

All About Trash

Primary students explore the basics of trash and its relationship to energy.



Grade Level: _____

Pri Primary

Subject Areas: _____

 Science

 Social Studies

 Math

 Language Arts



Teacher Advisory Board

Constance Beatty
Kankakee, IL

Barbara Lazar
Albuquerque, NM

James M. Brown
Saratoga Springs, NY

Robert Lazar
Albuquerque, NM

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Raleigh, NC

Leslie Lively
Porters Falls, WV

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Greene, RI

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**Jennifer Trochez
MacLean**
Los Angeles, CA

Robert Griegoliet
Naperville, IL

Wayne Yonkelowitz
Fayetteville, WV

Bob Hodash
Bakersfield, CA

DaNel Hogan
Tucson, AZ

Greg Holman
Paradise, CA

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In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

Energy Data Used in NEED Materials

NEED believes in providing teachers and students with the most recently reported, available, and accurate energy data. Most statistics and data contained within this guide are derived from the U.S. Energy Information Administration. Data is compiled and updated annually where available. Where annual updates are not available, the most current, complete data year available at the time of updates is accessed and printed in NEED materials. To further research energy data, visit the EIA website at www.eia.gov.



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All About Trash

Data in this guide comes from the U.S. Energy Information Administration (EIA), The Organization for Economic Development (OECD), and the U.S. Environmental Protection Agency (EPA). The majority of the data in this guide is taken from the EPA, which updates its Advancing Sustainable Materials Management report annually.

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Standards Correlation Information

www.NEED.org/curriculumcorrelations

Next Generation Science Standards

- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross cutting concepts within your required curriculum. For more details on these correlations, please visit NEED's curriculum correlations website.

Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

Individual State Science Standards

- This guide has been correlated to each state's individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.





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Curriculum Correlations

NEED has correlated their materials to the Disciplinary Core Ideas of the Next Generation Science Standards. NEED has also correlated all of their materials to The Common Core State Standards for English/Language Arts and Mathematics. All materials are also correlated to each state's individual science standards. Most files are in Excel format. NEED recommends downloading the file to your computer for use. Save resources, don't print!

- [Navigating the NGSS? We have What You NEED!](#)
- [NEED alignment to the Next Generation Science Standards](#)
- [Common Core State Standards for English and Language Arts](#)
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NEED is adding new energy workshops all the time. Want to



Teacher Guide

Background

Primary students are introduced to concepts of trash disposal and the associated energy implications using bold graphics, simple words, sentences, and graphs. Students enhance their reading comprehension, graph analysis, and artistic skills.

This guide is designed as a reader. It allows teachers to fold each page of the guide so that the student page can be shown on one side, with teacher background information, discussion questions, and suggested activities on the other side facing the teacher.

Preparation

- Familiarize yourself with the format of and information in the guide. Highlight the information in the background section that you wish to present to the students, as well as the discussion questions you will use from each topic.
- Decide which activities you will conduct to reinforce the knowledge presented in the guide. Activities are provided for most topics.
- Plan your unit and procure any materials you need to conduct the activities.
- Make copies or prepare to project any of the graphics from the guide that the students might need for the activities, especially the exhibits. Graphics are also available on NEED's SmugMug page at <http://need-media.smugmug.com/>.
- If you want the students to work in groups to prepare exhibits on the material they are learning, the following exhibit topics are suggested:
 - Introduction to Trash (pages 6-15)
 - What We Can Do (pages 16-27)
 - Recycling Glass (pages 28-31)
 - Recycling Paper (pages 32-35)
 - Recycling Metals (pages 36-39)
 - Recycling Plastics (pages 40-43)
 - Burning Trash (pages 44-49)
 - Landfills (pages 50-53)

Procedure

1. Introduce the subject to the students with a brief discussion of trash.
2. Read the guide with the students, using the discussion questions you have selected.
3. Conduct the activities you have planned.
4. Evaluate the activities with the students using the *Evaluation Form* on page 55, and return it to NEED.

Grade Level

- Primary, grades K-2

Time

- Three to five class periods, depending on the activities and discussion chosen



Trash



Trash is anything we throw away.



Trash

TEACHER

Introduction To Trash

Parents have asked their children for centuries, "Please take out the trash!" Trash is anything that homes and businesses throw away. It is old food, bags, boxes, jars, toys, clothes, branches, and furniture. It is paper, wood, cloth, metal, plastic, yard and food waste, and glass.

People have always had trash. The Greek city-state of Athens opened the first dump more than 2,500 years ago. During the Middle Ages, people threw their trash out the door. They didn't know that rotting trash could make them sick.

In the 1700s, cities began collecting their trash to get it off the streets and out of waterways. By the late 1800s, Europeans were even burning their trash and using the energy to make electricity.

America was a little different. To the colonists, the land seemed endless. When dumping on city streets became a problem, they dumped their trash outside of town. Today, we bury about half of our trash in modern dumps called landfills.

Discussion Questions

1. Why is it important to learn about trash?
2. What kinds of things do we throw away at school?
3. What happens to the trash we throw away at school?

Activity

Ask the maintenance or facilities personnel to talk to the students about the kinds of trash the school produces, how much trash is produced at the school every day, and what is done with it.



Lots of Trash



We throw away a lot of trash in the United States.



Lots of Trash

TEACHER

All Kinds of Trash

Trash can be grouped in two ways:

By material—what the trash is made of. Trash can be plastic, paper, metal, rubber, food waste, or yard waste. A plastic toy and a plastic milk jug would be in the same group because they are both made of plastic.

By product—how the trash was used. The trash may be a potato chip bag, an old shoe, or a broken toy. A plastic soda bottle and a soda can would be in the same group because they are both containers.

What do you think makes up most of the trash in this country? Paper? Plastics? Metals?

The answer is paper. Paper makes up 27 percent of our trash. Plastics make up 13 percent.

Discussion Questions

1. What kinds of trash do you produce?
2. Is the trash different from schools, homes, and businesses?
3. What kinds of trash might be in a typical trash bag from a home?
4. What kinds of things do we throw away every day? What kinds of things do we throw away once in a while?
5. What kinds of things would we never throw away?

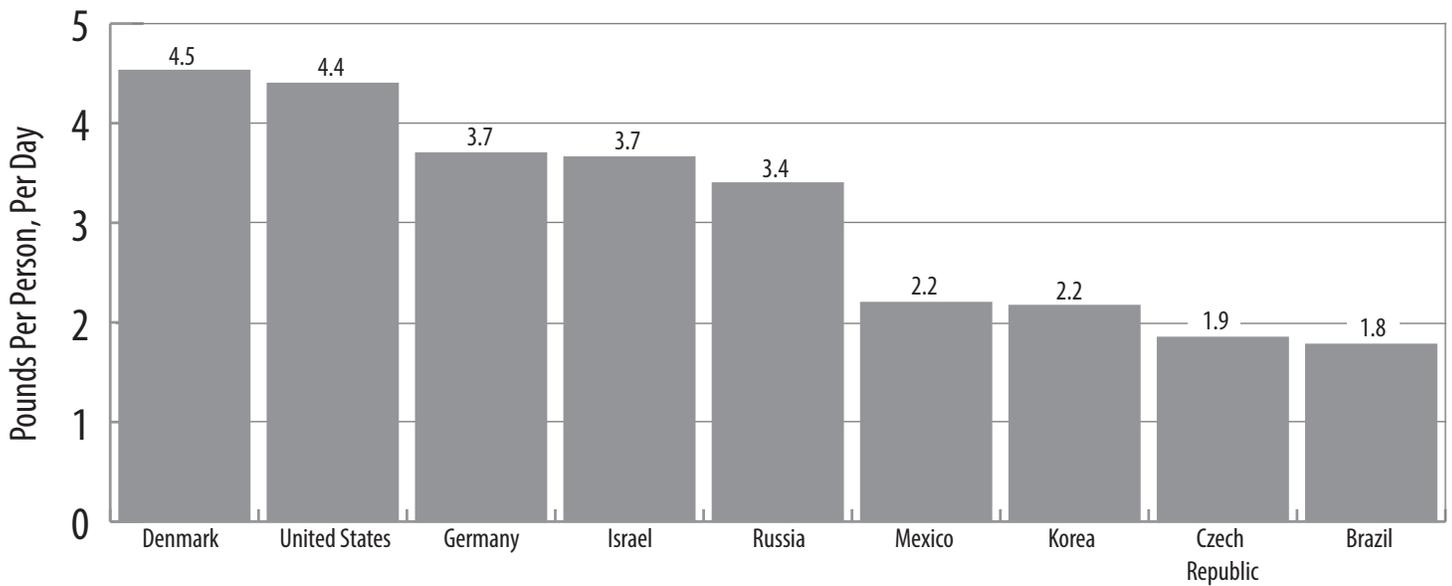
Activity

Look in the trash cans in the classroom, office, bathroom, clinic, and cafeteria. Compare. Make a list or graphic organizer showing the items found.



How Much We Throw Away Each Day

Trash Around the World, 2013



Data: OECD



How Much We Throw Away Each Day

TEACHER

Four Pounds of Trash

Think about all the things you throw away every day. You wake up in the morning and eat breakfast. You throw away a napkin or a wrapper or an empty cereal box.

You go to school. You use paper for math and reading. In art, you use more paper. In the cafeteria, the trash cans are filled with disposable trays, juice boxes, sandwich bags, paper napkins, and uneaten food.

After school, you throw away more trash. By the end of the day the average American has created 4.4 pounds of trash. This is more than people in almost every other country!

Discussion Questions

1. Does this mean that every person throws away four and a half pounds of trash every day?
2. What does average mean?
3. Why do Americans produce more trash than people in most other countries?
4. Is all trash bad?

Activities

- Have the students keep a journal of all the trash they throw away in a day.
- Weigh the amount of trash produced in the classroom every day for a week.



Kinds of Trash



Trash can be paper, glass, plastic, wood, metal, or food and yard waste.



Kinds of Trash

TEACHER

Kinds of Trash

Sometimes people who study garbage find it more useful to know what waste was used for, instead of what it was made from. They put waste in five product categories:

Containers/Packaging: This includes cans, jars, bags, bottles, boxes, and wrapping materials. Containers and packaging form the biggest product category. Packaging is the single largest product in the waste stream. Bread is wrapped in a plastic bag. Soup comes in a can. Cookies are arranged on plastic trays that are slipped inside other wrapping. Six bottles of soda or water are wrapped together in plastic or cardboard.

Yet packaging serves many useful purposes. The bread wrapper keeps the bread fresh and clean. The soup can keeps the soup fresh for months on grocery store shelves. The cookie tray keeps the cookies from getting crushed. The wrapping around soft drinks makes it easy to pick up six bottles of cola in one hand. Bagged potatoes mean less time selecting food. Without a doubt, packaging provides a convenient and sanitary way to store and transport food and other products.

Nondurable consumer goods: These goods are called nondurable because they are not meant to last a long time. This category includes many paper products such as newspapers, magazines, and paper towels. This category also includes clothing and disposable dinner plates.

Durable consumer goods: The goods in this category are called durable because they are meant to last a long time. This category is made of many bulky and oversized items like washing machines, old furniture, and rubber tires.

Yard wastes: This category is made mostly of grass clippings, but it also includes dead plants and bushes, leaves, branches blown down by the wind, and even dirt!

Food wastes: This is what you didn't eat for dinner, or the green gunk in the bottom of your refrigerator.

Discussion Question

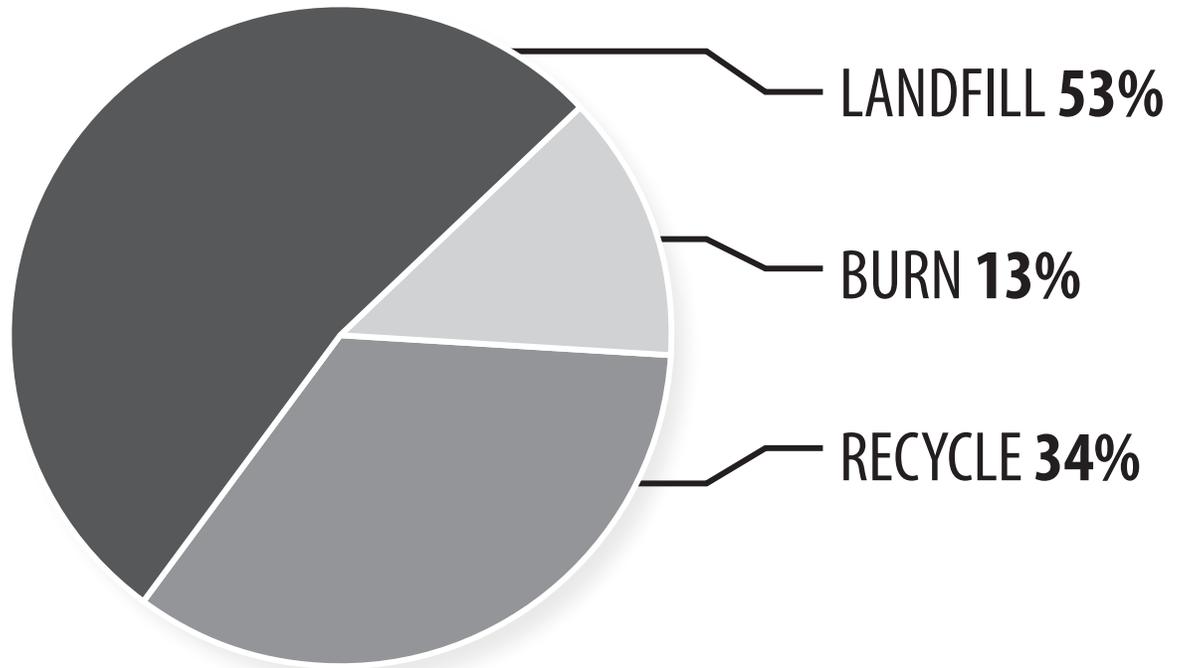
1. Why is packaging important?

Activity

Make a list of things that come in packaging and a list of things that have too much packaging.



Where Trash Goes



Data: Environmental Protection Agency



Where Trash Goes

TEACHER

What We Do With Our Trash Today

1. We bury it in landfills. When we bury trash in a landfill, we can't recover any of its potential value (except for methane or landfill gas that is sometimes recovered). It takes up valuable land to bury trash.
2. We recycle it. We recover its value and conserve natural resources.
3. We burn it in waste-to-energy plants to make electricity. We use the energy in the trash to generate electricity.

Discussion Questions

1. Do you think a lot of the trash that is buried could be recycled or burned?
2. Do you sometimes throw things away that could be recycled?
3. How could we get people to recycle more of their trash?

Activity

Make a bar graph using the information in the pie chart.



Reduce



You can reduce the amount of trash
you make.



Reduce

TEACHER

Reduce

Buy a larger container instead of two smaller ones. Buy products that do more than one thing—for example, shampoos that include conditioners.

Buy concentrated products or compact packages, such as frozen juices, fabric softeners, and cleaners you mix with water at home.

Look for products with minimal packaging. You will be using fewer natural resources, and you'll have less to throw away.

Leave grass clippings on the ground instead of bagging them when you mow your lawn. Grass clippings decompose quickly, adding nutrients to the soil.

Discussion Question

1. Why do you think the cafeteria uses small drink containers instead of large ones? (more sanitary, easier)

Activity

Make a list of times when small packages are a good idea. (traveling, lunch boxes, games)



Reuse



Reuse things instead of throwing them away.



Reuse

TEACHER

Reuse

Buy reusable products such as rechargeable batteries.

Pass on magazines, catalogs, and books to neighbors, hospitals, libraries, schools, and nursing homes.

Reuse plastic or glass containers for storage of food or other household items.

Reuse shopping bags, boxes, and lumber.

Reuse wrapping paper, gift bags, and bows. Use the Sunday comics for wrapping birthday presents.

Discussion Questions

1. What kinds of things do you reuse at home?
2. What things could we reuse in the classroom?

Activity

Make an art project using things that would otherwise be thrown away.



Repair or Repurpose



Repair or donate things
instead of throwing them
away.



Repair or Repurpose

TEACHER

Repair

Try to repair before you consider replacement of lawn mowers, tools, vacuum cleaners, and TVs. Maybe an item can be used for something else if it is broken.

Donate items you can't repair to local charities or vocational schools.

Keep appliances in good working order. Properly maintained appliances are less likely to wear out or break and will not have to be replaced as frequently.

Discussion Questions

1. Give an example of something your family repaired when it broke.
2. What kinds of things do people usually get fixed when they break? (Expensive items—television, washer, dryer, refrigerator, air conditioner, furnace, car)

Activities

- Make a list of things in the classroom that would be fixed if they broke.
- Make a list of things that would be thrown away.



Compost



Compost food and yard waste instead of throwing them away.



Compost

TEACHER

Compost

Recycling the leftovers of living things like grass, leaves, and food is called composting. Composting turns these wastes into humus (hyoo' mas). Humus can be used to mulch around plants or be mixed into the soil to add nutrients, help it hold water, and keep it loose and crumbly.

The waste of all living matter decays in time. You've all seen food in the refrigerator with mold growing on it. That's decay. You may have even slipped on the black, slimy leaves in the woods after a long winter, or picked up a huge stick that crumbled in your hands. That's decay, too. Decay is caused by bacteria feeding on dead matter and breaking it down.

Composting speeds up the natural decay of yard wastes and food scraps to make humus. All you need is the right mixture of waste, water, soil, and air. If the mixture is right, billions of bacteria will break down the waste in a very short time, usually six weeks to three months. This fast decay produces a lot of heat—the inside of a good compost pile can reach 140-160 degrees Fahrenheit.

If the mixture doesn't have enough air (oxygen), it will rot instead of decay. Different kinds of bacteria will be at work, ones that don't need oxygen. They will break down the waste, but it will take much longer and it might smell bad. Many of the nutrients will be lost and the humus won't be as good for the soil. A rotting pile doesn't produce heat like a compost pile does. Too much (or too little) water can also slow down the decay. A good compost pile should be damp, but not soggy. Bacteria need water to do their work, but you don't want to drown them. You can even purchase compost bins that help the process and allow you to contain the waste.

Before you put sticks, bushes, and tree limbs into a compost pile, you must cut them into small pieces. There are machines called chippers to do this. If the pieces of wood are too big, they will take longer to decay. Meat, bones, dairy products, and grease should not be put in a compost pile. They will have a bad smell and attract wild animals and flies. Other kitchen scraps are good for the pile and will help it decay faster. The best compost piles have a mixture of food wastes, grass, wood pieces, and leaves.

Discussion Questions

1. Do you compost at home?
2. Does the school compost?
3. Does your community compost?

Activity

Start a school compost pile. Use the humus to nourish the school's flower beds or start a vegetable garden.



Recycle



Recycle everything you can.



Recycle

TEACHER

What is Recycling?

Recycling means to use something again. Newspapers are used to make new newspapers. Aluminum cans are used to make new aluminum cans. Glass jars are used to make new glass jars. There are many reasons why recycling makes sense.

Recycling saves landfill space. Americans make more trash each year. Most of the trash is buried in landfills. Recycling is one way to reduce the amount of trash that is buried.

Recycling saves money. Getting rid of trash isn't free. Garbage trucks must pay to dump their loads at landfills. Recycling reduces landfill costs because less waste is buried.

Recycling saves energy. It almost always takes less energy to make a product from recycled materials than it does to make it from new materials. Recycling aluminum cans, for example, uses 95 percent less energy than making aluminum cans from new materials. One exception to the rule is plastics. Sometimes it takes more energy to recycle plastics than it does to use new materials.

Recycling saves natural resources. Natural resources are valuable. Natural resources include land, plants, minerals, and water. By using materials more than once, we conserve natural resources. In the case of paper, recycling saves trees, water, and energy. Preventing one ton of paper waste can save 15-17 mature trees. Recycling a ton of paper saves 7,000 gallons of water.

Recycling reduces air and water pollution. Using old cans instead of raw materials to make new aluminum cans reduces air and water pollution by 95 percent.

Discussion Questions

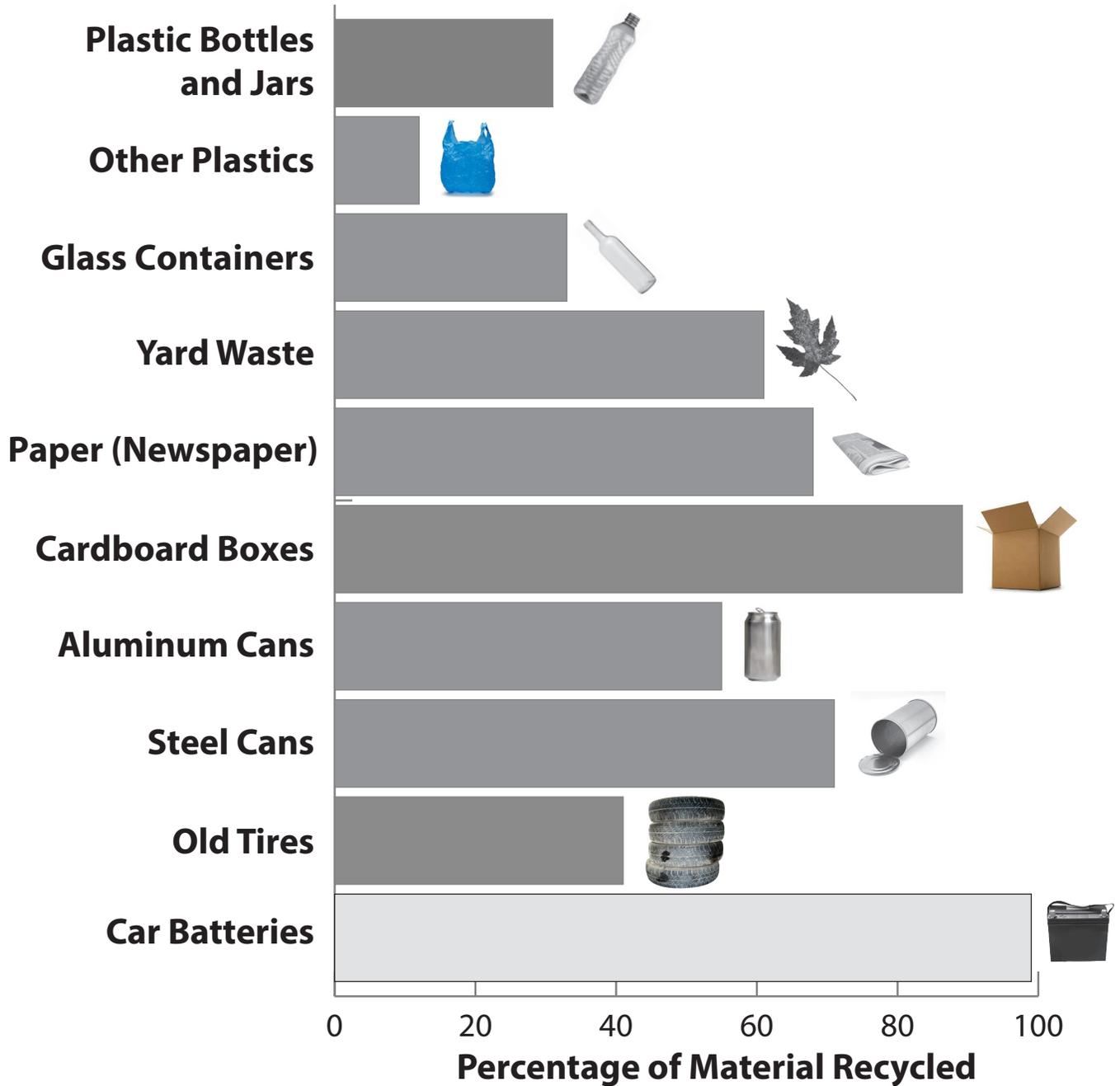
1. Do you recycle at home? What kinds of things do you recycle?
2. Do you recycle at school?

Activity

Make a poster or write a song to remind people to recycle at home and at school.



Things We Recycle



Data: Environmental Protection Agency



Things We Recycle

TEACHER

Discussion Questions

1. Why do you think we recycle so many car batteries and so few old tires?

(Service stations are required by law to recycle batteries. Lots of people change their own tires, so they don't have a simple way to recycle them. You can't put them in your recycling bin.)

2. Why are so few glass containers recycled?

(In many places, people must clean and sort glass by color. When people have to do work to recycle, they don't recycle as much.)

3. Why is so little plastic recycled?

(Sometimes it costs too much for plastics to be recycled and used in the creation of new materials.)

Activity

With the help of adults, have the students count the number of aluminum, steel, glass, and plastic containers thrown away in a week at their homes. Have them count how many could have been recycled. Or, if students are good recyclers, have them make a list of the items they recycle with a tally.



Recycling Glass

YES



We can recycle some kinds of glass.



Recycling Glass

TEACHER

Recycling Glass

Glass is used to package many foods: juices, jellies, baby food, and more. Glass makes up about four percent of all trash, and five percent of the waste in a landfill. The best way to deal with glass trash is to recycle it.

Burning glass in waste-to-energy plants is not a good choice. Glass does not provide any heat energy. Burying glass recovers none of its value either. So, recycling is usually the best choice.

Recycling glass is a good energy saver. Using recycled glass to make new products uses less energy than making it from new materials. It saves energy because crushed glass melts at a lower temperature than the raw materials used to make glass. New glass is made from sand, soda ash, and limestone.

Old glass is easily made into new glass jars and bottles. Glass jars and bottles can be recycled over and over again. The glass doesn't wear out.

Discussion Questions

1. Do you recycle glass at home?
2. Does the school recycle glass?



Recycling Glass

NO



Some glass cannot be recycled.



Recycling Glass

TEACHER

How to Recycle Glass

Preparing glass containers for recycling is easy. All you need to do is remove the lids or caps and rinse the containers in water. You don't need to scrub off the labels, since they will burn up when the glass is melted.

Recyclers sort glass containers by color—clear, green, and amber (golden brown). Once glass has been colored, the color cannot be removed. That means a maker of clear glass jars cannot use colored glass.

You cannot recycle all glass products. Light bulbs, ceramics, mirrors, windows, and dishes are not made with the same materials as glass jars and bottles. Still, it's the containers that we throw away every day, not the light bulbs and dishes, that make up most of our trash.

Discussion Questions

1. What glass objects in the classroom could be recycled?
2. What glass objects could not be recycled?

Activity

Make an exhibit of glass objects that can and cannot be recycled.



Recycling Paper

EASY



We can easily recycle some kinds of paper.



Recycling Paper

TEACHER

Recycling Paper

What is the number one material in trash? Look around your classroom. What do you see? Posters? Notebooks? Cardboard boxes? Textbooks? Bulletin boards decorated with construction paper? You get the picture. Paper is everywhere!

Paper is the number one material that we throw away. Of every 100 pounds of trash we throw away, 27 pounds is paper. Paper and paper products are 14% of all the trash sent to landfills.

There are many kinds of paper. It can be glossy or ragged, thin or thick. It can be for newspapers or stuffing diapers. Most paper products are made from trees, though paper can also be made from old cloth or grass.

According to the American Forest and Paper Association, nearly 80 percent of America's paper mills are designed to use paper collected in recycling programs. They depend on paper recycling to supply the raw materials they need to make new paper. Manufacturing new paper products from recycled paper uses 40 percent less energy than making paper from new wood pulp.

How Paper is Made

Papermaking uses a renewable resource—trees! The first step is cutting down the trees. Paper companies plant trees just for papermaking, like an apple farmer plants apple trees. If one tree is cut down, another is planted.

After the trees are cut, they are taken to a paper mill. Paper mills use every part of the tree, so nothing is wasted. The bark and roots are burned and used for energy to run the paper mill.

The rest of the tree is chopped into small chips to be made into paper. The raw paper is the color of grocery bags. Good papers are whitened with bleach and sometimes coated with clay to make them shiny.

Pulp, paper, and wood product mills need a lot of energy to make paper. They generate, on average, 65 percent of their average needs on site by burning wood scraps they cannot use to make paper. They buy the rest of the energy they need. Papermills also use many gallons of water to make paper.

Discussion Questions

1. Do you recycle paper at home?
2. Does the school recycle paper?

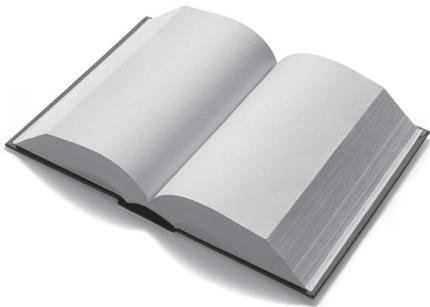
Activity

Make recycled paper. Try different types of paper as the feedstock.



Recycling Paper

DIFFICULT



Paper with glue or wax is harder to recycle.



Recycling Paper

TEACHER

Recycled Paper

Recycled paper is made from waste paper, usually mixed with new materials. Almost all paper can be recycled today, but some types are harder to recycle than others. Papers that have wax, paste, or gum—or papers that are coated with plastic or aluminum foil—are often not recycled because the process is too expensive.

Even papers that are recycled are not usually recycled together. Waste papers must be sorted. Newspapers and cardboard boxes can't be mixed together for recycling. Today, about 65 percent of new paper and 90 percent of cardboard boxes are recycled.

Not Always Recyclable

Paper cannot be recycled over and over again. After a few times, the paper becomes too weak to be used again. That is why new paper fiber is usually mixed with recycled paper. Most cardboard boxes contain at least 35 percent recycled content.

Saving Energy

Paper recycling saves energy. Making recycled paper also uses fewer chemicals and bleaches than making all-new paper. Paper recycling means fewer trees are used to make paper. All-new paper is almost always made from trees grown just for papermaking. A tree harvested for papermaking is soon replaced by another tree, so the cycle continues.

Discussion Questions

1. What kinds of paper in the classroom are easily recycled?
2. What kinds of paper are difficult to recycle?

Activity

Make an exhibit of paper that can and cannot be recycled.



Recycling Aluminum



All aluminum can be recycled.



Recycling Aluminum

TEACHER

Recycling Metals

In the U.S., the metals we recycle are mainly aluminum and steel. Some other metals—like gold, silver, brass, and copper—are so valuable that we rarely throw them away. They do not create a trash problem.

We use a lot of aluminum and steel. Americans use 100 million steel cans and 200 million aluminum cans every day. Recycling is the best way to deal with aluminum and steel waste.

Burning metal trash is not good because metals do not provide any heat energy. Aluminum melts and steel just gets very hot. Burying is usually not a good idea either. Aluminum, especially, is so valuable that it does not make sense to bury it.

Recycling Aluminum

Like most metals, aluminum is an ore. An ore is a mineral that is mined for a valuable material in it. Bauxite, a reddish clay-like ore, is rich in aluminum. To get the aluminum out, though, takes a huge amount of energy.

That is why recycling aluminum makes sense. It saves energy—a lot of energy. Recycling just four aluminum cans saves as much energy as the energy in one cup of gasoline. Companies save energy and money by using recycled aluminum, so they will pay you for your old cans—about a penny for every can.

After you have put your old aluminum cans in a recycling bin, what happens next?

The old aluminum cans are taken to an aluminum plant. The cans are shredded into potato chip sized pieces and put into a furnace. The melted aluminum is made into thin sheets.

The sheets are usually made into new aluminum cans. This is called closed-loop recycling because the old cans are turned into the same thing again. Aluminum cans are recycled into new cans and put back onto store shelves within 60 days!

Aluminum can be recycled over and over again. It does not lose its quality, and recycling it saves money, energy, and natural resources every time.

Discussion Questions

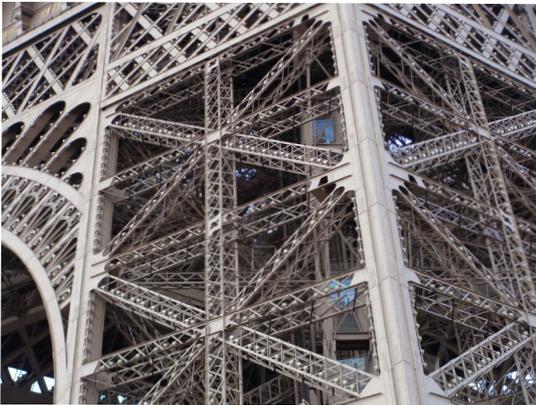
1. Do you recycle aluminum at home?
2. Does the school recycle aluminum?

Activity

Make an exhibit of aluminum items that can be recycled.



Recycling Steel



All steel can be recycled.



Recycling Steel

TEACHER

Steel Recycling

Steel is the most recycled metal. We recycle huge amounts of steel from cars, appliances, old buildings, and bridges. Today, all steel products are made with some recycled steel.

The cans with your soup, your dog's food, and tuna are made of steel. In fact, about 90 percent of all metal food containers are made of steel. You have probably heard people call a steel can a tin can. Steel cans are sometimes called tin cans because the inside is coated with a thin layer of tin. Tin protects the food in the can.

Steel and aluminum are both mined from ores, and are made in a similar way. Steel recycling saves a lot of energy. It takes about 75 percent less energy to make steel from recycled materials than it does from iron ore. That's why today's steel makers always use some steel scrap to make new steel products.

Steel is the easiest material to separate from the rest of the trash. Steel is attracted to magnets. If you're not sure which cans are steel and which are aluminum, use a magnet to separate them. Steel will stick to the magnet; aluminum will not. Recycling your used steel cans at home is easy, too. All you need to do is rinse the food from the cans. That's it.

Steel can recycling is like aluminum can recycling. Steel is melted in a furnace and then flattened into sheets. Recycled steel cans can be made into new cars, girders for buildings, or new food cans. Like aluminum, steel can also be recycled again and again. It does not lose any of its strength or quality in the recycling process. It can be a never-ending process that continues to save energy and resources.

Discussion Questions

1. Do you recycle steel at home?
2. Does the school recycle steel?

Activities

- Make an exhibit of steel items that can be recycled.
- Use a magnet to determine whether metals are aluminum or steel.



Recycling Plastics



There are many kinds of plastics.



Recycling Plastics

TEACHER

Plastics Recycling

We use plastic products more all the time. We cover our food in plastic wrap, drink hot chocolate from Styrofoam® cups, wear clothes made from nylon, polyester, and rayon, and even buy our plastic things with plastic credit cards! We use plastic hundreds of times every day.

The basic raw materials for plastic are petroleum and/or natural gas. These fossil fuels are sometimes combined with other elements, such as oxygen or chlorine, to make different types of plastic. Plastic can be soft or hard, clear or colored. It can look like leather, wood, or silk. It can be made into toys or heart valves. There are more than 10,000 different kinds of plastics.

Plastics are energy efficient. It takes less energy to make a plastic ketchup bottle than a glass ketchup bottle. And since plastics are lightweight, it takes less energy to ship a truckload of plastic bottles than a truckload of glass bottles.

Disposing of Plastic

Is plastic trash choking the Earth with Styrofoam® cups and fast-food plates? Not really. Plastics make up about 13 percent of America's trash. Plastics are generally very lightweight. They make up 18% of everything buried in a landfill.

Burying plastics is not always the best thing to do. There are other choices—recycling and burning. Recycling recovers the raw material, which can be used to make new plastic products. Burning recovers the energy, which can be used to make electricity. Burying plastics does neither of these things. The value of the plastic is buried forever.

Discussion Questions

1. Do you recycle plastics at home?
2. Does the school recycle plastics?



Recycling Plastics



PET Two-liter beverage bottles



HDPE Trash Bags



PVC Packing around meat



LDPE Food bags



PP Straws



PS Hot beverage cups



Other Mixed plastics



Some plastics can be recycled. They are coded with numbers 1 - 7.



Recycling Plastics

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Recycling Plastics

Recycling plastics is easy. You need to know what types of plastics can be recycled. Every plastic container has a code on it to tell you what kind it is. Plastics are made of different materials and should be sorted before they are recycled. Mixed plastics can be recycled, but they are not as valuable as sorted plastics.

Once you know what kinds of plastics you can recycle, you should rinse the container and squash it. You can leave the paper labels on the containers, but throw away the plastic caps. Plastic caps are made from a different plastic than the container and cannot be easily recycled.

Energy to Burn

Plastics are made from fossil fuels. Pound for pound, plastics contain as much energy as petroleum or natural gas. That is much more energy than other types of trash. This makes plastic a good fuel for waste-to-energy plants. Waste-to-energy plants turn trash into electricity.

Should we burn or recycle plastics? It depends. Sometimes it takes more energy to recycle plastics than it does to use new materials. In that case, it's better to burn the plastics at a waste-to-energy plant than to recycle them.

Discussion Question

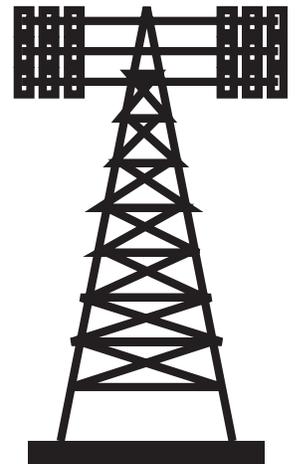
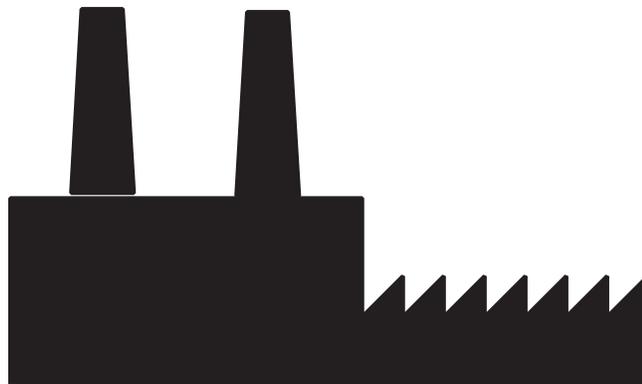
1. Have you ever noticed the triangles with the numbers on plastic objects?

Activities

- Look at plastic objects in the classroom to see if you can find a recycle code, then sort them by code.
- Make an exhibit of plastic items that can be recycled. See if you can find a plastic object with each number from 1 - 7.



Burning Trash



Some trash has energy in it. You can burn it to make electricity.



Burning Trash

TEACHER

Burning Trash For Energy

Some of our trash is full of energy. We can burn it to heat buildings or make electricity. There are roughly 80 waste-to-energy plants in more than 20 states in the United States. We burn about 13 percent of our trash in the U.S.

Waste-to-energy plants make enough electricity for millions of houses. Burning our trash also reduces the amount we have to bury in landfills. Some areas are running out of land for new landfills. And most people don't want landfills near their homes.

Some people worry that burning trash might hurt the environment. Waste-to-energy plants can pollute the air if they are not managed well. People also worry that burning waste will hurt recycling programs. If everyone sends their trash to a waste-to-energy plant, they say, there will be no reason to recycle.

Discussion Questions

1. Do you know anyone who burns their trash?
2. Do you think we should burn trash to make electricity?

Activity

Take a tour or virtual tour of a waste-to-energy plant or recycling center.



Burning Trash

YES



We can burn paper, plastic, yard waste, and tires. They have energy to make heat.



Burning Trash

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Burn or Recycle?

Recycling and burning can work together. It makes good sense to recycle some materials, and better sense to burn others.

Let's look at metals. Aluminum and steel can be recycled over and over. Burning them produces no heat energy. Metals are valuable to recycle and not useful to burn. Glass is another material that should be recycled. Burning glass produces no heat energy.

Paper is made of wood and has energy in it. It can be either burned or recycled. Shiny and colored papers are not easily recycled and should be burned for their energy. Other papers should be recycled if there is a demand for the paper. If there is too much paper, it should be burned.

Plastics are another matter. Because plastics are made from petroleum and natural gas, they are good fuels for waste-to-energy plants. Plastics are not as easy to recycle as steel, aluminum, or paper. Sometimes it costs more to recycle plastic than to make new plastic. In that case, plastic should be burned.

Trash is a mix of energy-rich fuels. In 100 pounds of trash, more than 80 pounds can be burned as fuel to make electricity. Those fuels include paper, plastics, and yard waste. Trash doesn't have as much energy as coal. It takes 2,000 pounds of trash to equal the energy in 500 pounds of coal.

Discussion Activity

Make a chart with the students (see page 49) and have them decide which materials should be recycled or burned to make electricity.



Burning Trash

NO



Don't burn glass, aluminum, or steel.
They don't make heat when burned.



Burning Trash

TEACHER

Activities

Make a chart like the one below to fill in with the students' input.

Make an exhibit of items that should and should not be burned.

Recycle or Burn?

Material	Recycle Value	Heat Value
Metals	Recycling saves money, energy, and natural resources.	Provides no heat when burned.
Glass	Recycling saves money, energy, and natural resources.	Provides no heat when burned.
Paper	Recycling some saves money, energy, and natural resources.	Provides heat when burned.
Plastics	Recycling some saves money, energy, and natural resources.	Provides heat when burned.
Yard Waste	Composting makes good fertilizer.	Provides heat when burned.



Burying Trash in Landfills



Some trash should be buried.



Burying Trash in Landfills

TEACHER

Yesterday and Today

For hundreds of years, people used dumps to get rid of their trash. The dump was just a pit or field outside of town where people left their trash.

People tossed all sorts of waste into these dumps. The dumps were breeding grounds for flies, mosquitoes, and rats. Rainwater washed filthy, and sometimes poisonous, liquids from the dump into streams and groundwater supplies that people used for drinking, bathing, and clothes washing.

Today, we still bury our trash, but not in the open dumps of yesterday. More than half of our garbage is hauled off in garbage trucks and put into landfills. Landfills are America's number one way of getting rid of trash.

Building new landfills is hard because people don't want trash buried near them. It is expensive, too. A new landfill can cost \$10 million to build.

There will always be a need for landfills. Why? Because not all waste can be recycled or burned. How do you recycle a broken light bulb, and why burn it if it doesn't provide any energy?

Landfill burial is the only good way to dispose of some types of waste. Sometimes it's the safest way, too. The best way of taking care of some dangerous wastes—old medicines, paints, pesticides, and other chemicals—are landfills. The landfills are made to keep dangerous wastes from seeping into underground water supplies. Many items like paints and pesticides shouldn't be placed in the trash, but taken to special facilities for disposal.

Discussion Question

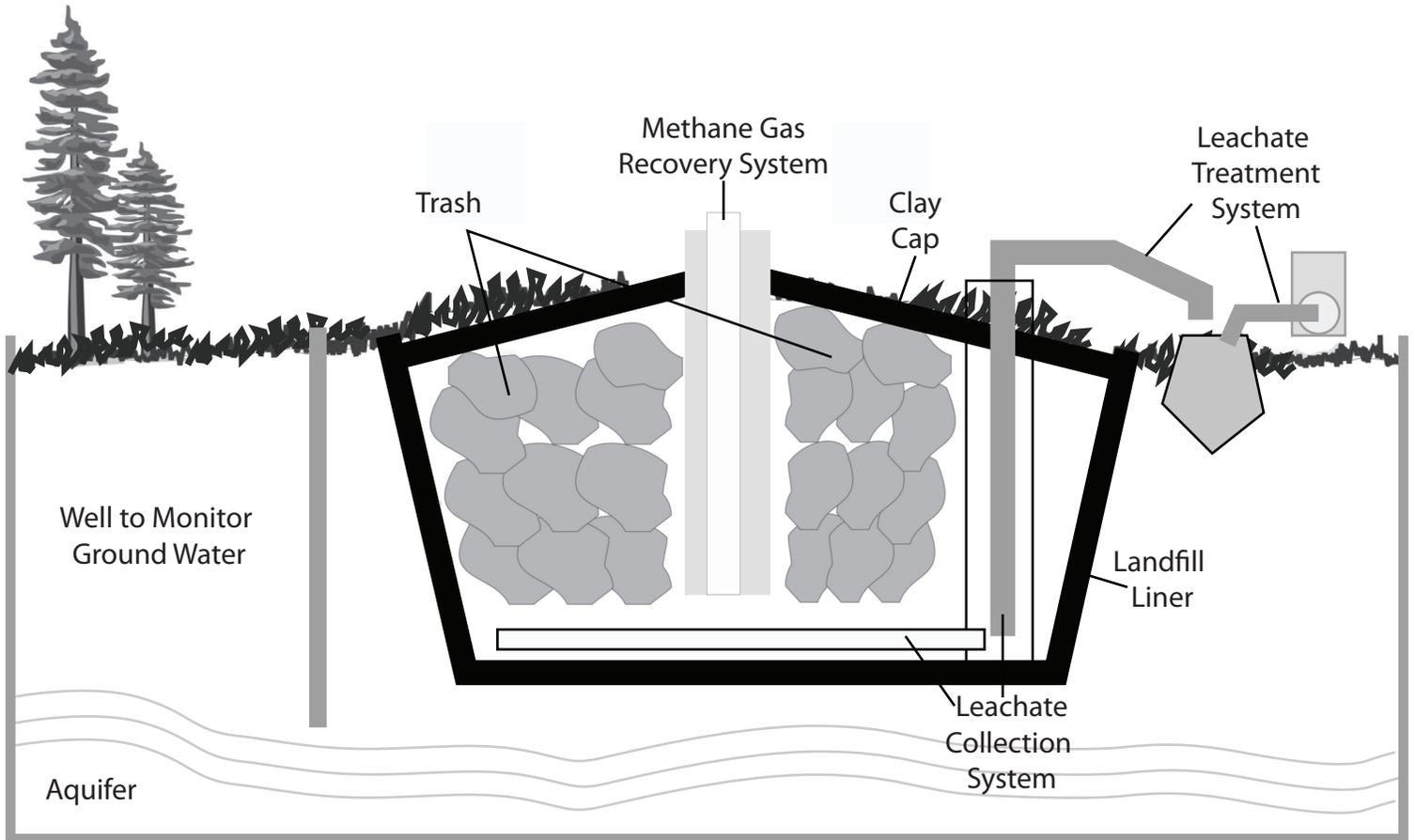
1. Would you like to live near a landfill?

Activities

- Look for things in the classroom that should be buried in a landfill.
- Make a poster or exhibit of things that should be buried in a landfill.
- Take a tour of a landfill.



Burying Trash in Landfills



We bury half of our trash in landfills.



Burying Trash in Landfills

TEACHER

A Modern Landfill

Today's landfills are very different from the dumps of the past. The landfills are lined with layers of clay or plastic to keep any liquid waste from escaping into the soil.

A network of drains collects the liquid (called leachate) and pumps it to the surface where it can be treated. Wells are drilled around the landfill to check the groundwater and make sure it is clean.

At the end of each day, workers spread a layer of earth—called the daily cover—over the trash to reduce odor and control pests. The workers seal each section of the landfill when it is full with a layer of clay and earth, and then seed the area with native grasses.

A Full Landfill

When a landfill is full, workers seal the landfill with a final cover of clay and dirt. Workers continue to check the wells for years after a landfill is closed to make sure nothing is leaking into the water.

Closed landfills can be turned into parks, parking lots, golf courses, and ski slopes. Building homes and businesses on landfills isn't allowed, though, since it can take many years for the ground to settle.

Discussion Questions

1. Why can't we just throw the trash in a hole and bury it?
2. Have you ever seen a modern landfill?

Activity

- Make a poster or model of a modern landfill with dirt and clay, and other materials. Put colored water into it and see if it keeps the liquid from leaking.
- Complete the *What Should We Do With...* worksheet on page 54.



What Should We Do With...





All About Trash Evaluation Form

State: _____ Grade Level: _____ Number of Students: _____

1. Did you conduct the entire unit? Yes No

2. Were the instructions clear and easy to follow? Yes No

3. Did the activities meet your academic objectives? Yes No

4. Were the activities age appropriate? Yes No

5. Were the allotted times sufficient to conduct the activities? Yes No

6. Were the activities easy to use? Yes No

7. Was the preparation required acceptable for the activities? Yes No

8. Were the students interested and motivated? Yes No

9. Was the energy knowledge content age appropriate? Yes No

10. Would you teach this unit again? Yes No

Please explain any 'no' statement below.

How would you rate the unit overall? excellent good fair poor

How would your students rate the unit overall? excellent good fair poor

What would make the unit more useful to you?

Other Comments:

Please fax or mail to: **The NEED Project**

8408 Kao Circle
Manassas, VA 20110
FAX: 1-800-847-1820



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