pizza and milk cartons.

Dumps and landfills are not the same thing. In fact, dumps have been phased out across the United States because they are harmful to the environment. Dumps are usually big holes or piles of garbage that allow



polluted liquid to come in contact with ground water threatening people's drinking water and attracting disease-carrying pests.

Landfills are constructed and operated in agreement with strict requirements. These requirements include:

- Location:
 - The area must be a suitable geological location that will not affect environmentally sensitive areas
 - There is a buffering zone from nearby properties
- Protection of environment:
 - Installing durable plastic liners to prevent trash coming into contact with the soil and groundwater. Landfill operators regularly sample groundwater at the site and send it to laboratories for pollution analysis.
 - Covering trash daily with soil or a special fabric cover. This special covering seals the compacted trash from air preventing bad smells and stops critters from getting into the garbage.
- Landfill Gas Management:
 - As trash breaks down in the landfill it creates landfill gas, which typically consists of 45-60% methane, 40-60% carbon dioxide and traces of other organic compounds (less than 1%). If not managed properly, the organic compounds can begin to stink and escaping landfill gas can affect the soil making it hard for plants to grow over the landfill.
 - Sometimes landfill gas is used to create energy. It is collected, dried (to get rid of any water), and then filtered (to get rid of any waste particles). After these processes it is fed through pipes to a gas generator that burns the gas to create electricity. Then it makes its way to your home and school—via the electricity network.

Garbage is hauled from households and industries to a landfill site. A fee is paid to the landfill operator based on how much trash the truck carries. Waste materials are unloaded, spread out and compacted by bulldozers and landfill compactors. People used to believe that all trash decomposed completely in landfills. However, in studies done by the University of Arizona, this was proven to be untrue. In an examination of waste buried for 15 years or more, chicken bones were found with meat still on them!

At an average sanitary landfill, waste and soil are alternately layered to a depth of 10 to 30 feet (3 to 9 meters) and rise above the level of the land by 50 to 100 feet (15 to 30 meters) depending on permit requirements. Several layers of waste comprise a cell. A cell is typically one part soil to four parts waste. Cells are built side by side and on top of each other until a landfill is completely filled.

Completed Landfills

What happens to a landfill when it closes? When landfills get completely full, workers seal and cover the area with a final cap of clay and dirt. By law, complete landfills have to be monitored for 30 years after they close, especially the groundwater. Landfills remain useful even after they are finished as waste deposits. They can be turned into parks or even ski slopes. Sometime energy plants can be constructed on old landfill sites to use the recovered gases.

A. Advantages of Sanitary Landfills

- Modern engineering allows landfills to better protect the environment, specifically groundwater
- They accept all types of garbage except hazardous waste (e.g. motor oil, pesticides, paint)
- They are useful as recreation areas after they are full
- They can be sources of alternative energy (e.g. saving fossil fuels) by using the recovered gases

B. Disadvantages of Landfills

- They require specific soil types and geological conditions
- They must be accessible and close to communities (these sites are becoming harder to find)
- They are filling up much faster than they can be replaced in many areas
- If not properly designed or managed, they can cause pollution problems

Layers of the Landfill



Final Earth cover & grass seed

Clay cap

Compacted solid waste

Daily cover

Compacted solid waste

Daily cover

Compacted solid waste

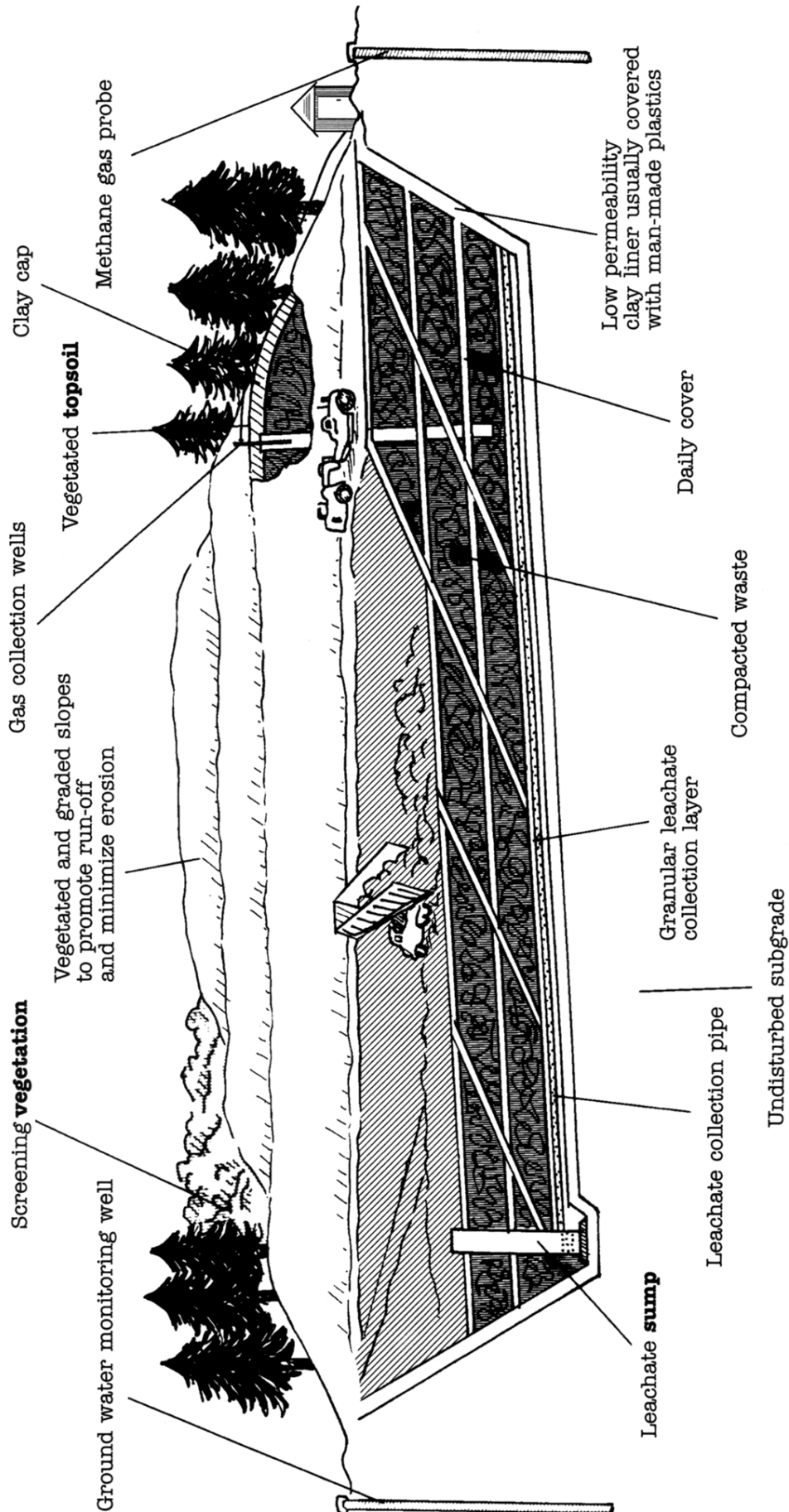
Daily cover

Compacted solid waste

Protective liner

Compacted clay

Landfill Diagram



Background on Waste-to-Energy Plants

The modern, safe and responsible way to burn waste, while also creating a useful by-product, is in a waste-to-energy plant. The burning waste creates heat, which is used to produce steam. The steam can then generate electricity for homes and businesses. The process takes place inside a building, which traps odors. These facilities save valuable landfill space by reducing the volume of waste by 80-90%. Waste-to-energy plants also have the added advantage of protecting groundwater.

There is a big difference between waste-to-energy plants and incinerators. Incinerators burn trash simply to get rid of the waste, they are not intended to create energy. Also, incinerators do not always remove hazardous or recyclable material before burning.

Waste-to-energy facilities must successfully manage both air quality and the disposal of the ash generated from burnt trash. Gases may be created by a waste-to-energy plant, but can be controlled through complex filtering systems and careful monitoring. Ash from the plant must be tested and disposed of in a landfill. If the ash is clean enough it can be a useful material. Ash is now used in some places for building roads, making concrete stronger and even as artificial reefs for marine animals.

A. Advantages of a Waste-to-Energy Plant

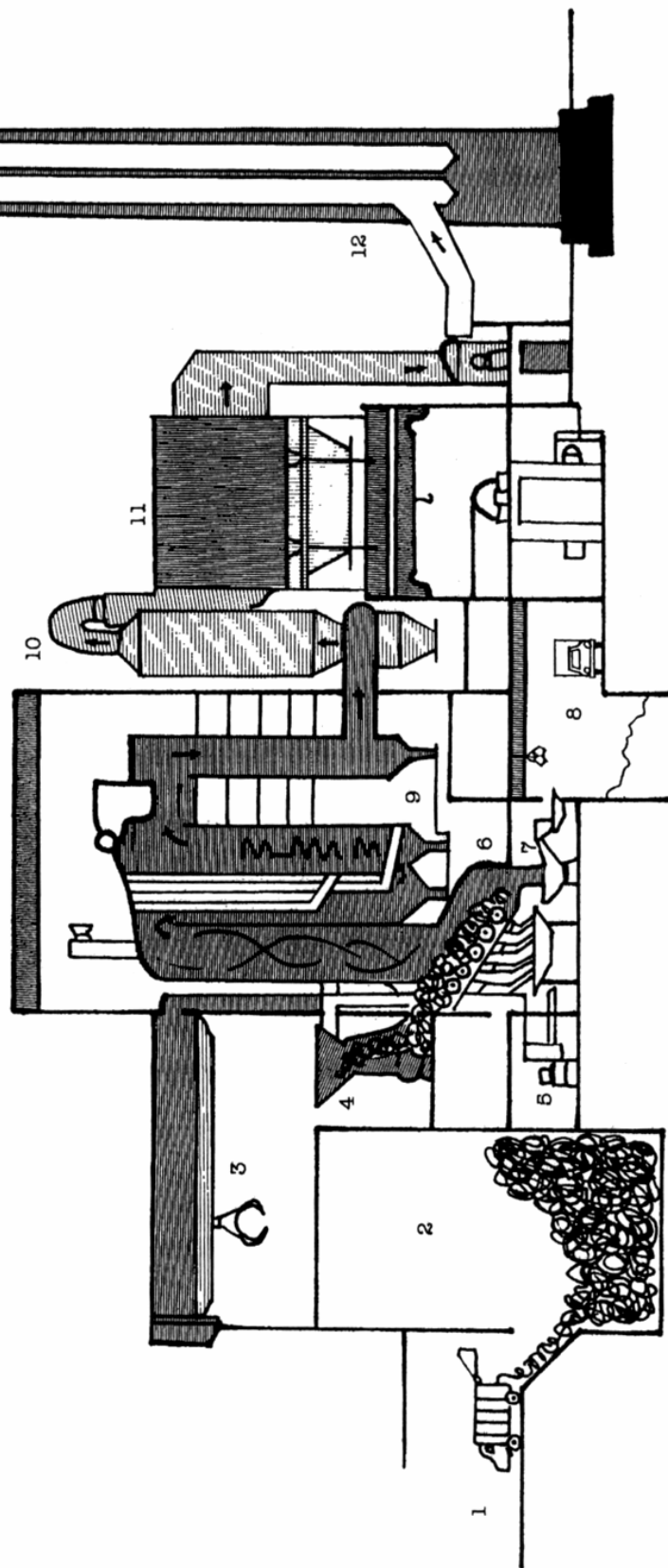
- It is an alternative energy source
- It can reduce the volume of waste by up to 90%
- It traps odors inside the plant

B. Disadvantages of Waste-to-Energy Plants

- In order to eliminate gases from being emitted into the atmosphere, special devices are required to filter air. These devices are expensive and must be carefully monitored and maintained
- Landfills are still needed to dispose of ash
- Not all materials can be burned

How Waste-to-Energy Facilities Work

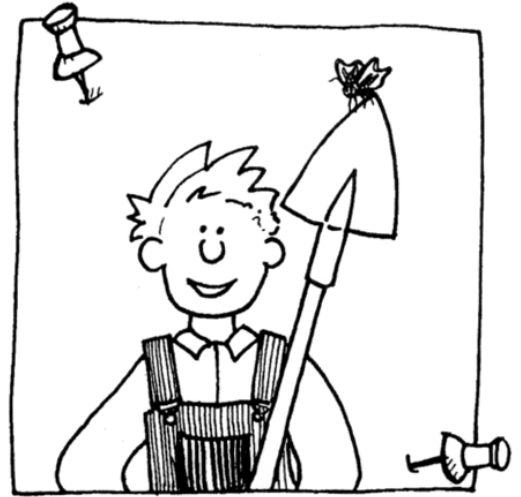
1. The tipping hall where trucks go
2. Refuse bunker where trucks put garbage
3. Refuse crane
4. Charging hopper that sends waste to grate
5. Under-fire fan
6. Roller grate for burning refuse
7. Ash conveyers
8. Ash bunker and crane for collection and transport
9. Fly ash collection: first stage of air cleaning
10. Scrubber to remove acid gases
11. Dust collector
12. Stack: final stage of air cleaning



Background on Composting

Compost is created from decomposed plant and animal material. Composting is a controlled process of decomposing plant material that creates humus, an enriching soil additive.

Yard waste, food scraps and other organic plant and soil materials can be placed into a compost pile to decompose. Many backyard compost piles are made of chicken wire to form a pen for the yard waste. This structure exposes much of the waste to the elements. Air and waste mix with the compost, as well as microbes who love to eat the waste. The compost heats up and creates humus, a rich natural fertilizer. Humus is high in carbon, nitrogen and other nutrients that can be terrific food for a garden.



Compost bins can be purchased from many hardware shops or can be a fun building project. Some composting is done community wide. Other times waste services companies pick up yard waste and other organic material separately and take it to a compost area. Here, the decomposing waste is managed by turning the piles to expose as much of the waste as possible to air and precipitation (rain).

A. Advantages of Composting

- Compost materials enrich the soil and plants
- Composting can be done safely in your own backyard
- Composting saves space in landfills by reusing organic materials

B. Disadvantages of Composting

- Some city and apartment dwellers do not have yard space available for composting
- Organic materials need to be added to the pile regularly to maintain a ready supply of humus

Food web of the compost pile



- 1° = First level consumers
- 2° = Second level consumers
- 3° = Third level consumers

In the food web of the compost pile, just as in a spider web, each piece is connected and needs the other for support. It is very important to remember that if one piece is missing, none of the consumers can survive.

How does the compost pile work? Organic residues such

as vegetables, fruits, breads, egg shells, coffee grounds and tea bags start to decay with the help of the first-level consumers, molds, bacteria and actinomycetes. Then along comes the second-level consumer, the earthworm. He eats mold, bacteria and actinomycetes. Next comes

the third-level consumer, the centipede or ground beetle who eats the earthworm and so on. This is how the food web works. Each level of consumers survives by eating the organisms in the level below it. Remember, if one piece of this web is missing, none of the consumers can survive.

Class Discussion Questions

Discussion Questions on Sanitary Landfills

1. How does a sanitary landfill differ from an open dump?
2. How is a sanitary landfill designed to protect the environment?
3. Why would it be very important to protect the groundwater underneath a sanitary landfill?
4. What is one disadvantage of a sanitary landfill?

Discussion Questions on Waste-to-Energy Plants

1. What advantage does this method have for processing trash over sanitary landfills?
2. What is one disadvantage of this method over sanitary landfills?
3. How are waste-to-energy plants different than incinerators?

Discussion Questions on Composting

1. What kinds of material would be good for a compost pile?
2. What kind of material does composting create? How can it be used?
3. How is composting different from sanitary landfills and waste-to-energy plants?

Chapter One

Lesson Three



Recycling is Not the End; It's Only the Beginning

Concepts and Skills Addressed

Social Science

The Environmental Cycle

Materials Needed

4.5 pound (2.05 kilogram) trash bag filled with recyclable and non-recyclable items

Materials Supplied

"Recycle Rosie" cartoon (found in worksheet packet)

Procedure

Students will learn how waste is generated, where waste goes and how to reduce it through recycling.

1. Read the background information on recycling.
2. If you have not already done so, introduce students to the cartoon character of Recycle Rosie.
3. Recycle Cycle Class Discussion. You may want to gather some visual aids to help you discussion: paper, a soda can, a glass jar or plastic milk jugs.

Background on Recycling

Recycling is the collection and reuse of materials that would otherwise be considered garbage to produce new products. For example, newspapers can be recycled into fresh newsprint or cardboard boxes, and aluminum soda cans can be transformed into new soda cans!

Often you can tell if a product can be recycled because it features this recycling symbol on the container:



Overview of the Recycling Process

Step 1: Collection and Processing

The way communities have their recycling picked up varies, but these are the most common methods:

- Curbside pickup: Recycled material like paper, cans and glass get picked up from the curb on a weekly basis.
- Drop-off centers: Places in a community where you can take your recyclable material to be processed.
- Deposit/refund programs: Small monetary incentives that try to get people to return recyclable material to the place they purchased it.

Regardless of the method used to collect the recyclables, the next leg of their journey is usually the same. Recyclables are sent to a materials recovery facility to be sorted and prepared into marketable commodities for manufacturing. Recyclables are bought and sold just like any other material, and prices for the materials rise and fall with market demand.

Step 2: Manufacturing

Once cleaned and separated, the recyclables are ready to undergo the second part of the recycling journey. More and more of today's products are being manufactured with total or partial recycled content. Common household items that contain recycled materials include newspapers and paper towels; aluminum, plastic, and glass soft drink containers; steel cans; and plastic laundry detergent bottles.

Step 3: Purchasing Recycled Products

Purchasing recycled products completes the recycling journey. By "buying recycled," governments, as well as businesses and individuals, each play an important role in making the recycling process a success. As people want more environmentally friendly products, manufacturers will continue to produce recycled products.



Class Discussion Questions

Q: What is an 'environmental cycle'?

A: An environmental cycle is a chain of natural events that happens around us every day, even if we don't always notice it! For example, a new tree sprouts from the ground in your backyard. Over the years, its roots dig deep into the soil to suck up water and minerals which they transform into food by using the sunlight. This process is called photosynthesis.

While the tree grows, its leaves help purify the air we breathe. Each year, the tree will drop seeds down to the ground where they will eventually sprout into seedlings. When a tree is old, it dies, falls down and decays. Nutrients from the wood enrich the soil so the saplings can grow into healthy new trees. Over the years, the young trees that grew from your tree's seeds become mature trees, and the cycle begins once again.

Q: What does the environmental cycle have to do with recycling?

A: Just as nature has an environmental cycle, when we recycle we create the "Recycle cycle"! Instead of using raw materials that come from nature to make new products, the recycle cycle allows us to use the materials in old products to make new ones. For example, recycled bottles may become jars, drinking glasses or new bottles. Aluminum cans may become aluminum foil and so on. By recycling, we are helping to preserve our natural resources and reducing the amount of waste that ends up in the trash.

Q: Where does paper come from?

A: Paper is made from wood pulp, which is manufactured when trees are cut down and ground into small pieces. Mixed with starch and water, the pulp forms a paste, which is squeezed through rollers to make paper. Most paper is recyclable so it doesn't have to be thrown away after it's been used. Rather, it can be broken down and made into new paper products.

Q: What is glass made of?

A: Glass is actually made from sand, tiny rocks that are cleaned then heated. The rocks melt into a liquid that turns into glass when cooled. Glass is also recyclable. Glass bottles and jars are recycled by being crushed into cullet, a material used to make fiberglass and paving material.

Q: What is used to make beverage cans?

A: Drinks like soda often come in cans made of aluminum. Aluminum is a great drink container because it is lightweight and flexible. It is also a great recyclable product. Your next can of soda could be turned into aluminum foil and trays or even melted down to make new cans.



Q: Can we just keep recycling products forever?

A: Paper or plastic, glass or aluminum, these items can't be recycled forever. Just like your jeans can wear holes in the knees or your shoes get holes in the bottoms, recyclable products eventually breakdown. But they can last much longer than they are used today so please don't just toss them in the trash!



MEET RECYCLE ROSIE!



Chapter One

Lesson Four

Create a Simulated Landfill

Concepts and Skills Addressed

Social Science
The Environmental Cycle
Arithmetic

Vocabulary

Landfill
Decompose
Organic
Inorganic

Time Needed for Activity

20 days or longer

Materials Supplied

Worksheet for recording observation

Materials Needed

Aquarium
Litter-box liner
Soil: NOT POTTING SOIL—it doesn't have necessary microorganisms
Toothpicks
Labels
Drinking Straw
Coffee Stirrers
Magnifying glass
Organic and Inorganic Material (e.g. aluminum foil, orange peels, cotton cloths, apple core, newspaper scrap)



Procedure

1. Describe a landfill to students, noting that landfills not only hold waste but also allow some material to decompose.
2. Explain that the landfill (aquarium) has already been sited in an environmentally sound location and lined with 10 feet of compacted clay.
3. Line the landfill with the kitty-litter liner which represents the plastic landfill liner (used to protect groundwater).
4. Place a drinking straw on the liner to signify the leachate collection system.
5. Cover with 4 inches of dirt and compact.
6. Have students look at the garbage under a magnifying glass or microscope and predict which materials will decompose and which will not decompose by writing a hypothesis in the space provided on the worksheet.
7. Empty your load of garbage into the landfill and spread it out so that you can mark each piece. When garbage trucks unload at actual landfills, this is called tipping.
8. Write the name of each item of garbage on a separate label and attach each label to a toothpick like a flag.
9. Mark the location of each piece of garbage with the appropriate flag.
10. Cover each item of garbage with about two inches of dirt and compact the dirt.
11. Insert two coffee stirrers into the dirt to signify your methane gas recovery system.
12. Have students date their worksheets and note the objects they buried.
13. Keep the simulated landfill in a sunny place and lightly water as needed to keep the soil moist. (Usually once a week for two school weeks.)
14. After 10 days, dig up garbage and have students examine it with the magnifying glass. Ask students to record their observations on their landfill worksheet.
15. Return all items to the landfill, bury and compact. Repeat the same procedure in 10 days and have students record their findings.
16. When it is time to "close" the landfill, remove the toothpicks and add an additional 4 inches of soil to the landfill and compact. This represents the final cover.
17. Plant grass seed in the dirt on top of the landfill.

Note: To ensure the health and safety of your students, all students should be required to wear protective gloves when working on the miniature landfill. Check with the appropriate department in your school district if you feel you need additional information.

Simulated Landfill Worksheet

Hypothesis:

Observations

After 10 Days

After 20 Days

1.

2.

3.

4.

5.

6.

7.

8.

Conclusion:

Chapter Two

Applicable to the core subjects social studies and language arts

Included are:

- Short skits on the history of waste that illustrate:
 - How trash is part of the environmental cycle
 - How trash was handled in the past
 - Reasons for our culture's accelerating waste disposal problem



Chapter Objectives

Students will learn how trash was handled in the past, and how our current methods of disposal have evolved. Through dramatized examples, students will compare non-industrialized cultures with modern society. Students will see how we've evolved into a culture with an accelerating waste disposal problem.

Chapter Outline

Lesson One: Here Today, Still Here Tomorrow play

- Act 1: "Oh Spear Me!"
- Act 2: "One Maid's Trash is a Princess' Treasure"
- Act 3: "Treasures under the Tree House"

Activity: Mural, Mural on the Wall...

Chapter Two

Lesson One

Here Today, Still Here Tomorrow

Concepts and Skills Addressed

History

Interpersonal communication and expression

Theater Arts

Materials Needed

For "Oh Spear Me!"

Fish prop

For "One Maid's Trash is a Princess' Treasure"

Bucket

2 chairs to serve as horses

Crown for Princess

Broomstick to make guard look official

Stone to serve as spearhead

Chair for Bertha to stand on

For "Treasures under the Tree House"

Stone to serve as spearhead

Shovel

Bandana

Materials Provided

Scripts for "Here Today, Still Here Tomorrow"



Procedure

1. Explain to the students that each short play illustrates something about waste disposal and the environment and to watch for these messages.
2. Cast the characters and rehearse.
3. Perform each part and then go through the discussion questions between each dramatic section that discusses the underlying environmental theme.



"Here Today, Still Here Tomorrow"

Act 1: Oh Spear Me!

Cast

Narrator: A reader to set the scene

Mooka: A hunter

Freya: Keeper of the cave and Mooka's wife

Peat: The couple's 12-year-old son

Asha: The old woman who lives in the cave next door

Narrator: It is 10,000 years ago in a strange land that will someday be known as England. Mooka, the top hunter in his village is returning from a hunting trip with his son Peat. Mooka's wife, Freya, is stretched out on a wolf skin rug enjoying the summer sunset while chatting with Asha, the old woman from the cave next door.



Freya: Oh Asha, life has sure been hard ever since Peat lost our family's spear in the antelope during that last hunting trip.

Asha: They never found it?

Freya: No, he and Mooka tracked that antelope through the night and even into the next morning but it disappeared in the forest over those hills to the west. So you know what that means—no juicy antelope meat for dinner, and no spear for our family to hunt with.

Asha: What a shame to lose all that delicious meat, a hide to make a warm coat for winter and material to make new moccasins for the tribal meeting next month.

Freya: To lose the antelope and the spear...poor Peat, he feels terrible. Mooka has been working hard to make a new spearhead, but it's slow work. A chip here, a chip there. And nine times out of ten the stone cracks and he has to start all over again.

(Mooka comes marching into the cave with Peat at his heels proudly carrying a huge fish).

Mooka: Hello dear wife. Hello Asha. Look at the big fish Peat and I caught for dinner.

Peat: It's a big one isn't it Mom!

Freya: That's just great son. Look at that beautiful fish. I can also use its bones to make some fine needles for sewing. I am so happy.

Mooka: Son, why don't you collect some wood to build a fire so we can start cooking.

Peat: Sure thing Pop!

Asha: I heard about the loss of your spear Mooka.

Mooka: Yes, it was a hard blow to our family.

Asha: You know Mooka, you should make many spears so that you can have some ready just in case you lose one.

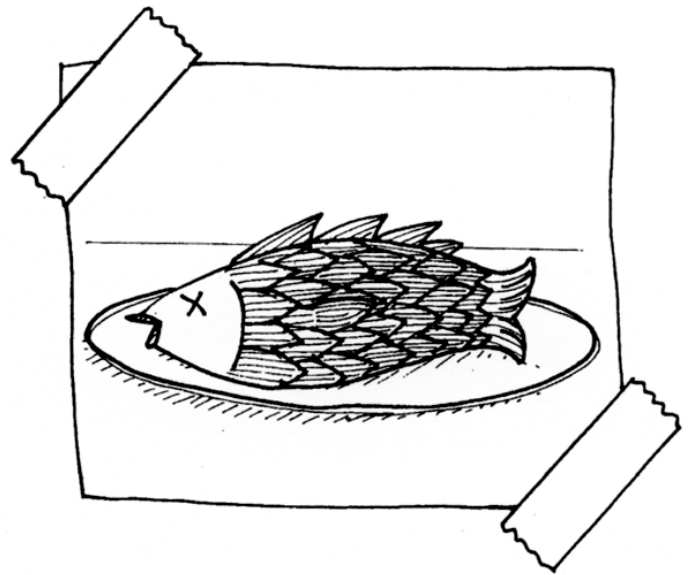
Freya: What a good idea. That way you won't have just one spear Mooka, you'll have ten.

Mooka: I don't know. My father always said, "Waste not, want not." I think that is good enough for me. Asha are you staying for dinner?

Asha: Yes, that would be lovely. All I have at my cave at the moment is a handful of nuts and an old duck egg.

Narrator: As you can see, Freya and her family used and saved everything they had. People made everything from the material they could find in nature. This included their clothing, shoes, knives, spearheads, needles and thread.

You name it and it came from an animal, rock, tree, bush or grass. The loss of an important tool like a spearhead could mean hardship, starvation or even death. But you'll soon learn... nothing is ever lost forever.



Discussion Questions for "Oh Spear Me"

What does this skit tell us about how people once lived?

How did they use the items they had?

What do you think they threw away?

What makes it hard for us to use our resources in the same way today?

"Here Today, Still Here Tomorrow"

Act 2: "One Maid's Trash is a Princess' Treasure"

Cast

Narrator: A reader to set the scene

Wanda: A princess

Horatio: Commanding Officer of the Royal Army

Joe: The palace guard

Bertha: The palace chamber maid



Narrator: Welcome to the medieval times. The year is 1350A.D. Life here is very different to life as we know it today. There is no electricity, no plumbing and no garbage collector. On this warm and sunny day, Princess Wanda has decided to go horseback riding with Sir Horatio, Commanding Officer of the Royal Army. Joe, the palace guard, is letting the couple out by lowering the drawbridge over the castle's moat. As they cross the drawbridge, Bertha, the chamber maid, throws a bucket of slop and dirt out of a second story window. The slop hits Joe on the head and sprays over Sir Horatio and Princess Wanda.

Wanda: Oh what a mess, this was a brand new dress.

Joe: (Shouting) Hey Bertha, why don't you watch where you're throwing that garbage.

Bertha: Stick it up your nose Joe, where else should I throw it? We always throw trash out the window.

Horatio: Well, you hit the Princess. You could hurt someone.

Bertha: Sorry about that Princess, but the trash has to go somewhere you know!

Joe: Ugh, I hate being hit by flying garbage. What was it today? Hmmm....there is an apple core, a leg of lamb, 3 candles, a broken plate and....and...hey look there is something sticking out of the ground here. Horatio what do you suppose this is?

Horatio: Why it looks like a spearhead.

Joe: How do you think it got here?

Wanda: Maybe it was lost by a hunter thousands of years ago.

Narrator: Horatio was right. The stone is part of a tool—a spearhead—that has been around for a very long time. Materials like stone and metal are very durable. They last a long time. Uh-oh, Bertha has just thrown another bucketful of slop out the window!

Joe: Bertha, don't make me come up there!

Wanda: Really fellows—there must be a better way to get rid of trash in my kingdom!

Discussion Questions for "One Maid's Trash is a Princess' Treasure"

Where do you think the spearhead came from?

Is it healthy to throw trash out the window, why?

What would happen if we all threw our trash out the window?

How do you feel when you see trash laying in parks or on the side of the road?



"Here Today, Still Here Tomorrow"

Act 3: "Treasures Under the Tree House"

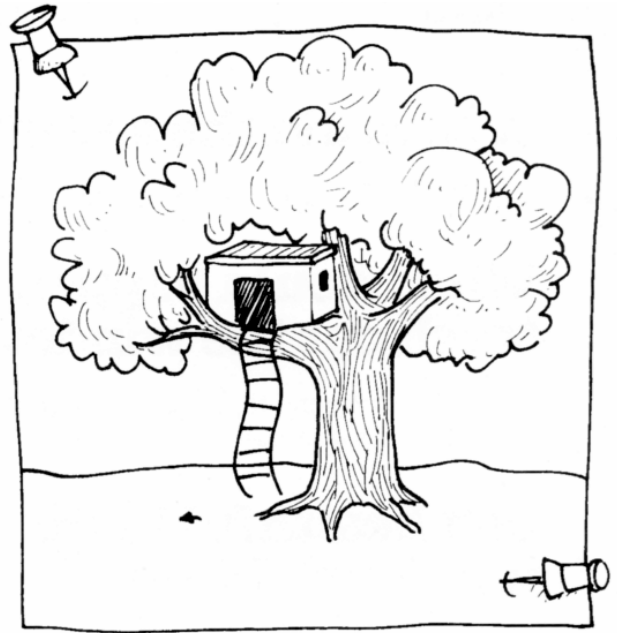
Cast

Narrator: A reader to set the scene

Dad: A handy-man with two children

Jason: Dad's 12-year-old son

Erin: Dad's 10-year-old daughter



Narrator: Dad and his family live in the country. Today Dad's children, Jason and Erin, are helping him build a tree house up in the big old oak tree in the backyard.

Jason: This is the best tree ever. When you climb up into the branches you get a great view of the neighborhood.

Dad: You know kids; I have a lot of great memories about the tree house I had when I was about your age.

Erin: (Laughs) You mean back in the olden days?

Jason: I call dibs on sleeping out in the tree house first!

Erin: Not fair Dad, I called dibs on it first.

Jason: Did not!

Erin: Did too!

Jason: Did not!

Dad: Hey, we're not building anything unless you're both willing to share.

Erin: Okay.

Jason: Yeah, sorry Erin.

Dad: Can you please pass me that shovel Sarah? I want to dig up some of this brush around the bottom of the tree.

Jason: Hey, check this out!

Erin: Whoa—that looks like a spearhead. I read about them in school.

Dad: Yes I think it is. It's probably very old. Look at the workmanship. It probably took some guy a very long time to make this.

Jason: Cool—I want to find another one! (He reaches down) Ouch, something cut me.

Dad: Come here, I have a bandana to wrap your finger in.

Jason: What cut me?

Erin: It looks like a bottle or a can. There's lots of them back here sticking out of the ground.

Dad: Someone used this area as a dump. It was probably the farmer who owned this place before we bought it. He most likely just dug a big deep pit and tossed in everything he couldn't use.

Jason: You're right Dad. There's bottles here, old tin cans, milk jugs...

Dad: Come on Erin, let's go inside and take care of Jason's hand. We'll come out later and clean this mess up. I'll bet we can take those cans and bottles to the recycling center.



Discussion Questions for "Treasures Under the Tree House"

Where do you think the spearhead came from?

Why would someone throw trash under the tree like that?

What should we do with our trash, why?

What kind of trash do you think people will find from us in 2,000 years, why?



Chapter Two

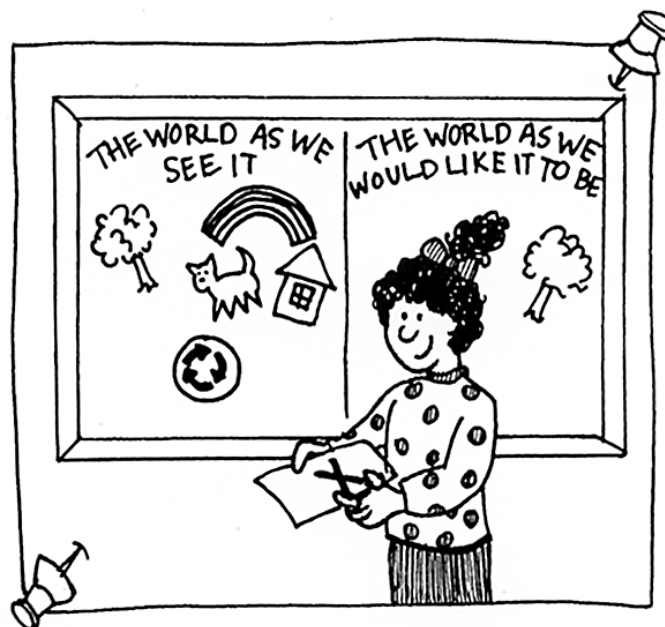
Lesson Two

Mural, Mural on the Wall....

Concepts and Skills Addressed

Interpersonal communication and expression

Fine Arts



Materials Needed

Magazines and newspapers that can be cut apart

Divided bulletin board with each side labeled to represent the world environment today and the environment of the future

Scissors

Stapler or thumbtacks

Procedure

1. Ask students to bring in old newspapers and magazines that can be cut up
2. Divide a bulletin board into two halves. Title the halves: "World Environment Today" and "The Environment of the Future." Hold a class discussion with the students regarding the differences between these areas before the exercise begins.
3. Set aside a time for students to go through the materials collected and then compile the collage on the board.
4. When the collage is complete, ask the student which pictures or words best describe how they feel about the environment.



Chapter Three

Applicable to the core subjects social studies and language arts

Included are:

- An examination of the environmental impact of various types of packaging.
- A demonstration, using a selection of trash, which helps students to learn to identify which items in the waste stream can be recycled, reused and/or reduced.
- A "Recycling Quiz Bowl" in which teams of students compete to answer questions about recycling and the environment.



Chapter Objectives

Students will learn how our consumer-oriented economy and each person's daily decisions can contribute to waste solutions. By exploring the activities outlined here, students will learn the importance of The New 3 R's. By Reducing, Reusing and Recycling, they can help solve the solid waste disposal problem.

Chapter Outline

I. Lesson One: Where Did the Garbage Problem Come From?

- a. Introduction to consumer changes
- b. Dependence on convenience
- c. Single-use items vs. reusable

II. Lesson Two: How Can We Reduce, Reuse and Recycle Our Resources

- a. Reduce waste in our trash
- b. Quiz Bowl

Chapter Three

Lesson One

Where Did the Garbage Problem Come From?



Concepts and Skills Addressed

Problem Solving

Class Discussion Listening Skills

Materials Needed

Consumer products that students can examine and discuss in class, examples could include:

- A pack of chewing gum
- Box of cake mix
- Wrapped container of produce
- Two-liter soft drink bottle
- Shampoo bottle
- Empty food jar
- Large pepperoni pizza
- Box of crayons

Students will learn how our demand for convenience sometimes leads to excessive packaging, which contributes to our waste problem. They will observe how we can avoid wasting some resources on single-use items by following the 3 R's: Reducing, Reusing and Recycling!

Procedure

1. Read the "Teacher Background" section
2. Divide the class in to groups and hand each group a product to examine.
3. Encourage the groups to dismantle their products and speculate what the packages are made of.
4. Go over the discussion questions as a class.

Teacher Background

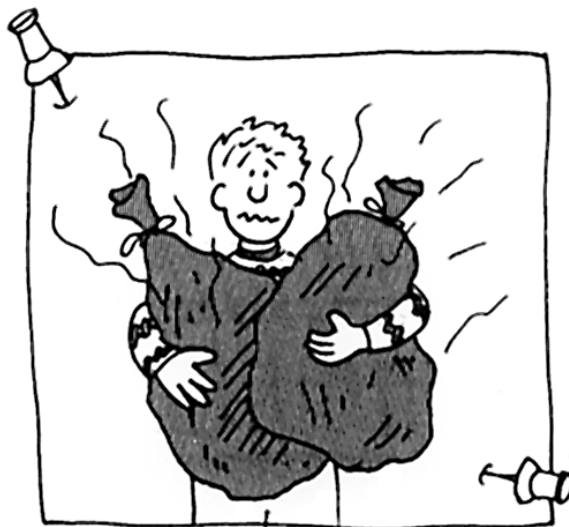
As we learned in Chapter Two, prehistoric societies made the most of their resources. Remember the cave dwellers that used almost every part of the animals they killed? Later,

we met a 10-year-old boy that was cut by broken glass in what used to be an open dump. How did we change from a society that once tried to get the most out of its resources to one that creates piles of waste while going about our daily lives?

Dependence on Convenience

Modern Western society has used disposable goods at a rapidly rising rate since the 1950's. In the United States, and the rest of the world, increasing pressures on natural resources and increasing waste generation presents a challenge to minimize our rate of consumption.

We've come along way from caves and this modern world has created a need for supermarkets, mass merchandise stores and discounters. To help service and attract new customers, merchandisers developed thousands of new products and then invented savvy, attractive packaging to market them. Pre-packaged food is convenient because now shoppers can choose their groceries quickly in pre-measured forms. This can be a bonus for store operators who now have better storage capacity, improved health standards and less damage to wares.



Remember how years ago, a milkman came to the doorstep, collected empty glass bottles, and replaced them with full ones that had been sterilized and reused? Today, people go to supermarkets to buy milk in cartons made of plastic or coated cardboard to use one time.

Unfortunately, the introduction of pre-packaging means there's a lot more garbage. Waste is created by delivering the products to retail outlets, more waste results from in-store operations, and still more waste is generated as customers use or consume products and discard the packaging. The food distribution industry is responsible for at least 30% of our national garbage volume. This increase in packaging has also led to an enormous demand for paper, plastic, glass and metal products that is putting a growing pressure on the waste cycle. However, much of what is currently seen as waste can be reused or recycled!

While many of the products we buy come in non-recyclable packages, we are throwing away too many things that contain materials that could be reused or recycled. Glass jars and bottles, for example, can be recycled into new containers; newspaper can be recycled and made into new newsprint and other paper products; aluminum and steel can eventually become engine parts and today's plastic bottle can become tomorrow's living room carpet!

More and more people are realizing the need for an environmentally friendly waste disposal option. Communities are responding by increasingly participating in recycling programs and manufacturers continue to explore ways to create degradable and biodegradable products as possible components to the solution. The ultimate waste solution will need to integrate a variety of disposal systems: recycling, waste-to-energy, landfilling and composting.



By becoming better-educated consumers and increasing our efforts to reduce, reuse and recycle, we can all play a positive role in meeting the waste disposal challenge. Our efforts as a community and a nation can and will make a difference.

Class Demonstration

Let's look at what we are putting into the waste stream. Recycle Rosie suggests that we take a look at the different way things we buy are packaged.

Why don't we examine the items given to each group? (Teacher asks each group to answer the following questions from Recycle Rosie)

Recycle Rosie asks:

- Why is the item packaged in this fashion?
- What are some ways you could package this item to result in creating less waste?
- With this new way, are you giving anything up? Freshness? Convenience?
- Can any of this packaging be used again for the same or new purposes? What are some of these ways?

Class Discussion Questions

How many of these packages are recyclable?

How much trash would we have to throw away after we took away the material that can be recycled?

What new ways could these items be packaged using less waste?

Did you find that repackaging these items could create problems?

What kind of problems and are there any solutions?

What ideas did your group have to make use of the reusable parts of your items?

Which item in the class would Recycle Rosie say is the most recyclable—why?

Chapter Three

Lesson Two

How Can We Reduce, Reuse and Recycle Our Resources?

Concepts and Skills Addressed

Social Science
Recycling Awareness
Arithmetic



Materials Needed

A trash bag filled with clean, recyclable and non-recyclable items weighing 4.5 pounds (2.05 kilos).

Materials Supplied

Glossary of terms
Discussion questions and answers

Students will learn ways in which they can contribute to reducing waste by recycling items found in the trash. In addition, they will learn how to reuse certain items and thereby reduce the trash they are producing.

Procedure

1. Divide students into groups of two
2. Ask each group the Quiz Bowl questions on the following page and give students time to listen to each other's answers.
3. At random, call on students to tell the class how their partner answered the question.
4. Continue this process, or begin addressing questions to the class as a whole group.
5. At the appropriate time, introduce the 4.5 pound bag of trash.

Recycling Quiz Bowl

Q1: What can we do to reduce the amount of trash we create each day?

Recycle Rosie says: *We can help reduce trash by reusing items we are now throwing away, recycling many of the resources in our trash and choosing to buy products that are recyclable and made from recycled material.*

Q2: Why is it important to recycle?

Recycle Rosie says: *By choosing to recycle we will reduce the amount of trash that each of us produces each day, and help landfills not fill up so quickly! We will also be helping to preserve natural resources like trees because we won't need them to make as much paper.*

(Refer to bag of recyclable and non-recyclable items)

Q3: Look at this bag of trash; does it seem like a lot?

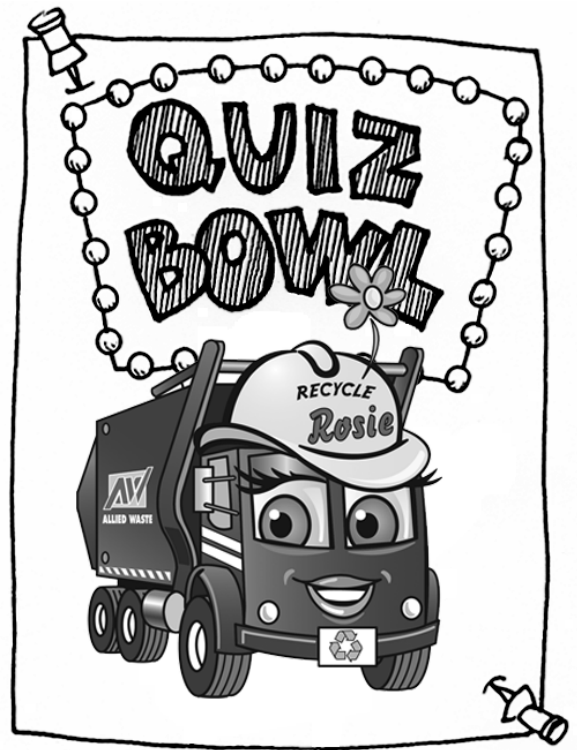
Recycle Rosie says: *It's not a lot by itself, but on average EVERYONE in the country creates 4.5 pounds of trash EVERYDAY!*

Q4: If each of us creates 4.5 pounds of trash every day, how much does that mean our class is responsible for creating each day?

Recycle Rosie says: *Ask students to multiply the number of students in the class by 4.5.*

Q5: Now can you figure out how much trash all the students in our school will create?

Recycle Rosie says: *Ask students to multiply the number of students in the school by 4.5.*



Q6: How can kids help reuse and reduce the trash they create?

Recycle Rosie says: Reusing: There are lots of things kids can do to reuse items and help stop creating more trash. Why not use rechargeable batteries to reduce trash? Do you know only one bottle in four is recycled, how about taking a reusable water bottle with you to sports practice? Can you think of any other items in your trash at home that could be reused?

Reducing: There are lots of ways to recycle. Try reusing things before you recycle them. For example, why not pack your school lunch in a lunchbox instead of a paper bag? Or wrap presents in gift bags or the comics from the newspaper instead of wrapping paper? You can also ask a teacher about starting a recycling program at school if you don't already have one.

Q6: What is a good way to clean up trash in the community?

Recycle Rosie says: When trash is put in the wrong place, like tossed out a car window or thrown on the street, it becomes litter. Litter can cause a lot of problems when animals eat it (thinking it's food) and it can also hurt the environment! Recycle Rosie has a couple of tips on how to clean up litter in our community:

- *Hold a Recycle Rosie community cleanup day*
- *Get a good habit...always pick up after yourself and others.*

Q7: What are some things in your house that you could donate to a charity instead of throwing out?

Q8: Pretend you just became the owner of a neighborhood supermarket. What are some things you could do to reduce the amount of waste caused by the products you sell?

Q9: Recycled Rosie asks you to think for a minute about what influences your choices when you buy things at the store. What are some of the reasons?

- *The Cool Reason: It's the "must have" item at school or in town.*
- *Peer Pressure: You buy something because everyone else has it.*
- *Advertising: Did the product have a cool ad on TV or the radio?*
- *Day Dream Factor: You think this product will make you seem smarter, fun, cooler and more athletic.*
- *Cost: Can you afford it?*



Q10: Why do you think it would be important to consider recycling when you're deciding what to buy at the store?



Chapter Four

Applicable to the core subjects science, mathematics, social studies and language arts



Included are:

- A practical exercise that involves examining a ton of trash and the percentages of raw materials that make up the waste stream
- An examination of the raw materials that shows how resources can be saved through recycling

Chapter Objectives

Students will explore their connection and contribution to the waste disposal problem by looking at the content of a ton of trash. They will compare the amount of raw materials needed to make certain products to using recycled materials for the same products.

Chapter Outline

I. Lesson One: It Weighs a Ton!

- a. Students will learn how the trash each of us creates daily (4.5 pounds) build quickly into a huge pile

II. Lesson Two: What It Takes To Make A Ton

- a. Waste percentages in tons
- b. Recycle Rosie Discussion

III. Lesson Three: Listen Up, 99.5 Recycling FM

- a. Design radio ad promoting recycling

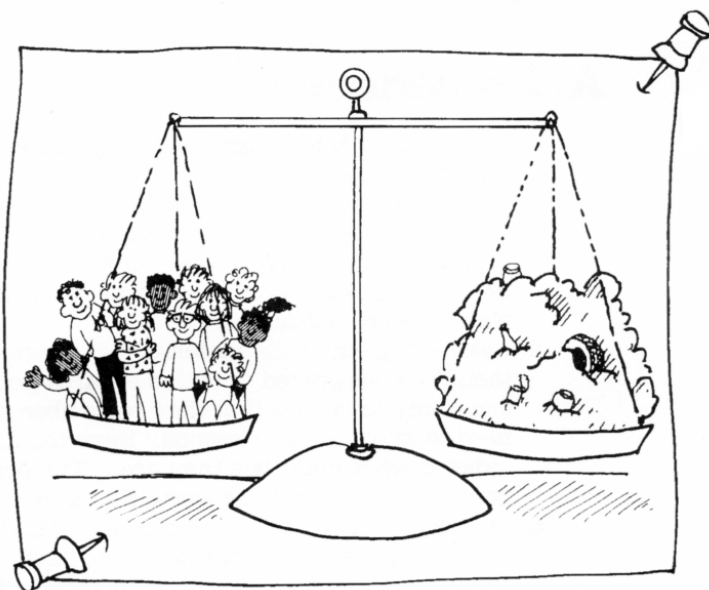
Chapter Four

Lesson One

It Weighs A Ton!

Concepts and Skills Addressed

Social Science
Problem Solving



Materials Needed

Name tags

Materials Supplied

None

Students will learn how the trash each of us creates daily (4.5 pounds) builds quickly into a huge pile. They will learn the concept of a ton, and will discover what comprises a typical ton of trash. They will explore some of the ingredients that make up many commonly recycled products, and which raw materials can be saved by recycling those products.

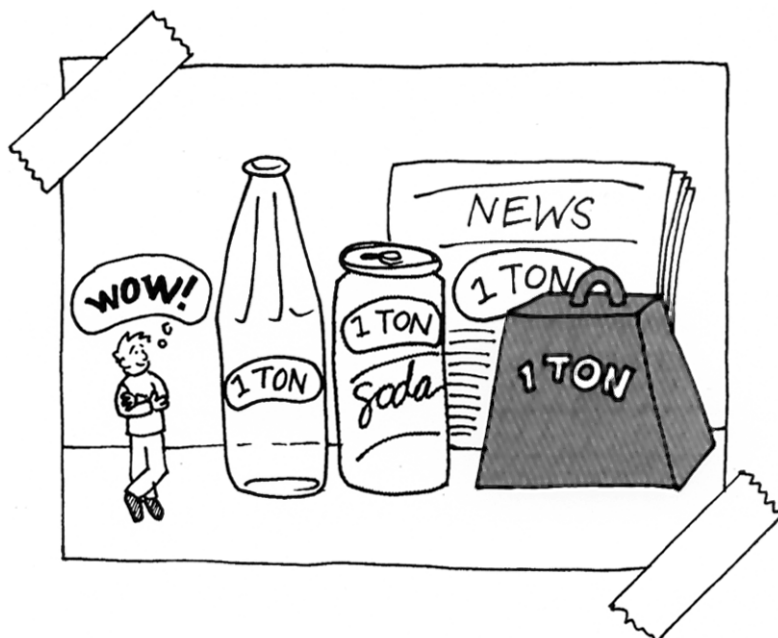
Procedure

1. Explain how much a ton weighs by using the information provided in the following pages.
2. Tell your class that together they weigh a ton.
3. Divide the group into the categories given on the next page and tell each group the name of the category they represent (e.g. glass, paper, plastic).
4. Ask each group if the material they represent is recyclable. If it is, move them to a designated 'recyclables area.' Have the groups make name tags to indicate which material they are. The point is that there is always a percentage of recyclable waste that is non-recyclable (e.g. used paper towels, light bulbs).
5. Once each group is divided into recyclables and non-recyclables, you should have roughly 80% of your class in recyclables (paper, metal, glass, food, plastic and yard waste) and 20% in non-recyclables (e.g. light bulbs, used paper towels and tissues, leather, toothpaste tubes)
6. Explain to the students that if we recycle all the items that are recyclable in our trash, we could reduce the amount of waste sent to the landfills by as much as we reduced the size of the group.
7. Share with them the figures from "It Weighs a Ton," then move on to Lesson Two and explain how raw materials and natural resources can be saved by recycling.

It Weighs a Ton!

What is a ton?

A ton is 2,000 pounds. If each student in the class weighed about 80 pounds, it would take 25 students to make a ton. A metric ton is equal to 1,000 kilograms. If each student weighs 40 kilograms, it will take about 25 students to equal a metric ton.



What's in a ton of trash?

A typical ton of trash in America is comprised of:

Paper: On average, Americans use about *700 pounds (318.18 kilos)* of paper each year. What are some types of paper that can be recycled but normally get thrown in the trash (write these on the board)? For example, what about newspapers, school work, food wrappers and cardboard boxes?

Glass: Currently Americans use about *79.5 pounds (36.14 kilos)* of glass each year. We're getting better at recycling this resource when it comes as food or beverage containers but some specialty glass is not widely recycled. This includes items like light bulbs, window glass and mirrors. (Continue writing what can be recycled on the board)

Aluminum: We toss out *72 pounds (32.6 kilos)* per person of aluminum per year. (Besides soda cans, what other aluminum items can be recycled?)

Food Waste: We each toss out a whopping *183.3 pounds (83 kilos)* of food waste in America each year. (List various food items that are thrown away.) Who can remember about composting and how we can recycle food scraps?

Plastic: *300 pounds (136 kilos)* of plastic ends up in the trash bin each year for every one of us. Many plastics can be recycled and new uses for plastic are being discovered all the time-like clothing, carpet and construction material. (What are some plastic items that get thrown out?)

Yard Waste: Yard waste can often be composted, but unfortunately for every American we toss out *205 pounds (92.9 kilos)* of yard waste per year. Many states in the U.S. have laws proposed or in place banning yard waste from entering the landfill. (What type of yard waste can end up getting trashed?)

Miscellaneous Trash: This category includes items that don't fit in the above categories. Many of these items can be recycled or reused but the amount is small compared to the other categories.



Chapter Four

Lesson Two

What it Takes to Make a Ton

Concepts and Skills Addressed

Social Science
Problem Solving

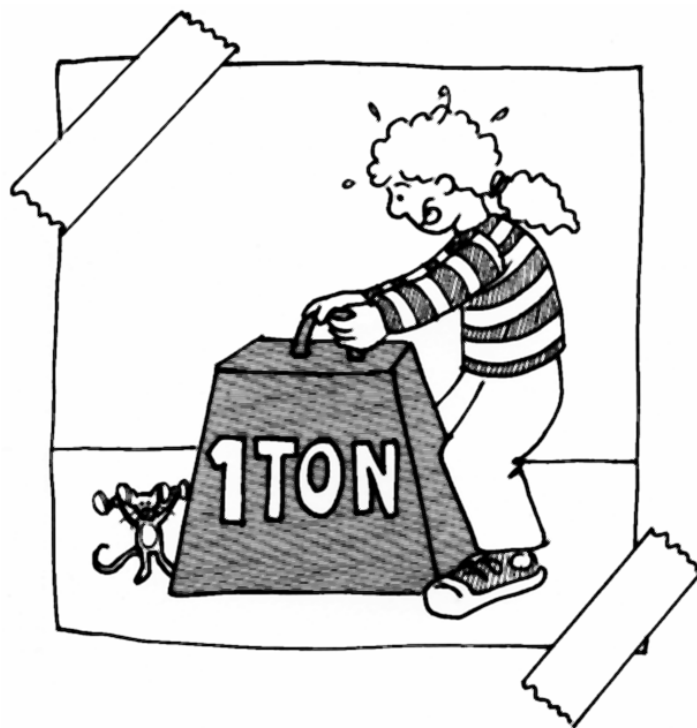
Materials Needed

None

Materials Supplied

"What it takes to make ton" facts

"Recycle Rosie considers her options," discussion sheet



Students will learn how raw materials and our resources can be preserved through recycling

Procedure

1. Read through the included material, "What it takes to make a ton."
2. Divide the class into four groups: paper, glass, aluminum and steel.
3. Give each group the list for their category of the "Resources Saved by Recycling."
4. Ask each group to discuss briefly how saving these resources can benefit the world.
5. Designate a writer in each group to jot down the ideas and to tell the rest of the class the resources that are preserved and how that benefits the world.
6. Finish off the exercise by having a class discussion around the questions raised in "Recycle Rosie Considers Her Options."

What it takes to make a ton:

To Make a Ton of Bleached Paper:

We use these raw materials:

- 3,688 lbs. of wood
- 216 lbs. of lime
- 360 lbs. of salt cake
- 76 lbs. of soda ash
- 24,000 gallons of water
- 28 million Btu of energy

We have to treat and dispose of:

- Pounds of air pollutants
- 36 lbs. of water pollutants
- 176 lbs. of solid waste

Resources saved by recycling one ton of paper:

- 17 trees
- 24,000 gallons of water
- 60 pounds of air pollution
- 3 cubic yards to landfill space

To Make A Ton Of Glass:

We use these raw materials:

- 1,330 lbs. of sand
- 433 lbs. of soda ash
- 433 lbs. of limestone
- 151 lbs. of feldspar
- 15.2 million Btu of energy

We would have to treat and dispose of:

- 32.5 lbs. of mining waste
- 8 lbs. of air pollution

Resources saved by recycling a ton of glass:

- 693 lbs. of carbon dioxide
- 9 gallons of fuel oil
- 5 lbs. of air pollution



To Make A Ton of Aluminum

We use these raw materials:

- 8,766 lbs. of bauxite
- 1,020 lbs. of petroleum coke
- 238 lbs. of lime
- 197 million Btu of energy

We would have to treat and dispose of:

- 3,290 lbs. of red mud
- 2,900 lbs. of carbon dioxide
- 181 lbs. of air pollutants
- 789 lbs. of solid waste

Resources saved by recycling one ton of aluminum:

- 789 lbs. of solid waste
- 238 million Btu of energy
- 40 barrels of oil
- 10 cubic yards of landfill space

To Make a Ton of Steel:

We use these raw materials:

- 1,970 lbs. of iron ore
- 791 lbs. of petroleum
- 454 lbs. of lime
- 29 million Btu of energy

We have to treat and dispose of:

- 538 lbs. of solid wastes
- 42 lbs. of air pollutants

Resources saved by recycling one ton of steel:

- 1,400 lbs. of coal
- Reduces air pollutants by 86%



Hey—But what about plastic?

Recycle Rosie says:

There are many types of plastic and not all kinds are recyclable. A shampoo bottle, for example, may be made of one kind of plastic while the cap might be made of a different kind of plastic. There are a couple of super easy ways to reduce the amount of plastic that you waste:

- Plastic containers like margarine tubs can make great food containers!
- Donate older plastic toys to charity rather than throwing them away.
- Reuse plastic bags from the grocery store.
- Wash plastic cups and utensils to use again

Recycle Rosie Considers Her Options:

Imagine Recycle Rosie has come to visit your classroom today. How would you answer if she asked you the following questions?

How does recycling help make the world a better place?

How can we develop a recycling habit?

How can we help others to do the same?

What are two easy ways we can recycle?

What can we do to cut down the amount of paper and plastic we throw away?

Do you feel like you can help reduce the amount of trash that goes to the landfill?

How can your class help reduce the amount of recyclable material that gets thrown away?



Chapter Four

Lesson Three

Listen Up, 99.5 Recycling FM

Concepts and Skills Addressed

Language Arts

Materials Needed

Paper

Pencils

Tape recorders

Camcorders

Video and Audio cassette tapes

Materials Supplied

None

Procedure

1. Divide class into groups of 4.
2. Explain that each group will write and record a radio or television commercial to teach and promote recycling to their peers.
3. Before creating the commercial, have teams state the message that they wish to convey—what will the ad tell people?
4. Explain that students can get their message across in many creative ways: using sound effects, music, multiple voices, impersonations, person-on-the street interviews, etc.
5. Give students time to discuss what they will do and prepare to record their commercial. They may need some time to gather items that they'll use in the recording.
6. Rehearse and record the commercials, then present them.

Chapter Five

Applicable to the core subjects science, mathematics, social studies and language arts

Included are:

- Lessons in arithmetic and the metric system



Chapter Objectives

Students will learn how packaging choices affect the price of certain products. They will sharpen arithmetic skills through exercises designed to give meaning to the size and scope of the solid waste issue.

Chapter Outline

I. Lesson One: Paying the True Price for Beverages

- a. Students will explore the differences between various types of containers.

II. Lesson Two: Math and Logic Problems

- a. Students will sharpen arithmetic skills while they learn the impact that our choices have on our lives and our environment.

III. Lesson Three: Recycle Rosie Masters the Metric System

- a. Recycle Rosie teaches children about the metric system

Chapter Five

Lesson One

Paying the True Price for Beverages

Concepts and Skills Addressed

Self Expression

Problem Solving



Materials Needed

Drink Containers from home: glass, plastic, metal, paper

Materials Supplied

Discussion Questions

Students will explore the differences between various types of containers. They will see how size affects the cost of the products we buy.

Procedure

1. Ask the students to bring in liquid containers from home. You will want to bring some examples yourself to be sure there are many different kinds, including both returnable and non-returnable glass bottles, a plastic milk carton, a plastic beverage bottle and an aluminum or steel can.
2. Read the message from Recycle Rosie to students.
3. Begin the discussion questions by calling on students to identify each different type of container, then go onto the next question.

Note to Teachers: Be sure to caution students about the type of containers to bring in. Suggest beverage containers and/or those that held food products. Be certain that the students understand that they should not bring in containers that held household cleaners, oil and so on.

A Word to Students from Recycle Rosie:

It seems simple. We buy drinks in plastic or non-returnable bottles and when we're finished we toss them into the trash bin. But this really isn't the best thing to do because after we throw them away they are not gone. Trash goes to a landfill where it takes up a lot of space. Then we have to use more of our natural resources to make new containers. Doesn't that seem silly?

There is a much better choice we can make. We need to choose to recycle a great deal of the things we normally throw out without a second thought. This helps protect our environment and reduces trash, a great and easy thing to do for your town and planet!



Class Discussion Questions:

What materials are the containers made of?

Which of these containers can be most easily recycled?

What are two ways your containers might be recycled?

What are two ways your containers might be reused?

What might prevent someone from not recycling?

What should you think about when buying containers?

Do you think people should participate in recycling programs? Why?

Chapter Five Lesson Two

Math and Logic Problems

Concepts and Skills Addressed

Arithmetic

Materials Needed

Paper

Pencil or Pen

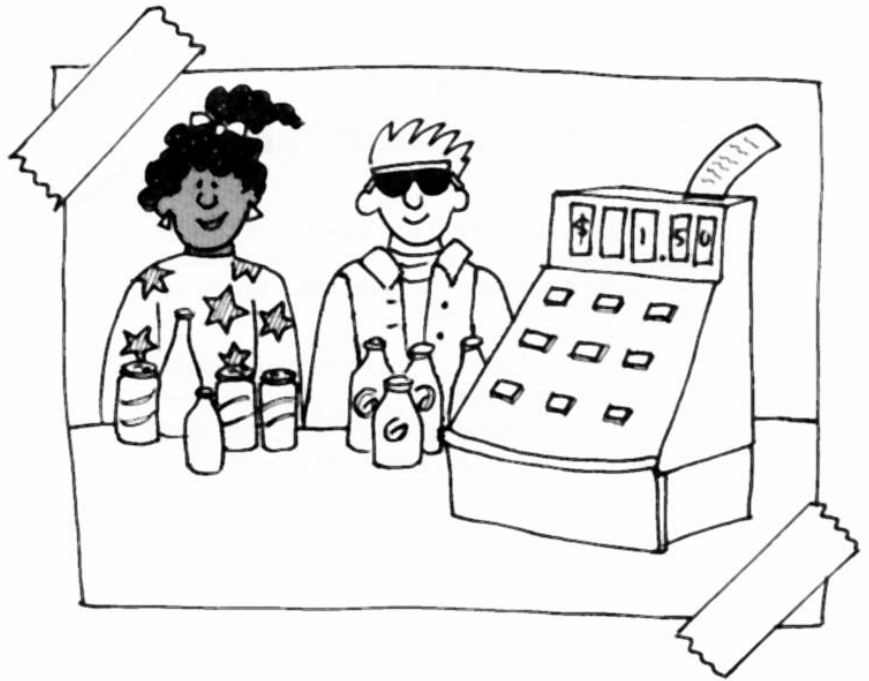
Materials Supplied

Word Problems

Students will sharpen arithmetic skills while they learn the impact that our choices have on our lives and our environment.

Procedure

1. Divide the class into groups of two.
2. Ask students to read each problem aloud and to work out the answer together.
3. Discuss, then hand in assignment.



The Recycle Rosie Center

You have learned that recycling helps us keep useful materials out of the waste stream. But did you know that recycling is also a way to earn money? That's right, cans glass and plastic bottles can be collected and turned in for money.

Imagine that Recycle Rosie operates her own recycling center, Waste Not Inc., where you receive money for turning in cans and bottles. Based on the chart, answer the following questions.

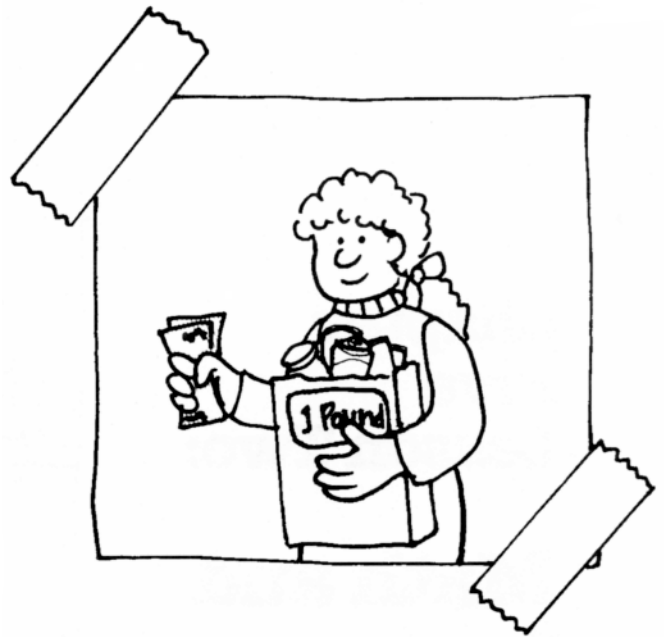


Chart One

Material	Value Per Pound*
Glass	1 cent
Plastic	20 cents
Aluminum	50 cents

*these are examples only

1. How much money would Recycle Rosie pay you if you brought her four pounds of empty plastic bottles and one pound of aluminum cans?
2. How much money would you earn if you brought Recycle Rosie one pound of each kind of material?
3. How much money would you earn if you brought Recycle Rosie two pounds of each material?
4. You collected one pound of aluminum cans and one pound of glass bottles and brought them to Waste Not Inc. How much more money would you still need to buy a drink that costs \$.60?
5. If you collected enough plastic bottles to equal your weight, how much money would they be worth at Waste Not Inc? How about aluminum cans? Glass bottles? (If you don't know your weight, assume you weigh 80 pounds)

The Recycling Rosie Beverage Company



Recycle Rosie is going to start her own beverage company, 3R-Cola. She needs your help to figure out how much energy it takes to put her beverages in containers made of glass, aluminum and plastic. Energy is the amount of power and electricity it takes to make the cans and bottles. It is measured in Btu.

What is Btu? Btu is a unit of measurement used to calculate the amount of energy necessary to raise the temperature of 1 lb. of water 1° Fahrenheit.

Once Recycle Rosie knows how much energy it takes to make the containers, she can figure out how much to charge for her beverage containers. Remember, energy costs money so the more energy you save, the lower the price for the containers. Recycle Rosie has a hunch that she can save money in producing beverage containers by using recycled materials...let's see if she's right!

Chart Two

<u>Container Type</u>	<u>Btu's used per ounce*</u>
Glass	
All recycled ingredients	164
No recycled ingredients	383
Aluminum	
All recycled ingredients	125
No recycled ingredients	391
Plastic	
All recycled ingredients	117
No recycled ingredients	164

*Example figures

1. The average sized container for a Recycle Rosie 3R-Cola is 16 ounces. Multiply the Btu's per ounce of each container type (include recycled and non-recycled ingredients) by 16. Share answers with class.
2. Which containers used less Btu's, the recycled or non-recycled ingredients containers?



3. If Recycle Rosie were a smart businesswoman, choosing which type of ingredients would save 3R-Cola money?
4. Recycling cannot only be a good solution to waste disposal problems; it can also save on energy costs. Why do you think it might be good to save energy?



Teacher Answer Sheet

The Recycle Rosie Center:

1. \$1.30
2. 71 cents
3. \$1.42
4. 9 cents
5. Compare answers

The Recycle Rosie Beverage Center:

1. Glass Recycled: 2,624
Glass Non-Recycled: 6,128
Aluminum Recycled: 2,000
Aluminum Non-Recycled: 6,256
Plastic Recycled: 1,872
Plastic Non-Recycled: 2,624
2. Recycled
3. Recycled
4. Compare answers



Chapter Five

Lesson Three



Recycle Rosie Masters the Metric System

Concepts and Skills Addressed

Arithmetic
Weights and Measures
Metric Conversion

Materials Needed

Paper
Pencil or Pen

Materials Supplied

Word Problems
Conversion tables

Students will learn and sharpen mathematical skills in addition, multiplication and metric conversions while learning the concepts of weights and measures as applied to recycling and waste disposal.

Procedure

1. Read the lesson outline and questions on the following pages.
2. Photocopy the lesson for each class member or for pairs or groups of students.
3. Give students time to work through the problems. You may consider assigning each student group certain problems.
4. Work through the answers in class.

Recycle Rosie Measures Up



There are many different ways to measure things. You may have noticed that all through these lessons we have put in metric measurements after those used in the United States, which uses a system called the U.S. Customary System. Recycle Rosie loves to learn and knows that many other countries use the metric system. Let's take a look at both systems.

Metric Measurements:

10 grams	=	1 decagram
10 decagrams	=	1 hectogram
10 hectograms	=	1 kilogram
1,000 kilograms	=	1 metric ton
10 meters	=	1 decameter
10 decameters	=	1 hectometer
10 hectometers	=	1 kilometer (or 1,000 meters)

U.S. Customary System:

16 ounces	=	1 pound
100 pounds	=	1 hundredweight
2,000 pounds	=	1 ton (also called a short ton)
12 inches	=	1 foot
3 feet	=	1 yard
1,760 yards	=	1 mile (5,280 feet)

How to convert:

From	To	Multiply by
Pounds	Kilograms	0.454
Kilograms	Pounds	2.2
Feet	Meters	0.3048
Meters	Feet	3.282
Metric tons	Short tons	1.102
Short tons	Metric tons	.907
Kilometers	Miles	.6214
Miles	Kilometers	1.6093



Let's Measure Up Some Recycling!

1. If we create 4.5 pounds of garbage every day, how many kilograms do we generate in a week?
2. If your family recycles 11 kilograms of aluminum cans in a month, how many kilograms of cans do you recycle in a year?
3. By recycling one ton of newspaper, you are preserving about 3 cubic yards of landfill space. How many cubic yards would be saved if 18 tons of newspapers were recycled?
4. The Rosie Recycling Center is one kilometer from your home. You can only carry ten pounds that far or you'll have to take your bike. You have six kilograms of recyclables. How many pounds do you have? Can you take your bike?
5. What's the fastest way to get to the neighborhood recycling drive at your school? Past Phil's house, which totals one kilometer from your house to school, or past Isabel's, which is a one mile trip from your house to school?
6. How much do you weigh in kilograms? In pounds?
7. If you had 3 metric tons of plastic bottles, how many short tons would that be?
8. If you had a stack of newspapers in your garage that needed to be recycled that was 2 meters high, how many feet would that be?
9. You have 13 pounds of compost to spread around your garden, how many kilograms is that?



Teacher Answer Sheet

1. 14.301 kilograms
2. 132 kilograms
3. 54 cubic yards
4. 13.2 pounds, no you can't take your bike
5. 1 kilometer
6. Compare answers
7. 3.306 short tons
8. 6.56 feet
9. 5.902 kilograms



Chapter Six

Applicable to the core subjects science, mathematics, social studies and language arts

Included are:

- Class activities that integrate all of the lessons learned in the Recycle Rosie curriculum as students work together to create their own recycling program for their class or entire school.

Note to teachers: Because this chapter involves active recycling on the part of the school, its success depends on the availability of a recycling center or the arrangement of recycling pickup in your area.

Chapter Objectives

Students will explore and demonstrate team building and leadership by coordinating and participating in a classroom recycling project or for a number of classes in the school. They will learn by setting goals and tracking their progress as they go along.

Chapter Outline

I. Lesson One: Our Environmental Responsibility—Reduce, Reuse, Recycle

- a. Students will develop a recycling project for their classroom or for a number of classes in the school.
 - i. What do we do?
 - ii. What do we need?
 - iii. Who can help us?



Chapter Six

Lesson One

Our Environmental Responsibility—Reduce, Reuse, Recycle

Concepts and Skills Addressed

Leadership
Team Work
Communication

Materials Needed

Bins for each participating classroom to collect recyclables
A bulletin board to track the students progress toward their recycling goals

Materials Supplied

A planning guide for your recycling program

Procedure

1. Follow the steps outlined in the planning guide.



Recycle Rosie Planning Guide



1. What do we do?

If your school is not already recycling on a regular basis, here is an opportunity to get started. This could be a big project, even for just one classroom, so the best way to start is by planning.

2. Set goals

Ask the class to set goals for how long they want to run the recycling program. We know that recycling must become a habit for a lifetime, but that can seem like an awfully long time at first. Start with a goal of a week or a month or set a goal based on weight or volume. Gather the recyclable paper discarded in your classroom daily and weigh it. Keep track of the amount saved on a chart so that students can see their progress. The school cafeteria personnel could become involved if you ask them to save cans and other recyclable containers. Students could also bring in recyclables from home (if recycling is not available in your area.)

3. Choose a coordinator

Whether one class is involved or 100, someone has to coordinate the effort. The coordinator could be a responsible student, a teacher, or a task force made up by administrators. If the project turns out to be large, a multi-tiered approach may be needed to better handle the work. While leadership is a key part of making any project work, remember to cultivate good followers along with budding leaders in your class.

4. Set Rewards

Every goal deserves a reward when it is accomplished. If recyclables in your area can be turned in for cash, the group could choose to buy something for the school or their class. Classes may choose to challenge other classes, or you may want to challenge another school in your area to see which school collects the most recyclables within a set period of time. A celebration could be planned at the end for everyone involved. The point is not to spend a lot of money on a party but to recognize the school's accomplishment toward recycling and environmental responsibility.

5. What do we need?

- Some supplies are needed, and arrangements must be made to make a school recycling program work. Residents in your area may already recycle at home. If



so, your school program will include only the recyclables generated at the school. If not, your program may include bringing recyclables from home.

- a. Classrooms need separate collection boxes or containers and a central storage area must be provided to hold the recyclables.
- b. Transportation to a recycling center will have to be arranged. Perhaps your local recycling company will pick up the materials, or parents and teachers could volunteer to take them there at regular times or at the end of the program.
- c. If your program is designed as a contest between classes or another school, a means of counting or weighing the material must be arranged.
- d. A speaker may be brought in to give students an opportunity to ask questions. If there is an Allied Waste division office in your area, you may call and see if they have speakers available.
- e. A tour could be planned of a recycling facility or sanitary landfill site. Please call your local Allied Waste division office to inquire about tours of their recycling facilities.

6. Who can help us?

Call your local Allied Waste office or other area recycling company. If you don't know anyone in your area that collects recyclables, contact the solid waste hauler for your school and ask them who you should talk to about a class recycling project. Also, most cities have a solid waste department or a public works director who can provide information.

Environmental Education Resources

The Ecology Center

2530 San Pablo Avenue
Berkeley, California 94702
Tel: 510.548.2220
Website: www.ecologycenter.org

Maintains a library, bookstore and information line dealing with a wide-range of environmental issues, including waste reduction.

Environmental Defense Fund

257 Park Avenue South
New York, NY 10010
Tel: 212.505.2100
Website: www.edf.org

Environmental Defense is dedicated to protecting the environmental rights of all people, including future generations. Among these rights are clean air, clean water, healthy food and flourishing ecosystems.

Environmental Industry Associations

4301 Connecticut Avenue, Suite 300
Washington, DC 20008-2304
Tel: 202.244.4700
Website: www.envasns.org

EIA represents companies and individuals who manage solid and medical wastes; manufacture and distribute waste equipment; and provide environmental management, consulting and pollution-prevention-related services.

Friends of the Earth

1717 Massachusetts Avenue, NW, 600
Washington, DC 20036-2002
Toll-free: 877.843.8687
Website: www.foe.org

Friends of the Earth is the U.S. voice of an influential, international network of grassroots groups in 70 countries. Has store and resource center on website.



Glass Packaging Institute

515 King Street, Suite 420
Alexandria, VA 22314
Tel: 703.684.6359
Website: www.gpi.org

The Glass Packaging Institute (GPI) serves as the voice for the glass container industry in Washington, D.C., and across the country.

Izaak Walton League of America

707 Conservation Lane
Gaithersburg, MD 20878
Toll-Free: 800. 453-5463
Website: www.iwla.org

The Izaak Walton League of America focuses on public education promoting responsible use of the forest and other natural resources. The website also as a link to "Young Ikes," designed especially for young people interested in protecting and enjoying the outdoor

Keep America Beautiful

1010 Washington Boulevard
Stamford, CT 06901
Tel: 203.323.8987
Website: www.kab.org

Keep America Beautiful is a national non-profit public education organization dedicated since 1953 to engaging individuals to take greater responsibility for improving their local community environments. Focuses include: waste reduction, litter prevention and community beautification.

National Recycling Coalition

1325 G Street, Suite 1025
Washington, DC 20005
Tel: 202.347.0450
Website: www.nrc-recycle.org

National Recycling Coalition is dedicated to the advancement and improvement of recycling, source reduction, composting, and reuse by providing technical information, education, training, outreach, and advocacy. The coalition can provide up-to-date recycling fact sheets on national recycling figures.

Society of the Plastics Industry, Inc.

1275 K Street N.W., Suite 1000

Washington, D.C 20006

Tel: 202.974.5200

Website: www.plasticsindustry.org

The Society of the Plastics Industry, Inc., is the trade association representing one of the largest manufacturing industries in the United States. SPI's members represent the entire plastics industry supply chain, including processors, machinery and equipment manufacturers and raw materials suppliers. Provides outreach and education material for teachers.

The Solid Waste Association of North America

P.O. Box 7219

Silver Spring, MD 20907-7219

Toll-Free: 1-800-GO-SWANA

Website: www.swana.org

SWANA's mission is to advance the practice of environmentally and economically sound municipal solid waste management in North America, Sells resources on municipal solid waste.

Steel Recycling Institute

680 Andersen Dr.

Pittsburgh, PA 15220-2700

Toll-Free: 1-800-YES-1-CAN

Website: www.recycle-steel.org

Provides a good range of teaching materials, including: Roscoe's Recycling Room, Nature's for Me (designed by Head Start parents and teachers) and Earth Cycles curriculum resources for grades 3-5.



Recommended Reading

Adult Literature

Basic Composting: All the Skills and Tools You Need to Get Started.
Ebeling, Eric. Stackpole Books, 2003.

Reducing And Recycling Waste (Improving Our Environment).
Inskipp, Carol. Gareth Stevens Publishing, 2005

McGraw-Hill Recycling Handbook, 2nd Edition.
Lund, Herbert F. McGraw-Hill Professional, 2000.

Garbage Land: On the Secret Trail of Trash.
Royte, Elizabeth. Little, Brown; 2005.

Rubbish!: The Archaeology of Garbage.
Rathje, William. University of Arizona Press, 2001.

Juvenile Literature

Recycling (True Books: Environment).
Donald, Rhonda. Children's Press, 2002.

50 Simple Things Kids Can Do To Recycle.
Earthworks Group. Earthworks Press, 1994.

Garbage and Recycling (Young Discoverers: Environmental Facts and Experiments).
Harlow, Rosie and Morgan, Sally. Kingfisher, 2002.

The Great Trash Bash.
Leedy, Loreen. Holiday House, 2000

Earth Day—Hooray.
Murphy, Stuart J. and Andriani, Renee. HarperTrophy edition, 2004.

Acknowledgements

Allied Waste specialists on Recycling, Landfills, Waste-to-Energy and Composting; City of Clearwater, Florida; City of Melbourne; City of Ottawa; Environment Canada; Glass Packaging Institute; Grassroots Recycling Network; Illinois Recycling Center; Franklin Associates, LTD.; Friends of the Earth; National Recycling Coalition; Patagonia; Society of the Plastics Industry; Solid Waste Association of North America; United States Environmental Protection Agency; University of Arizona; Waste Age; Wastewatch; Wikipedia; World Book Encyclopedia



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