

(pre-tour)
**CLASS WASTE
AUDIT**

CONCEPTS:

Students will learn:

- what types of waste are generated in the classroom
- how reducing waste saves money, energy, and the environment
- how to decrease the amount of classroom waste through reducing, reusing, and recycling



Activity Overview:

Students will:

- categorize the waste from their classroom by type of material from which products were made, and analyze each category by weight, volume, number of items, and types of items
- calculate the percent of waste by type of material
- determine how much waste is generated by the class in one week, one month, and one year
- plan ways to reduce the amount of waste the class generates

Vocabulary:

- compost
- natural resources
- pollution
- solid waste
- source reduction

Time Requirement:

- Approximately 5-10 minutes a day for one week to seal and label garbage bags
- Approximately 60-90 minutes to analyze trash and discuss results

Materials:

- Large plastic garbage bags (transparent, if possible) to store daily trash
- Plastic grocery bags for students to carry their trash
- Ziplock bags for students to seal food waste
- Grocery-size paper bags in which the waste can be separated
- Washable plastic or cloth tarp on which to separate waste
- Kitchen gloves for students
- A scale for weighing waste material
- Transparency of the “Class Waste Analysis”

Preparation:

- Read the “Background Information” at the end of this lesson.
- Ask the custodian not to throw out the garbage bags in your class for one week (or for 2 days or 3 days or whatever amount of time you choose).
- Inform the administrative staff (and perhaps other teachers) of this activity.
- Post a notice in your classroom about the project.
- Find out which materials are recycled in your community (or have students research this information) by contacting your city’s or county’s solid waste department or by visiting www.earth911.org.
- Make a transparency of the “Class Waste Analysis.”

PROCEDURES

I. COLLECT WASTE FOR ABOUT ONE WEEK

(approximately 10-15 minutes)

(**Note:** Be sure that you have:

- asked the custodian not to empty the garbage bags in your class
- informed the administrative staff and, perhaps, other teachers, especially if students will be carrying their trash around with them
- posted a notice about the project in your classroom to remind the custodian and other staff.)

A. Ask students the following questions. Record their answers to compare with findings after conducting the waste audit.

1. How many times do you think you drop something in the trash can at school each day?
2. How much waste do you think you generate in one school day? How many pieces of trash (e.g., sheets of paper, soda cans)? How much weight?
3. How much waste do you think we would have in the classroom after one week if we collected all the items you throw in the trash at school?

B. Tell students that for one week (or 2 days, or 3 days, or whatever time period you choose) they will be collecting all the trash they throw away at school. Explain that they will be doing an analysis to see what they throw away and how much they throw away.

C. Explain the following procedures to your students.

(**Note:** The procedures for elementary classes, in which students stay in one room, and for middle- and high-school classes, in which students change classrooms, are slightly different.)

1. Students should put everything they throw away all day at school into the specially labeled garbage bags that remain in the classroom. There will be two garbage bags for each day of the project — one bag for food waste and one bag for everything else.
2. When not in the classroom, students will need to carry a grocery bag in which to keep their trash. Since they will be carrying their trash around with them at times and since the trash that is collected in the room will not be taken away for a while, they need to follow some rules:

- Food waste should be sealed into a ziplock plastic bag.
- Food containers jars, cans, cartons – should be rinsed out.
- No hazardous items should be put into the trash.
- No private notes or anything else that shouldn't be read by others should be put into their trash.

3. For elementary classes: If students arrive before school begins and participate in activities that generate trash (e.g., breakfast), they should come to the classroom to pick up a grocery bag and ziplock bag in which to collect and carry their trash. After recess and lunch breaks, students' individual trash bags should be emptied into the large daily garbage bags in the classroom – food in one bag; all other waste in the other.

For middle- and high-school classes: At the beginning of each day, students should come to the class to pick up a grocery bag and ziplock bag in which to collect and carry their trash. At various times during the day and especially at the end of the school day before students go home, their individual trash bags should be emptied into the large daily garbage bags in the classroom – food in one bag; all other waste in the other.

(**Note:** If the waste audit is being conducted by several different classes, make sure the each class has its own garbage bags.)

4. Assign teams of students to seal and date the garbage bags at the end of each day.

D. Emphasize to students that ALL of the trash that they generate at school (except for the items noted above) should be put into the garbage bags in the classroom.

II. ANALYZE TRASH

(approximately 35-45 minutes)

- A.** At the end of the trash collection period, before analyzing the trash in all the garbage bags, ask students the following questions:
1. How did you feel about carrying your trash around with you?
 2. Were you surprised by the weight and/or volume of the garbage you collected?
 3. Did you change any of your habits because of this activity?
- B.** Arrange the garbage bags chronologically by the days they were collected. Have students look at the bags of trash in the classroom and note any differences. For example:
- Was less trash generated as the week progressed? Why?
 - Is there more trash on some days? Why?
 - Is the trash different from day to day, perhaps more food on some days, more paper on other days? Why?
- C.** Spread a plastic or cloth tarp on the classroom floor and empty the garbage bags **not** containing food waste onto the tarp. Tell students that they are going to analyze the waste that they have generated.
- D.** Project the “Class Waste Analysis” and tell students that they are to separate the waste into these categories. Explain that items made of mixed materials – for example, a notebook with a plastic cover, metal rings, and paper sheets – should be classified by the predominant material. Tell them if they are not sure what an item is made from to put it in the “other” pile.

CLASS WASTE ANALYSIS

	PAPER	GLASS	ALUMINUM (CANS)	OTHER METAL	PLASTIC	FOOD	OTHER ITEMS	TOTAL
EXAMPLES OF TYPES OF WASTE								
NUMBER OF PIECES OF WASTE								
PERCENT OF TOTAL NUMBER OF PIECES								
WEIGHT								
PERCENT OF TOTAL WEIGHT								
VOLUME (OR NUMBER OF BAGS OR PORTION OF BAG)								
PERCENT OF TOTAL VOLUME								



- E.** Hand out gloves to students and have them sort the trash, placing items in piles by category.
- F.** To analyze the trash after it has been separated, have students:
1. Record **examples** of the types of trash in each category on the “Class Waste Analysis” projected on the overhead.
 2. Count the **pieces** of trash from each category and record on the “Class Waste Analysis.”
 3. Total the number of pieces of all waste and write this number in the last column on the chart.
 4. Calculate and record the **percent** for each type of waste (i.e., divide the number of a waste items in a category by the total number of pieces of waste).
 5. Place each category of waste into a separate grocery bag or bags, compacting the trash in the bags as much as possible and label the bags according to the type of waste.
 6. Weigh each bag (subtracting the weight of an empty grocery bag). Record the **weight** of each waste category on the chart.
 7. Add up the total weight for all waste and record on the chart.
 8. Calculate the **percent** of each waste type by weight and record.
 9. Determine the **volume** of the waste. Either measure the width, length, and depth of the trash in each category to figure the volume, or (for younger students) approximate what portion of the bag (or how many bags) the waste occupies. Record the results on the chart.
 10. Calculate the **percent** of each waste type by volume and record.

III. DISCUSS RESULTS OF ANALYSIS

(approximately 10-15 minutes)

- A.** Compare the actual waste figures to the students' estimates at the beginning of the lesson. Ask students if any of the results surprise them. Also compare their figures to the statewide figures shown in the background information at the end of the lesson.
- B.** Discuss the "Class Waste Analysis" by asking the following questions:
- 1. What does the chart reveal about our class's waste? Which category contains the most waste by item? by weight? by volume?**
(Paper is usually the top waste item in schools.)
 - 2. Did every piece of waste have to be thrown away? Is there anything that could have been used again?**
(For example, the back side of a sheet of paper could be used as scratch paper; a glass jar could be used as a container for pencils, nails, etc.)
 - 3. Is there any waste that didn't need to be generated?**
(For example, excess packaging, disposable eating utensils, recyclable items.)
 - 4. What clues about our habits does our trash provide?**
(For example, soda cans might indicate what beverages we like to drink; a lot of disposable items might indicate our value for convenience.)
 - 5. What type of trash do you usually throw away at home? How does it differ from school trash?**
(At home, we usually have more food packages and food waste.)
 - 6. What would you do if there was no trash can to throw these items into?**
(Perhaps we would try to create less waste, or perhaps we would litter more.)
- C.** From the figures on the "Class Waste Analysis," have students calculate:
- How much waste, by weight, would their class generate each month? How much in one school year?
- D.** Ask students why generating so much waste is a problem. Discuss:
- If the waste in their classroom is normal, how much waste would be generated by the entire school?
 - the **money** and **energy** it takes to pick up the trash, transport it, and bury it in a landfill
(Several billion dollars are spent each year in the U.S. to manage our solid waste, which includes costs for labor, gasoline, electricity, equipment, land, water, etc.)
 - the **pollution** created by trucks hauling trash
(Truck exhaust emissions include hydrocarbons, nitrogen dioxide, carbon monoxide, and particulate matter – all of which contribute heavily to smog.)
 - the **natural resources** used up
(Everything is made from natural resources: paper comes from trees, metals from mineral ore, plastic from petroleum. When those products are buried in landfills, the natural resources are gone – and some natural resources, such as petroleum, are nonrenewable.)
 - the amount of **land** needed to create sanitary landfills
(In Los Angeles County, our trash every day covers 3 acres of land 20 feet deep. [An acre is about the size of a football field.])



IV. PLAN WAYS TO REDUCE TRASH

(approximately 10-15 minutes)

- A.** Introduce to students the waste management hierarchy listed below. Explain that the list shows priorities for dealing with our waste, based on energy savings and the amount of natural resources conserved.

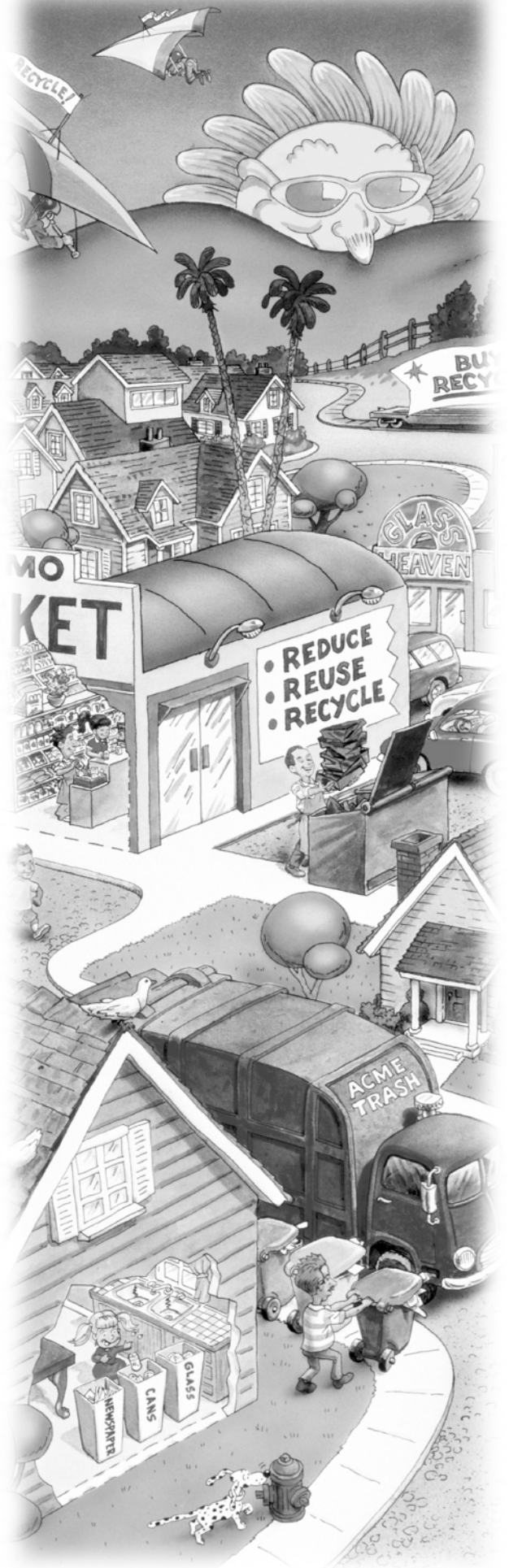
First – Prevent waste (also called source reduction), which means reducing and reusing.

Second – Recycle and compost waste (also includes buying products made from recycled materials).

Third – Dispose of waste either by burying it in landfills or by incinerating it at waste-to-energy generation plants (neither of which should be done at home because of serious pollution problems).

- B.** Have students look at the “Class Waste Analysis” to determine which of the trash items listed could be reduced, reused, or recycled. If it is not known exactly what items are recycled in your community, have students do research either by calling the city’s or county’s solid waste department or by going online (www.earth911.org) to obtain information about the types of materials that are being collected for recycling and the places items can be recycled (curbside, drop-off centers, etc.). Recycle those items that can be.
- C.** Brainstorm a list of trash reduction actions. Ask, for example, what are good ways to save paper? Some ideas include:
- Use both sides of a sheet of paper.
 - Cut up paper used on one side and use it for memos and notes.
 - Make double-sided photocopies whenever possible.
 - Photocopy or print draft documents on the back of paper that has already been used on one side.
 - Save scraps of colored paper for art projects.
 - Use the minimum number of paper towels you need.

(**Note:** Keep the “Class Waste Analysis” chart for Pre-Tour Lesson 2.)



EXTENSIONS

- **Create graphs** to summarize the data on the “Class Waste Analysis.”
- **Apply waste reduction methods.** Have students look at their “Class Waste Analysis” to try to determine how much of the trash could have been kept out of the landfill by reducing, reusing, and recycling.
- **Design and carry out a plan to reduce classroom waste.** Ask for volunteers to monitor the wastebasket. Conduct a class meeting once or twice a month to analyze whether students are continuing to limit the amount of waste that goes into the landfill.
- **Have a waste reduction contest** with other classes to see which class can produce the least amount of waste.
- **Research and write about the garbage found from past civilizations.** Explain that archaeologists study garbage left by people in the past to determine how the people lived, what they ate, and what they valued. Ask students what types of garbage they would expect people who lived in their area 100 years ago to have? 500 years ago? How would the garbage from past civilizations be different from our garbage? What do they think will be different about garbage in the future?
- **Calculate the density of each category of waste** (density = mass [weight] ÷ volume). Which category is the densest? Would the density change from the trash truck to the landfill? What else would affect the density of trash? Why is density important?
- **Analyze variations in people’s solid waste.** For example, have students track and analyze differences according to: seasons, ages of people, rural vs. urban, size of residences, income levels, and so on.
- **Devise a solid waste management plan.** Tell the class that they are the city council members for their town (their class). Explain that all the waste that has been generated during the waste audit project must be disposed of and that the bags of garbage will continue to increase until a plan is developed. Have them brainstorm ideas, listing the costs and benefits of each idea.

BACKGROUND INFORMATION

In Los Angeles County, we generate 36,000 tons of solid waste, or trash, each day. That means each person generates approximately 7 pounds of solid waste each day. In one year, a person fills about 42 large garbage cans with trash – that’s almost a can a week!

Generating so much waste costs all of us money and time, and it has negative effects on the environment. Decreasing how much we throw into the trash every day is something that everyone can do – children and adults – in schools, homes, and businesses.

One of the first steps in reducing how much waste we create is learning how and where the waste is being created. This can be as simple as evaluating daily activities which generate waste to weighing and identifying types of materials that are discarded. A waste audit, like the project in this lesson, allows students to analyze the trash generated in a school. The audit consists of evaluating qualitatively and quantitatively the types of waste and the activities involved in producing the waste.

The audit may also provide insight to starting reduce, reuse, and recycle programs at the school, or even at home and in the community. An assessment of the waste produced at school is often enlightening. Studies have shown that in most schools paper makes up the largest component of waste. Therefore, finding ways to reduce, reuse, and recycle paper in the classroom can greatly lessen the amount of waste that is sent to a landfill. For example, one school district not only reduced its paper trash but also realized cost savings by not purchasing notepads. Teachers and other staff members were quite willing to use pads made from paper used on one side.

In addition, recycling not only will decrease the waste stream but also can be an effective method for schools to save money and earn revenue from the materials recycled. As students reduce, reuse, and recycle, they will be able to see the success of their efforts.

Overall California Waste Composition

<u>Material Type</u>	<u>Percentage of Waste by Weight</u>
Organic (food, leaves, crop remains, textiles, etc.)	35.1
Paper (computer paper, cardboard, bags, newspaper, magazines, etc.)	30.2
Construction & Demolition (concrete, asphalt, lumber, etc.)	11.6
Plastic (HDPE, PETE, plastic wrap, etc.)	8.9
Metal (cans, major appliances, etc.)	6.1
Miscellaneous (ash, tires, sludge, etc.)	5.0
Glass (flat, clear & colored bottles & containers, etc.)	2.8
Household Hazardous Waste (paint, oil, batteries, etc.)	0.3

