# What's In Your Trash?

**Students will discover the hidden energy in what they throw away and what they can do to save that energy.**

**Grade Level:** 4th

**Phenomena:**
**How can we save energy by recycling the things we throw away?**

**Objectives:**
- Students will give specific examples of how they can reduce, reuse, and recycle.
- Students will explain how using the three R's conserves resources and saves energy.
- Students will categorize different items based on how to dispose of them.
- Students will measure energy savings to everyday means of consumptions such as TV hours and hours of light.

**Materials:**
- Staged bags of trash
- Audit record sheets (pg 7)
- Reuse, Reduce, Recycle, Compost, & Trash posters
- Life Cycle of Aluminum Can poster
- Pictures of objects (pgs 8-12)

**Time Considerations:**
Preparations: 30 minutes
Lesson Time: 50-60 minutes
*Activity 1: 10-15 minutes*
*Activity 2: 10-15 minutes*
*Activity 3: 30 minutes*
*Conclusion: 5 minutes*

**Related Lesson Plans:**

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**Next Generation Science Standards**

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

**Science and Engineering Practices: (SEP):**
Constructing explanations and designing solutions.

**Disciplinary Core Ideas:**
Designing solutions to engineering problems.

**Crosscutting Concepts:**
Cause and effect.

**Excellence in Environmental Education Guidelines**

**Strand 1– Questioning, Analysis and interpretation skills A) Questioning**
Learners are able to develop questions that help them learn about their environment.

**E) Organizing information-**
Learners are able to describe data and organize information to search for relationships and patterns concerning environmental topics.

## Background

Everyday objects are produced and used to satisfy consumer demand. In order to make the items we use everyday, we need to use resources. In addition to the natural resources like minerals and plant products, energy is needed. Energy is used at every step of the production, distribution, and use of the product. With an increasing demand for energy, we need to consider ways to reduce the energy we consume.

Typical ways to save energy include converting to CFL light bulbs, installing solar panels and other energy efficient appliances. There is another way that we can save energy that not many people think about: Recycling! In order to consider the impact of recycling on conserving energy, we must examine what we throw away every day.

Sorting and counting the things you throw away is called a waste audit. From your results, you can determine the energy savings you could create by recycling. It is important to note that the energy saved is not at your house or office, but at the very beginning of the production cycle. The savings are still real, even

though you may not see it in your energy bill.

The concept of recycling is typically introduced with the


Fig. 1—The 3 Rs
http:hillsidemommy.blogspot.com/2012/07/how-to-make-your-home-greener.html

three R's or reduce, reuse, recycle. It is important to understand the distinction between recycling and the other two R's. Reduce means that you are working to minimize how much you use in the first place. Examples of reducing are buying one big bag of chips instead of a pack of smaller bags, using one paper towel instead of two, buying a liter of soda instead of 12 cans. These are decisions that must be made at the point of purchase.

Reusing is the idea that something made for one purpose can be used for another. For example, using a milk carton for a plant container, filling up a water bottle again, using cardboard for a craft project, or a glass jar for a cup. The number of ways to reuse products can be infinite. This is a decision made after the use of the product. And finally, recycling is disposing of a product properly so that it goes back into the production cycle, in turn reducing energy and resources used. This action is performed at the time the product is being disposed of.

Along with the three R's, there are two more ways to dispose of what we use, compost and trash. Composting is the decomposition of plant material into soil. This is a great way to recycle the nutrients back into your garden. Trash is the most common method of disposal. When you throw something away, it goes to the landfill. This last way is the most inefficient and leads to the need for more resources and energy.

Recycling (meaning all 3 R's) can reduce energy in several ways. When a product is recycled, it goes back into the production line. For example, the resources that are in an aluminum can do not have to be mined or harvested. That saves energy and resources in the mining/harvesting process as well as the production step. It takes less energy to produce an aluminum can from a recycled one than it does to produce it from raw materials.

The main benefit from recycling comes from changing the production line into a production cycle, where the resources continue to be used instead of disposed of in a land fill. This saves energy and resources. We can observe these effects by monitoring our waste.

## Preparation

To prepare for this lesson you will need to prepare bags of "trash" for students to sort. It is important that you don't just use a bag of trash because of the potential for finding hazardous items. Stage your trash bags by collecting recycled items, clean trash, and some compost items (compost in a Ziploc bag.). Make sure there are roughly the same amount of each item in the bag. Include things like soda cans, glass jars, cereal boxes, cardboard, plastic bottles, etc.

Print out the audit sheets for each group to record their findings.

Before the lesson starts, set up the four posters around the room: Trash, Compost, Reduce, Reuse, Recycle.

## Doing the Activity

***Activity 1:***
***Energy Question***
***Viewpoints on a Line***

Tell students you will be doing an activity that involves standing on an invisible line between two points. One end represents the number "0" and the other end represents the number "10"

Instruct students that they are to stand on a point or between the two points based on their answer to a question. The number"10" is "agree" and the number "0" is "disagree".

Pose a sample question to students to demonstrate how the activity works.

Instruct students to think about their answer before moving to a point on the line.

Before students answer, first have them explain what energy is and come up with a definition for the class. Restate the first question again and discuss answers.

Ask the question: "Does trash have anything to do with energy?"

Tell students that today they are going to be investigating how our trash is related to energy. First, however, we are going to take a look at all the options we have when we are done using an object.

Have students move to a point on the line.

Ask students to make a note of where everyone else is and tell them we will come back to this activity at the end of class.

### *Activity 2: Human Recycling*

Direct students attention to the signs you have posted around the room. Explain each one before starting the activity.

Point out that there is a difference between reducing, reusing, and recycling materials.
**Reduce**– use less of (ex. less paper towels to clean up a spill, buying a big bag of chips instead of a bunch of little snack bags)
**Reuse**– keeping an object and using it for a different purpose (ex. using old food for compost, using a glass jar as a vase)
**Recycle**– having a recycling company take the object and turning it into something else (ex. putting a plastic bottle in a recycling bin)

**Compost-** Using decayed organic material as a plant fertilizer. (ex. Food scraps, grass clippings, leaves).

Tell students that you will hold up a picture of an object and they must decide how to correctly dispose of it by standing near the correct poster.

Once students move to the poster, give them about 30 seconds to discuss their choice with their table. Then ask for volunteers to share with the class why they chose that object to be disposed of in that particular way.

After students give their explanation, allow other students to move around the room if they have changed their mind with what they would do with the item.

After going through each item, have students return to their seats.

Ask students if there was a definite "right" answer for each object. The answer is no! There are many different ways of using and/or disposing of waste objects and it is a personal decision that not everybody has to agree on.

For example, one student may have decided to reuse a plastic water bottle by refilling it, while another student chose to reduce them by having a long lasting refillable water bottle. And someone else may have decided to recycle it.

Ask students if they think treasure has value? Why or why not?

Tell students trash has value as well and inform them they are going to do an activity to figure out what value trash has.

### *Activity 3: Waste Audit*

Tell students that today we are going to conduct a waste audit, which is a scientific survey of what's in our trash. Explain these trash bags have been made with "clean" trash so there won't be anything surprising and there is no need to wear gloves. in order for us to determine the value of trash, we have to know what is in our trash. Because of this, we are going to conduct a scientific survey called an "Audit".

Go over the audit sheets and explain how to perform the calculations.

Ask the students to sort the trash into three piles: trash, compost, and recycle (stress that reduce and reuse are included in the recycle pile for this audit).

Divide students into groups of four, hand them an audit sheet, and place them around the room.

Give students a few minutes to sort the trash. Have them count each item and fill in the formulas to determine how much energy was saved in terms of light and TV hours.

If some groups end up finishing before other groups you can have them turn their worksheets over and divide up their recycling pile into reduce, reuse, and recycle. Have students write objects in separate reduce, reuse, recycle list and their reasoning for each.

Once all groups have finished, tally up class totals of energy saved for glass, aluminum, and plastic.

Bring the discussion back to the value of recycling and talk about how much energy was saved by recycling these everyday items.

Mention the three R's and how it includes three parts: reduce, reuse, and recycle, not just recycle.

Review some ways to reduce and reuse some everyday items with the class.

If there is some extra time mention some true/false facts about recycling. There are some examples on page 12, but any relevant facts will suffice.

Show the class a poster of the Life Cycle of an Aluminum Can to show the amount of time and energy saved by recycling the can.

## Conclusion

Go back to opening activity and pose the same question to students.

See if students have different responses. Ask why they changed their answer?

Recycling can help save energy. When you recycle you are reusing something that has already been made so it takes up less energy to turn it into something else versus starting from scratch.

## Assessment

Assess students on their ability to correctly sort staged trash bags.

Assess students based on responses to review questions.

## Extensions

**Life of an Aluminum Can**

Have students research the production process of an aluminum can starting from the mining of aluminum ore, bauxite, and finishing with the enjoyment of a nice cold beverage at your house on a hot afternoon.


Students sorting trash and completing Waste Audit Activity
Photo By: NOS

Have students display their research on a storyboard, recreating the life and production of an aluminum can.

Have students write a paragraph about how recycling helps conserve natural resources and reduces energy expenditures by putting the aluminum can back into the production cycle.

Asses students on their ability to conduct research, display results, and draw conclusions about how recycling helps conserve resources.

Illustrate ideas on how to reuse items by making crafts from recycled items.

Have students talk to younger students about recycling.

Start a class recycling program. Get other classes involved.

## Vocabulary

**Compost**: The decomposition of organic yard and kitchen waste into nutrient rich soil.

**Recycle**: Disposing of trash so that it goes back into the production system instead of a landfill.

**Reduce**: Conserving resources from buying in bulk, reduced packaging and generally using less.

**Reuse:** Using a product for a use it wasn't intended for to reduce waste.

**Trash**: What we throw away that ends up in the land fill.

**Waste audit**: Examining, sorting and counting the trash you throw away to determine its potential value.

## Sources


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**Images:**

Fig. 1. The 3 Rs http:hillsidemommy.blogspot.com/2012/07/

# RECYCLING FACTS (TRUE/FALSE)

1. 40% of what we throw away can be recycled…**FALSE** (80%)

2. 60% of what can be recycled is actually recycled…**FALSE** (28%)

3. It takes 1 million years for a glass bottle to decompose…**TRUE**

4. It takes about 9 months for a recycled aluminum can to be back on a store shelf as a new one…**FALSE** (2 months)

5. 20 aluminum cans can be made from recycled aluminum with the same amount of energy it takes to make 1 new can…**TRUE**

6. If all aluminum cans were recycled for one year it would save enough energy to light up Washington D.C. for 5 months…**FALSE** (3.7 years)

7. It is very important to recycle pizza boxes. FALSE (Pizza is very greasy and it will not be recycled)

8. Most trash in the ocean comes from people throwing it directly into the ocean FALSE (80% of trash that enters the ocean was ground litter that was washed into a storm drain or river.)

9. Americans generate less trash during the holiday season than any other time of the year. FALSE (Americans generate 25% more (

# Waste Audit Record Sheet

**Name:** _____ **Date:** _____

**Step 1: Sort the trash bag into 3 groups: Trash, Recycling, and Compost (anything that can be Reduced, Reused, Recycled or Composted)**

**Step 2: Count and record your trash and recycling items.**

| **Group Totals:** | **Class Totals:** |
|---|---|
| Trash: _____ | Trash: _____ |
| Recycling: _____ | Recycling: _____ |
| Compost: _____ | Compost: _____ |

**Step 3: Calculate your energy savings.**

**Aluminum:** Recycling 1 aluminum can saves enough energy to power a TV for 3 hours.

# of aluminum cans: _____ X 3 = _____ hours of TV energy saved

**Plastic:** Recycling 1 plastic container saves enough energy to power a light bulb for 6 hours.

# of plastic containers: _____ X 6 = _____ hours of Light energy saved

**Glass:** Recycling 1 glass container saves enough energy to power a light bulb for 4 hours.

# of glass containers: _____ X 4 = _____ hours of Light energy saved

**Total class Energy Savings**

**Aluminum:** _____ Total hours of TV energy saved


# Tire

# Water Bottle

# Glass Jar

# Paper Towels

# Fruit