Action in the classroom

An Introduction to RECYCLING for South Carolina's Fifth-grade Students

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For additional teaching materials including fact sheets, guides, posters, videos and more, contact DHEC's Office of Solid Waste Reduction and Recycling at **1-800-768-7348** or **visit www.scdhec.gov/recycle**.

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Lesson Correlations

5-3.6 Explain how human activity (including conservation efforts and pollution) has affected the land and the oceans of Earth.

Taxonomy Level: 2-B Understand Conceptual Knowledge

- Recycle – Don't Litter
- Look in Your Garbage Can
- Musical Resources
- My Bag
- Where does the garbage go?

5-4.8 Explain how the mixing and dissolving of foreign substances is related to the pollution of the water, air and soil.

Taxonomy Level: 2.7-B Understand Conceptual Knowledge

- My Bag

About 'Action in the classroom'...

"Action in the classroom" is designed for fifth-grade teachers to introduce recycling and other solid waste management issues in the classroom.

This program is part of "Action for a cleaner tomorrow: A South Carolina Environmental Curriculum Supplement" ("Action"), which is the centerpiece environmental education program offered by the S.C. Department of Health and Environmental Control (DHEC).

"Action in the classroom" provides hands-on lessons, lesson resources (fact sheets for teachers that present more detailed background on issues), student activities and worksheets as well as a glossary. Each of the program's lessons is correlated to the current South Carolina science standards.

The lessons focus on the common methods of waste management including waste reduction (preventing waste in the first place), recycling and disposal (placing waste in landfills or burning in incinerators).

The goals of this program include:

- helping students understand the connection between natural resources and the products they use every day;
- helping students understand that there are preferred options for managing waste and that each of us plays an integral role in deciding which options to choose;
- helping students to think critically of their own actions in conserving natural resources, reducing waste and recycling; and
- helping students recognize the concept of personal responsibility toward the environment and to "take action" to make a positive impact in their home, school and community.

Two of the lessons in "Action in the classroom" have been favorites of teachers since the curriculum supplement was introduced in the early 1990s. "Musical Resources" is a fun, easy-to-use and informative lesson that reminds students of how we use natural resources in the things we buy and use everyday. "My Bag," another favorite, lets students know that many of the items that they throw away could be repaired, reused or recycled.

All of the lessons in this booklet are part of "Action."

"Action" was created in 1992-93 by DHEC in conjunction with a statewide curriculum development team of teachers and the S.C. Department of Education. Currently in its eleventh edition, about 52,000 teachers and other educators have been trained on "Action" since its introduction in 1993. "Action" lessons have been taught in classrooms to thousands of students throughout the state.

"Action" and "Action" workshops are provided at no cost to schools and teachers. For more information about "Action," please contact DHEC's Office of Solid Waste Reduction and Recycling at **1-800-768-7348** or visit **www.scdhec.gov/recycle**.

Action in the classroom

LOOK IN YOUR GARBAGE CAN

PREPARATION TIME: **MODERATE**

Learning Objectives

Students will:

- see what the average family of four throws away every day;
- learn how much Americans throw away and recycle each year; and
- discover what steps can be taken to reduce the amount of garbage a family generates by reusing, recycling and composting.

Background

Let's talk trash. What did you throw away today? An empty cereal box? Your lunch bag? Some papers from school?

Think about it. You probably will be surprised at the amount.

Here are some numbers to consider. In South Carolina every day, each of us generates about 5.0 pounds of **garbage** – also known as **municipal solid waste** (MSW) – in fiscal year (FY) 2011 (July 1, 2010 to June 30, 2011). MSW is simply defined as solid waste that we make in our homes and schools as well as where we work. That's 1,825 pounds for each of us every year and 7,300 pounds for a family of four.

Overall, South Carolinians generated about 4.2 million tons of MSW in FY 2011. Of that amount, nearly 3.1 million tons were disposed of in Class 3 landfills. The remaining 1,172,768 tons were recycled.

Overall, Americans generated about 250 million tons of MSW in 2010 according to the U.S. Environmental Protection Agency (EPA).

The EPA provides a report every other year on what makes up our waste. The waste characterization study breaks down waste by categories such as paper, yard trimmings, food scraps, plastic, metal, rubber, leather and textiles, wood and glass.

While recycling has been an environmental success story in South Carolina, there's still much to do. Most of what is being thrown away can be recycled or composted.

Continued on the following page

Learning Essentials

Focus: Garbage awareness

Subject: Science

Extensions: Math, Social Studies

Materials: Heavy cardboard or construction paper, colored marking pens

Teaching Time: One class period

Vocabulary: Garbage, grasscycling, municipal solid waste

Lesson Resources: "Backyard Composting," "Garbage 101," "Recycling 101"

Learning Procedure

In this activity, students will examine the amount of waste generated nationally, according to weight.

1. Using heavy cardboard, draw an illustration of a garbage can and cut it out. Then cut it into nine pieces. Each piece should be sized according to one of the nine categories of waste including: paper; food scraps; yard trimmings; plastics; metal; rubber, leather and textiles; wood; glass; and miscellaneous. Then label each piece with the MSW category and the percentage of garbage by weight.

2. **Ask:** What is in your garbage can?

3. Place all nine pieces of your version of the garbage can face down on a table. Divide the students into eight groups and have a student from each group choose a piece. (The teacher should keep the Miscellaneous puzzle piece.) Have the student show and read what is on the card and then tape it on the board. As students select pieces they will assemble the garbage can on the board. In the individual groups, have the students research their selected category of waste. Use the following facts as a guide for each selected garbage category. Some discussion questions are included.

   PAPER: About 29.0 percent by weight of everything we generate is paper and paperboard.

   - Paper and paperboard (which includes office paper, newspaper and cardboard boxes) were the No. 1 category of the nation's MSW stream in 2010. Americans generated 71.3 million tons of paper and paperboard before recycling.

   - Paper and paperboard were the top materials recycled by weight in 2010. Nearly 63 percent (44.5 million tons) of paper and paperboard generated were recovered for recycling.

   - About 85 percent of all corrugated cardboard boxes and 71.6 percent of all newspapers, inserts and directories were recycled.

   Ask: What are some things that we throw away that are paper? What are some paper products that can be recycled? What products are made from recycled paper? (Examples include legal pads and notebook paper.) What products are packaged in recycled paper and paperboard? (Look on cereal boxes and other products for the recycling symbol or information about recycled content packaging.)

   FOOD SCRAPS: About 13.9 percent by weight of everything we generate is food scraps.

   - Food scraps (which include uneaten food and food preparation scraps) were the No. 2 category of the nation's MSW stream in 2010. Americans generated 34.76 million tons of food scraps before recycling.

   - About 2.8 percent (970,000 tons) of food scraps generated were composted.

   Ask: Do you compost food scraps at home? Does your school have a composting program for food scraps from its cafeteria? Food scraps that can be composted include fruit and vegetable scraps, coffee grounds and egg shells.

   YARD TRIMMINGS: About 13.4 percent by weight of everything we generate is yard trimmings.

   - Yard trimmings (which includes grass, leaves, tree and brush trimmings) were the No. 3 category of the nation's MSW stream in 2010. Americans generated 33.4 million tons of trimmings before recycling.

   - About 57.5 percent (19.2 million tons) of yard trimmings generated were recovered for recycling.

   Ask: Do you compost at home? Does your school have a composting program. Introduce the term **grasscycling** (leaving grass clippings on the lawn when cutting the grass).

PLASTICS: About 12.4 percent by weight of everything we generate is plastic.

- Plastics (which include soft drink and water bottles, milk jugs and many other products and applications) were the No. 4 category of the nation's MSW stream in 2010. Americans generated 31.04 million tons of plastic before recycling.

- About 8.2 percent of plastics (2.55 million tons) were recycled. While overall recovery of plastics for recycling is small, the recovery of some plastic containers is more significant. About 29 percent of PET bottles and 28 percent of HDPE bottles were recycled.

  Ask: What are some things that are made from plastic? (Many of the things we use each day are made from many different types of plastic including parts of computers and cars, beverage containers, shampoo and ketchup bottles, compact disc cases and trash bags.) Do you recycle your soft drink and water bottles at home and school? Find out the types of plastics that can be recycled in your community. **Ask:** What products are made from recycled plastic? (Clothing and carpet can be made from soft drink and water bottles. Laundry detergent containers, recycling bins, pens and floor tiles can be made from milk, water and juice containers.)

METAL: About 9.0 percent by weight of everything we generate is metal.

- Metal (which include steel and aluminum cans and appliances) was the No. 5 category of the nation's MSW stream in 2010. Americans generated about 22.4 million tons of metal before recycling.

- About 35.1 percent (7.87 million tons) of metal was recycled.

  Ask: Do you recycle aluminum and steel (food) cans at home? Does your school have an aluminum can recycling program? Does your school cafeteria recycle its food cans?

RUBBER, LEATHER AND TEXTILES: About 8.4 percent by weight of everything we generate is rubber, leather and textiles.

- Rubber, leather and textiles (which include tires, clothing) comprised the No. 6 category of the nation's MSW stream in 2010. Americans generated 20.9 million tons of rubber, leather and textiles before recycling.

- About 15 percent (1.1 million tons) of rubber and leather were recovered for recycling. About 15 percent (1.97 million tons) of textiles were recycled.

  Ask: Can tires be recycled? (Yes. In fact, it's the law in South Carolina. They are the No. 1 source of rubber in the nation's MSW stream.) What can be done with old tires? (They can be used for fuel at cement kilns and paper mills. They can be used in road-paving and landscaping applications. In addition, old tires can be used to make running track surfaces and mats that go under playground equipment. This can make a playground or schoolyard a much safer place for children to run and play.)

WOOD: About 6.4 percent by weight of everything we generate is wood.

- Wood (which includes furniture, crates, pallets, etc.) comprised the No. 7 category of the nation's MSW stream in 2010. Americans generated 15.88 million tons of wood before recycling.

- About 14.5 percent (2.3 million tons) of wood was recovered for recycling.

  Ask: What are some sources of wood waste? (Examples include furniture, cabinets for electronic equipment as well as wood

packaging like crates and pallets.) What can be done with furniture instead of throwing it away? (Give it to charity. Sell it at a garage sale.)

GLASS: About 4.6 percent by weight of everything we generate is glass.

- Glass (which includes beverage and food containers, electronics and furniture) comprised the No. 8 category of the nation's MSW stream in 2010. Americans generated 11.53 million tons of glass before recycling.

- About 27.1 percent (3.13 million tons) of glass was recovered for recycling.

  Ask: What happens to most recycled glass bottles? (Most are used to make new glass bottles.) How long can glass bottles be recycled? (Glass can be recycled forever.)

MISCELLANEOUS: Other types of waste make up 3.4 percent by weight of everything we generate. The Miscellaneous category includes any type of waste not mentioned in the previous eight categories.

- In 2010, Americans generated 8.63 million tons of miscellaneous waste.

- About 29.4 percent (1.41 million tons) of miscellaneous waste was recycled.

Questions for the Class

1. List the contents of the average family garbage can.

2. If each person throws away an average of 3.6 pounds of garbage from their household and school every day, how much is each family throwing away each day? Each class?

3. Where does the family garbage go?

4. What are some ways to reduce the amount of garbage being thrown away from each home and school?

Extension Activities

1. South Carolina has both urban and rural areas. How is the trash different in these areas? How is it the same? How is it disposed of differently? Have students research and discuss.

2. Have students become "Garbologists" for a day. Have them investigate the contents of their family garbage can to discover what our trash tells about us. Write a paragraph about what we eat, what we buy and our lifestyle.

MUSICAL RESOURCES

PREPARATION TIME: **MODERATE**

Learning Objectives

Students will:

- identify natural resources; and
- see how natural resources are depleted by the things we buy and use each day.

Background

Natural resources are useful materials from the Earth, such as water, coal, oil, natural gas and trees. **Nonrenewable resources** are those that become depleted more quickly than they naturally regenerate (for example, oil and mineral ore). Once mined and used completely, they are gone forever. **Renewable resources** (for example, trees, fresh water, sun, wind) are those that can be replenished at about the same rate at which they are used. Given the fact that many of our natural resources are **finite**, that is, limited in number, it is important that we reduce our use of these resources to make them last.

People use natural resources as **raw materials** to manufacture or create products and conveniences that we use everyday. Water and food, for example, provide people with nourishment and energy while fossil fuels are used to provide energy for transportation, heating and manufacturing. It also is important to remember that many of the natural resources that people use are important for plants and wildlife to survive as well.

Resources used for the first time are called **virgin materials** and their extraction, processing and use require energy and can create pollution. **Resource recovery** is a practice that conserves natural resources by extracting material (e.g., paper, glass, aluminum and steel) and energy from the waste stream and reprocessing them for reuse.

Recycling saves natural resources like minerals, trees and water. When 1 ton of steel is recycled, about 2,500 pounds of iron ore, 1,400 pounds of coal and 120 pounds of limestone are conserved.

Recycling also reduces or eliminates pollution by lessening the need to extract, move and process raw materials.

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Learning Essentials

Focus: Dwindling natural resources

Subject: Science

Extensions: Language Arts, Music, Physical Education

Materials: Chairs equal to half the number of students, 10 to 15 assorted objects (see the list in the Learning Procedure), index cards, crayons, music and player, a bag

Teaching Time: One class period

Vocabulary: Consumption, finite, natural resources, nonrenewable resources, petroleum, raw materials, renewable resources, resource recovery, virgin materials

Lesson Resources: "Natural Resources"

Manufacturing products from recycled material almost always saves energy. It takes 95 percent less energy to make aluminum from recycled aluminum than it does to make it from the virgin material bauxite. It takes 70 percent less energy to make recycled plastic, 60 percent less energy to make recycled steel, and 40 percent less energy to make recycled newsprint or recycled glass.

There are many ways each of us can conserve resources including reducing our **consumption**, that is reduce what we buy or buy things with less packaging, reuse what we can, compost and recycle as much as possible.

This activity is similar to Musical Chairs. Chairs represent natural resources and, as they are used and depleted, chairs are removed. Everyone, however, remains in the game and more people are added to simulate the growing population. The students must share chairs to demonstrate increasing stress on our diminishing supply of natural resources.

Learning Procedure

1. Arrange the chairs to fill a large circular area representing the Earth. There only should be enough chairs for half the students. To start the game, there will be a chair for each beginning player.

2. Tape an index card with the name of a resource to each chair. See the sample cards included with this lesson. Some resources may have to be used more than once.

3. Tell the students they represent the people of the world and the chairs represent the resources of the Earth.

4. Place 10 to 15 objects in a bag – aluminum can, glass jar, perfume bottle, pencil, plastic bottle, paper clip, leather belt, penny, steel can, sock, etc. Select items that represent a wide variety of natural resources and items that the students can identify with buying and owning.

5. Have half of the students sit in the circle of chairs. Have each student choose an item from the bag representing resources. The other half of the class also should participate in the discussions.

6. Going around the circle, ask each student to name the natural resource and/or raw material used to produce it. NOTE: The students may need help with naming the basic raw materials used. For example, plastic is made from oil (**petroleum**) – a nonrenewable resource.

7. Make a list of the natural resources the students name. Discuss whether they are renewable (cotton, trees) or nonrenewable (aluminum, copper).

8. Tell students sitting in the chairs that they are the people of today's world (the players) and the other half of the class are the people of the future. They will sit out and watch until they are "born" and called upon to play. Give each student in both groups a crayon to use later in the game.

9. When the music plays, the people will walk around in a circle, similar to Musical Chairs. While there are a finite amount of resources, there are plenty of resources for everyone at the beginning of the game. When the music stops, everyone will find a place to sit. At this time, each player is instructed to color one of the little squares on the card where he/she is sitting to represent a portion of the consumption of that particular resource. **Ask:** What resource are you consuming and what is it used to make?

10. When the music begins, the procedure is repeated. Again, instruct the players to find a chair (resource) and color a square when the music stops.

11. Before starting the music a third time, tell the students that there are more and more people being born every day, so add three or four new members to the world's population. Begin the music. This time when the music stops, there will not be enough chairs for each student to have his/her own, so those left without one must find someone who is willing to share his/her chair. Again, each person must color a box on their chair's card. Chairs holding two people will receive two marks on the card. Chairs holding three, three marks and so on. Everyone must be sitting before the music begins again.

12. Repeat the procedure, adding additional players with each new round. WHEN ALL THE SQUARES ON ANY ONE CARD ARE FILLED IN, THE CHAIR IS REMOVED FROM THE EARTH. This is to represent the consumption of that natural resource. Continue this process until almost all the chairs are gone and all the students are balancing several people deep on the remaining chairs.

Extension Activity

Play musical resources again, but this time when a player reaches a chair, give the student the option of stating a way the resource can be recycled or conserved. If the player can think of a way to conserve (not consume) the resource, the box on that turn will not have to be colored.

The game can go on indefinitely when the resources do not have to be consumed. Remind students that even renewable resources need wise conservation.

Questions for the Class

1. What would happen if the game continued and we kept on populating the Earth and consuming our natural resources?

2. Was it sometimes difficult finding someone to share a chair? Do countries have difficulty sharing resources?

3. How did it feel to be crowded on one chair? How did you feel when a resource (chair) was removed?

4. Is there a similar problem on Earth? Are some nations using resources more rapidly than others?

5. How could we preserve our natural resources? What can your school do? Make a list of ways to conserve our resources.

BAUXITE (Aluminum) – NONRENEWABLE

This resource is used to make aluminum products such as cans, siding, automobile parts, window frames, etc.

COPPER – NONRENEWABLE

This resource is used to make electrical wire for homes, factories, businesses, cars, computers, etc.

GOLD – NONRENEWABLE

This resource is used to make jewelry, electrical components, etc.

IRON ORE (Steel) – NONRENEWABLE		

This resource is used to make food cans, cars, construction supplies, bicycles, etc.

WOOD – RENEWABLE			

This resource is used to make paper, books, furniture, construction materials, etc.

PETROLEUM – NONRENEWABLE			

This resource is used to make gasoline, plastic, medicines, polyester and other fabrics, etc.

SAND – NONRENEWABLE				

This resource is used to make glass, construction material, etc.

COTTON – RENEWABLE			

This resource is used to make cotton fabric such as denim, rugs, some papers, etc.

FELDSPAR – NONRENEWABLE				

This resource is used to make glass, insulation material, etc.

TIN – NONRENEWABLE		

This resource is used to make metal alloys, electronics, etc.

SILVER – NONRENEWABLE		

This resource is used to make jewelry, electronics, photographic films, etc.

MATH
HISTORY
SCIENCE

MY BAG

PREPARATION TIME: **MODERATE**

Learning Objective

Students will identify waste that can be recycled, reused, rejected, repaired and composted.

Background

What you call **trash** or garbage, professionals call solid waste. There are different kinds of solid waste, but the most common type measured is municipal solid waste (MSW). What is MSW? MSW is the garbage we make in our homes, places of work and schools. In South Carolina, MSW is defined as the combined residential, commercial, institutional/non-profit and industrial packaging/office waste we make. South Carolinians generate about 5.0 pounds of MSW each day. Of that amount, about 3.6 pounds is disposed of in Class 3 landfills. We **recycle** the rest – about 1.4 pounds per person per day.

Recycling is a smart waste management option that conserves natural resources and reduces the need to build landfills or incinerators. Other smart waste management options are to **reuse** or **compost**. When implemented, waste is removed from the MSW stream and is not disposed of in our **landfills**.

In this activity, students look into a typical bag of household trash and decide which items can be recycled, reused, **rejected**, repaired and composted as well as those that must be thrown away.

Learning Procedure

1. Show students the bag of trash you have prepared and ask them to **estimate** its weight. Call on several students to estimate from just looking at the bag and then from holding the bag. Weigh the bag. Using a bath scale, weigh the person with the trash bag and weigh the person without the trash bag. Then subtract to obtain the weight of the trash bag. Your answer should be about 5.0 pounds. Tell students that this is how much trash each one of us generates each day. Students may find this unbelievable. Remind them that this figure includes trash from all of their meals, classroom waste, etc. It is just the MSW that we make. It does not include any of the waste from an industry's processing or manufacturing operations.

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Learning Essentials

Focus: Recycling

Subject: Science

Extension: Math, Physical Education

Materials: About 5 pounds of clean trash (including items that can be recycled, reused, rejected, repaired or composted – also have items that only can go in the landfill/incinerator), six clean paper bags, bath scale

Teaching Time: 30 to 45 minutes

Vocabulary: Compost, estimate, landfills, recycle, reduce, rejected, reuse, trash

Lesson Resources: "Garbage 101" and "Recycling 101"

2. Make six cards marked RECYCLE, REUSE, REJECT, REPAIR, COMPOST and LANDFILL. Tape these cards onto the six bags. Discuss what these words mean. Find out and discuss with the class what is recyclable in your community. Visit **www.scdhec.gov/recycle** and click on RECYCLING WHERE YOU LIVE for more information.

3. Have the students open the trash bag and tell what each item is used for and why it was purchased. Discuss if the product was necessary or not. Now that the item is trash, was it worth buying the product in the first place? Remind students that we can **reduce** the amount of trash we throw out by only buying what we need.

4. Have students divide the contents of the trash bag into the proper categories – RECYCLE, REUSE, REJECT, REPAIR, COMPOST and LANDFILL.

5. After classifying, re-weigh the items in the landfill category and discuss how much trash was saved from going to the landfill.

6. As a math exercise, create a chart graphing the weight of the six bags after the 5.0 pounds of trash has been sorted into recycle, reuse, reject, repair, compost and landfill.

7. As another math exercise, ask the class to multiply 5.0 pounds by the number of students in the class and school.

Teacher's Answer Key for Student Worksheet

F	Trash
G	Litter
A	Reuse
C	Reduce
J	Natural Resources
I	Landfill
H	Recycling
B	Paper
D	Reject
E	Compost

Extension Activities

1. Older children may play a recycling relay race. Divide the class into teams. Each child picks an object from a bag of mixed clean trash and delivers it to a box or bag labeled RECYCLE, REUSE, REJECT, REPAIR, COMPOST and LANDFILL. Each student must justify their decision.

2. Using a bag of clean, mixed trash, hand one trash object to each student and have all students stand together in a group representing the waste stream. The teacher can be the trash collector who will take the trash away to a landfill, one item at a time. Tell students that, at a landfill, they will be put into a specially lined hole in the ground and covered with soil. They will remain there forever. There's no light and virtually no air, so there's very little decomposition. Ask if anyone wants to go to the landfill. If they don't and want to reuse the resource, have them think of a way the item can be reused or recycled. Try to keep items out of the landfill by thinking of alternatives. Discuss ways to change the items that cannot be recycled or reused. Continue until all the students/trash items are taken out of the landfill.

3. Have students (and teacher, too) tie a plastic bag to their waists. Each student is to place in the bag all the waste from the class, clean and dry lunch waste and any other waste each student is responsible for making. Compare the amounts at the end of the day or week. You could try this both before and after this lesson to demonstrate how the students' habits may change.

4. Have students complete the "If bagging trash is your game, THIS MATCH IS FOR YOU" Student Worksheet.

5. Go back through the RECYCLE bag and REUSE bag and discuss what is in them and why.

6. Encourage students to pack waste-free lunches. Consider providing a "green" snack or a class party.

Student Worksheet Name: _____

If bagging trash is your game, THIS MATCH IS FOR YOU!

Match each word on the left with the phrase that best describes it.

___ **Trash**	A.	To find a new use for something instead of throwing it away.
___ **Litter**	B.	A recyclable material made from trees.
___ **Reuse**	C.	To buy less and to throw away less trash.
___ **Reduce**	D.	To stop purchasing an item in a container or package that is not recyclable.
___ **Natural Resources**	E.	Leaves and grass clippings that are broken down by natural processes and can be used on gardens.
___ **Landfill**	F.	Our garbage, all the things we throw away.
___ **Recycling**	G.	Trash that is in the wrong place, such as on the ground or in the street.
___ **Paper**	H.	A process that makes something new out of something old.
___ **Reject**	I.	A special place where trash is buried.
___ **Compost**	J.	Things that are found in nature that we must have to live.

MATH
HISTORY
SCIENCE

RECYCLE – DON'T LITTER

PREPARATION TIME: **EASY-TO-DO**

Learning Objectives

Students will:

- identify and evaluate ways that litter can endanger wildlife; and
- identify ways to help reduce these dangers.

Background

South Carolina is known worldwide for its beautiful and diverse environment – from the foothills of the Blue Ridge Mountains to the more than 180 miles of sun-splashed, white sand beaches. The state's rich natural environment offers a variety of outdoor activities including world-class fishing and hunting, kayaking and canoeing black water rivers, hiking mountains wilderness trails, shooting rapids, and boating on lakes and ocean waters. South Carolina's outdoors is home to an amazing variety of plants and wildlife.

The state's environment plays a huge role in South Carolina's economy. Consider these figures. The total tourism value added $11.6 billion (about 7.6 percent) to the state's economy in 2007 according to the S.C. Department of Parks, Recreation and Tourism. The tourism economy generated total wages and salaries of about $7.3 billion.

Pollution and litter are dangerous to our wildlife, aquatic life, safety and economy. The threat is not imagined. According to the Ocean Conservancy, about 600,000 volunteers collected more than 8.3 million pounds of trash and litter from beaches and waterways in 114 countries (including 46 states and the District of Columbia) during the 2010 International Coastal Cleanup – the world's largest volunteer effort of its kind. The No. 1 debris item collected as part of the cleanup was cigarettes and cigarette filters – about 20 percent. Other examples of litter found includes plastic bottles, plastic bags, caps/lids, food wrappers/containers, glass bottles and paper bags.

In 2010, there were 32,834 days that beaches were either closed or under an advisory (equaling about 5 percent of the total available beach days) across the United States according to the U.S. Environmental Protection Agency. In comparison, during South Carolina's 2010 swimming season, actions were reported less

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Learning Essentials

Focus: How litter effects wildlife and aquatic life

Subject: Science

Extensions: Math, Social Studies

Materials: Pictures from magazines or samples of litter (six-pack plastic rings, fishing line, plastic wrap, plastic bottles, gum wrappers, cigarette butts, aluminum cans, etc.), "Litter in the Wild" Student Worksheet

Teaching Time: Two class periods

Vocabulary: Debris, endanger, litter, littering, pollution

Lesson Resources: "Recycling 101"

than 1 percent of the time, affecting one beach. The primary sources of ocean debris include storm sewers, illegal dumping, balloon releases, commercial and recreational boats and commercial shipping.

Debris is a problem for a number of reasons. Marine animals can become caught in discarded fishing nets and lines, grocery bags, six-pack plastic rings, ribbons and other floating debris. In addition, some animals mistakenly eat the man-made materials. Sea turtles, for example, consume floating trash bags and balloons, likely mistaking them for jellyfish. Several bird species have been found to swallow plastic pieces and cigarette butts. These materials damage the animals' digestive systems. They may stop eating because their stomachs feel full and starve to death.

On land, litter also **endangers** wildlife. Half-open food and soda cans are a problem for animals. Deer and raccoons can cut their mouths on cans and smaller animals can get their heads stuck inside the cans and starve to death. Many people are unaware of the injury, suffering and death they cause animals by throwing trash on the ground or into the water.

Learning Procedure: Day One

1. Write the words litter, pollution and endanger on the board. Discuss with students and help them to define each word.

2. Discuss with the class how litter can harm wildlife and aquatic life.

3. Using litter items or pictures of potential litter items, have students discuss the potential harm each item could present in the wild. You may choose to rate items according to their potential harm.

4. Have students identify the most harmful object. Have students discuss each item's potential for harm.

5. Ask for volunteers to attach each picture or item to a large cardboard or art paper panel and draw in large numbers to show each item's rating as it is decided.

6. Assign students to look for pictures of items that often become litter and pictures of wildlife that can come in contact with litter and to bring them to class.

Learning Procedure: Day Two

7. Divide the class into groups of four or five students. Have each group use its pictures to assemble a collage. When the collages are finished, have the students rate each piece of litter in their collage. If students bring in pictures of items that were not rated, have the group assign a rating.

8. One by one recognize each group. Have a group representative give the collage's total score. Have each group discuss the litter items on their collage and what could be done to prevent it. Write suggestions on the board.

9. Distribute the "Litter In The Wild" Student Worksheet and ask students to complete it.

Extension Activities

1. Invite a wildlife expert to join the class for the discussion and to present examples of local **littering** that harms wildlife.

2. Display the litter collages in a local shopping center during National Wildlife Week – celebrated in April. For more information, visit **www.nwf.org/watch**.

3. Ask students if they want to start a six-pack plastic ring recycling program at school. There is a program available that allows students to learn about and participate in closed-loop recycling.

   The Ring Leader Recycling Program accepts all flexible six-pack plastic beverage ring carriers. It offers a free kit that includes a tree for collecting rings, educational materials and postage paid mailing labels. For more information, visit **www.ringleader.com**.

Student Worksheet Name: _____

LITTER IN THE WILD

1. Name five types of litter.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. Name ways that litter can harm aquatic life and wildlife.

   a. _____

   b. _____

   c. _____

   d. _____

3. List three things you can do to reduce the litter threat to aquatic life and wildlife.

   a. _____

   _____

   _____

   b. _____

   _____

   _____

   c. _____

   _____

   _____

MATH
HISTORY
SCIENCE

WHERE DOES GARBAGE GO?

PREPARATION TIME: MODERATE

Learning Objectives

Students will:

- learn how much solid waste we generate each day;
- learn how solid waste is managed;
- learn that most of the solid waste we generate goes to a landfill; and
- learn that a landfill is a specially designed space to hold solid waste.

Background

Each of us produces **garbage**. What you call **trash** or garbage, professionals call **solid waste**. There are different kinds of solid waste, but what we throw away from our homes, schools and places of work is know as **municipal solid waste** (MSW).

In South Carolina, each of us generated 5.0 pounds of MSW each day in fiscal year (FY) 2011 (July 1, 2010 to June 30, 2011). That's 1,825 pounds a year and about 7,300 pounds a year for a family of four. Overall, South Carolinians made about 4.2 million tons of MSW in FY11.

Where does the garbage go? Well, MSW is managed one of two ways. Most of it (about 72 percent or 3.6 pounds per person per day) is disposed of in Class 3 **landfills**. The remaining amount (about 28 percent or 1.4 pounds per person per day) was recycled.

In short, when you throw it away, where is away? Away is usually a landfill. Landfills are the most common form of waste disposal.

Just what is a landfill? Well, it is not a **dump**. And it is not just a hole in the ground. A landfill is a large area of land that is specially designed and built to receive waste. Federal and state regulations strictly govern the location, design, operation and closure of landfills in order to protect people and the environment.

Continued on the following page

Learning Essentials

Focus: Waste management

Subject: Science

Extensions: Art, Language Arts, Social Studies

Materials: "Create a Mini-landfill" Student Activity Sheet, "Where Garbage Goes" Student Handout

Teaching Time: Two class periods

Vocabulary: Cell, dump, garbage, groundwater, landfills, leachate, methane, municipal solid waste, open dumps, solid waste, trash, water table

Lesson Resources: "Garbage 101," "Landfill 101"

Class 3 landfills – that accept MSW for disposal – must be located in areas away from land prone to earthquakes or flooding. The design of a Class 3 landfill includes hard plastic liners and other materials like clay to prevent **groundwater** contamination.

Nearby groundwater must be tested regularly and explosive gases such as methane must be collected. Some Class 3 landfills, including four in South Carolina, collect **methane**, a gas created by decomposing garbage, and convert it into an energy source.

How do Class 3 landfills work? The trucks that pick up the garbage from your curb or at a drop-off center, bring the garbage to the Class 3 landfill. The garbage is placed in a specific area called a **cell**, crushed (compacted) and covered with soil or other material to reduce odor and litter as well as control rodents and pests. (Refer to the "Where Garbage Goes" Student Handout.)

Landfills are expensive to build and operate. Beyond the expense, landfills are difficult to build simply because the public frequently opposes new construction. People remember the past poor practices of unlined, **open dumps** and are concerned about their health and environment as well as property values, noise, odors and traffic.

Reuse, reducing waste, recycling and composting all decrease the amount of garbage that otherwise would have to be disposed of in a landfill or sent to an incinerator. All of these waste management options save landfill space and reduce the need to build landfills.

Learning Procedure

1. Invite the school custodian to talk to the class and ask about trash removing duties. **Ask:** How much of the day is devoted to removing trash? Where does the trash go? How often is it picked up? What makes up the trash? How much do we throw out each week? What does it cost to throw it out?

2. Arrange a short interview with the school's garbage hauler the next time they are scheduled for a pick-up. When the garbage truck comes, have the class watch the removal process. Then ask the garbage collector about the business. When do you start working in the morning and finish at night? How many truck loads of trash do you collect each day? Why is your truck designed the way it is and how does it work? How many schools, houses and businesses do you collect from each day? How many miles do you drive each day? Do you pick up recyclables separately? Why or why not? Where do you take the garbage? What happens to the garbage?

   OPTIONAL PROCEDURES FOR STEPS 1 AND 2: If scheduling a custodian or garbage hauler proves to be inconvenient, you may want to interview them yourself outside of class and role-play the parts with the class.

3. On the basis of the interviews, have the class construct a mural depicting all the stages in creation, collection and disposal of garbage. Add specific facts learned in the interview and display the mural in the school to teach others.

Questions for the Class

1. Why are custodians and garbage haulers important?

2. Where does the school's garbage go?

3. What happens to it after it gets there?

4. Why is it necessary to take our trash to a special place? Why not just leave it in the backyard or by the side of the road?

5. How is a landfill different from a dump?

Extension Activities

1. Take a trip to the local landfill to see how it works and how big it is.

2. Have students conduct interviews with the cafeteria staff to determine how much food waste is made at your school.

3. Does your school have a recycling program? If so, how much and what does it collect? If not, can you start one? Does your school have a composting program for food waste? If so, how much and what does it collect? If not, can you start one?

4. Have students create a mini-landfill. See the "Create a Mini-landfill" Student Activity Sheet.

Student Handout

WHERE GARBAGE GOES

A Trip to the Landfill

In South Carolina, an average family of four throws away about 101 pounds of garbage each week.

In many areas, each household has a roll cart garbage container or bags to put garbage in for collection by trucks that come by on a regular schedule.

Step-by-Step

1. Garbage is picked up by large garbage trucks. In some areas recyclables also are picked up by trucks. In other areas, families are responsible for taking garbage to drop-off locations. Frequently, recyclables also are collected at these locations.

2. At the landfill, garbage goes into special lined areas that prevent the garbage from polluting surrounding land and water. Each day's garbage is buried and covered with a layer of soil.

Student Activity Sheet

Create a MINI-LANDFILL

This mini-landfill shows how garbage is layered and how landfills are designed to protect public health and the environment. Students may build their landfill individually or in groups. For each landfill:

1. Use a plastic cake container from the grocery store as your landfill site.

2. Cut eight circles from heavyweight paperboard (cereal boxes) or cardboard. Cut one circle from a black garbage bag. Students will use these circles to prepare representations of the many layers of a landfill.

3. Have students create the following.

   A. Water Table – Create a circle to represent the water table. Explain that the **water table** is the level below which the ground is saturated with water. Groundwater is the water below the Earth's surface that moves between soil particles and rock. This water supplies much of our drinking water. To make this layer, use crayons or markers to color the cut-out circle or – for a three-dimensional look – use clay or a salt and flour mixture colored with blue food coloring.

   B. Dirt Layer – This represents the ground. Have students color this layer or glue sand to the circle.

   C. Plastic Liner – Use a circle cut from a black plastic garbage bag and glue it to a cardboard circle to represent the thick plastic liner in the landfill.

   D. Leachate Pipes – Glue two straws together to represent the pipes that collect water in the bottom of the landfill. This water (leachate) is pumped from the landfill and treated at a wastewater treatment plant.

   E. Trash Layer – Have students glue a variety of trash to this circle.

   F. Dirt Layer – Prepare as before.

   G. Trash Layer – For this layer have students use only materials that can be recycled.

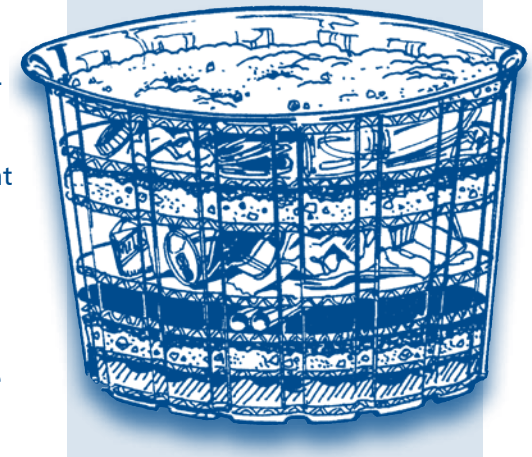
   H. Dirt Layer – Prepare as before. Explain to students that landfills are covered with a dirt layer at the end of each day.

4. After students prepare their landfills, have them discuss how garbage takes up space in the landfill. Then let students remove the recyclables from layer G. Let students see how keeping recyclables out of the landfill saves valuable space and resources. Explain that we must separate recyclable items from the garbage before it goes to the landfill.

Supplies for Each Mini-landfill

- Plastic cake container
- Eight paperboard or cardboard circles cut to fit inside container
- Plastic circle cut from black garbage bag
- Small pieces of garbage including materials that can be recycled
- Glue, crayons and markers
- Two drinking straws
- **Optional:** Sand, salt and flour mixture, blue food coloring or clay

Landfills keep our garbage in place and help to protect the environment. Recycling helps save landfill space. When you remove from the waste stream the things that can be recycled, you reduce the amount of garbage disposed of in the landfill.



Student Activity Sheet

Create a Delicious LAYERED LANDFILL

This activity simulates the construction of a landfill. Layers represent actual landfill components.

STEP 1: Distribute supplies to each student. (The cup represents an excavated hole in the ground.)

STEP 2: Have students carefully "unscrew" two of their cookies so that one half has cream and the other half is bare. (Students should have two cookie halves with cream and two cookie halves without cream.) Crush the bare cookie halves into small pieces and put them into the cup. (The crushed cookies represent a layer of soil that is placed in the bottom of landfills.)

STEP 3: Next, have the students take the cookie halves with cream and break them into two or three pieces. Direct students to place the pieces in the cup with the cream side up. (These pieces represent a layer of clay that is put on top of the soil in landfills.)

STEP 4: Have students use the plastic knife to cut their fruit roll-ups into a circle roughly the same diameter as the top of the cup. Lay them flat on top of the cookies. (This represents the plastic liner which prevents leachate from flowing into the groundwater. **Leachate** is liquid that is created when garbage decomposes and rainwater runs through the landfill.)

STEP 5: Have students crush and add their graham crackers to represent a sand layer. (This layer is to protect the plastic liner.)

STEP 6: Next, have the students cut the licorice sticks in half and lay them on the sand layer. (This represents the leachate collection system which collects any liquid caught by the liner. In landfills, this system pumps leachate to holding ponds or tanks where it is treated.)

STEP 7: Have students place raisins on top of "licorice pipes" to represent a layer of pebbles. (This represents a cover for the leachate pipes and helps protect the liner.)

STEP 8: Have students sprinkle the candies or chips on top of the raisins. (These represent pieces of garbage.)

STEP 9: Next, add the scoop of chocolate pudding. (This represents the leachate created from decomposing garbage and rain seeping through the garbage.) Then have the students add one more layer of candies on top of the pudding. (Since garbage is placed in the landfill each day, liquid is continually created.)

STEP 10: Have students "unscrew" their two remaining cookies and crush another layer of the bare cookie halves on top of the candies and pudding to represent soil. (This layer reduces the amount of rain water that reaches the garbage.) NOTE: You will have two cookie halves with cream left over.

STEP 11: Add another layer of fruit roll-up. (This represents a final plastic liner to prevent rainwater from entering the landfill.)

STEP 12: Next, add a layer of whipped cream to "cap" or cover the landfill. (This represents the clay layer. It prevents odors, insect and rodent problems and repels rainwater.)

STEP 13: In front of the class, stick a candle deep into your (teacher's) "landfill" and light it. (This represents the methane gas recovery system which draws methane gas from the decomposing garbage. The flame represents energy that can be generated by burning the captured methane gas.)

STEP 14: Eat and enjoy your "landfill."

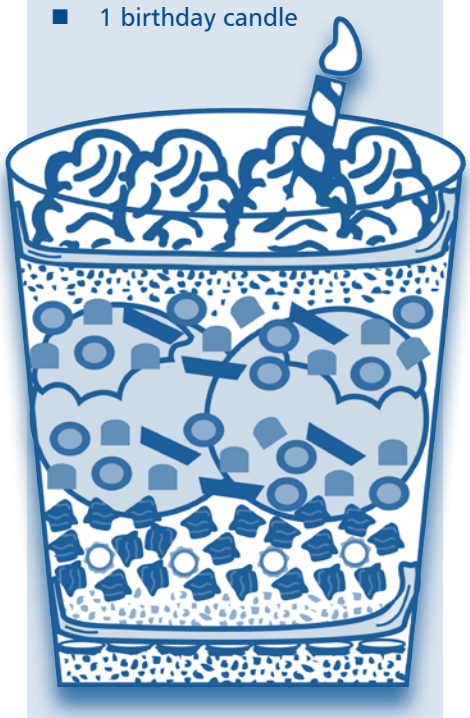
STEP 15: Finally, have students notice whether the cookies on the bottom are still dry or whether the pudding has passed through the fruit roll-up "liner" to soak the cookies. In a correctly built landfill, the cookies will be dry.

Materials and Ingredients:

- 1 clear plastic cup (8 oz.) per student
- 4 Oreo cookies per student
- 1 plastic knife and spoon per student
- 2 fruit roll-ups per student
- 2 graham crackers per student
- 1 box of raisins (8 oz.) per student
- 2 licorice sticks per student
- 1 handful of a variety of small candies or chocolate/ peanut butter chips per student
- 1 scoop of chocolate pudding per student
- 2 Tbs. of whipped cream per student

FOR THE TEACHER ONLY:

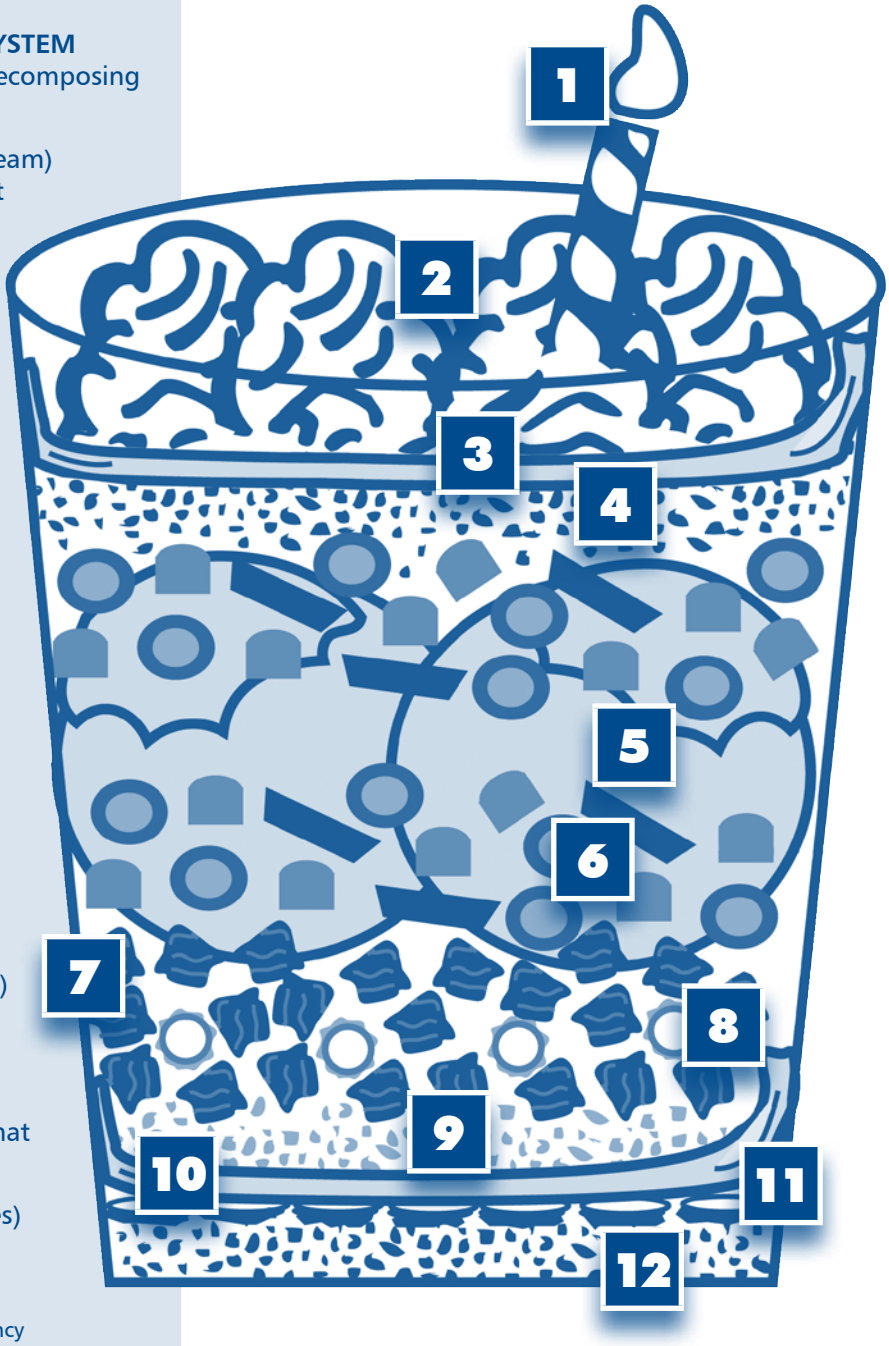
- Matches or a lighter
- 1 birthday candle



ANATOMY OF A LANDFILL

1. A **METHANE GAS RECOVERY SYSTEM** (candle) recovers energy from decomposing garbage.
2. The **LANDFILL CAP** (whipped cream) prevents odor, insect and rodent problems and repels rainwater.
3. The **PLASTIC LINER** (fruit roll-up) prevents rainwater from entering the landfill.
4. The **SOIL LAYER** (cookie pieces) is used to cover garbage daily.
5. **LEACHATE** (pudding) is a natural by-product of decomposing garbage.
6. **GARBAGE** (candies) is added daily from communities.
7. The **PEBBLE LAYER** (raisins) helps protect the landfill's liner.
8. The **LEACHATE PIPES** or **COLLECTION SYSTEM** (licorice sticks) collect leachate.
9. The **SAND LAYER** (graham crackers) protects the landfill's liner.
10. The **PLASTIC LINER** (fruit roll-up) prevents leachate from flowing into groundwater.
11. The **CLAY LAYER** (cookie pieces) absorbs any leachate or liquid that escapes the plastic liner.
12. The **SOIL LAYER** (crushed cookies) lines the bottom of the landfill.

SOURCE: U.S. Environmental Protection Agency



Backyard Composting

You've heard about it, but you are not really sure you want to do it.

Well, here's the dirt on composting. It's simple to do. All you need to get started is a little time, a little space, a bin and a basic understanding of the composting process.

Still not convinced? Composting helps protect the environment. Composting conserves natural resources. And composting saves you money.

Got your attention now? Good. Let's define composting.

You recycle, right? Well, composting is nature's way of recycling. Composting is the controlled natural decomposition of organic material (from plants and animals) such as leaves, yard trimmings, grass clippings and manure as well as fruit and vegetable scraps. Microorganisms break down this material into compost, a crumbly, dark-colored, earthy-smelling, soil-like material. That material is a nutrient-rich product that can be used in your garden, flower beds and lawn.

Composting can be practiced almost anywhere – including your backyard. Why on earth would you want to do that? There are lots of reasons.

Benefits of Backyard Composting

There are many benefits to backyard composting.

- Compost is a valuable product. Compost improves soil by increasing aeration (the ability of air to circulate) and water-holding capacity (reducing your need to water) as well as helping plants absorb nutrients. Compost also helps suppress plant diseases and pests.
- Compost reduces or eliminates chemical fertilizer and pesticide use. That saves you money as well as helps protect the environment by reducing runoff pollution to nearby streams, rivers and lakes.
- Compost reduces the amount of waste a household generates. Yard trimmings and food scraps make up about one-fourth of the total amount of municipal solid waste generated by households according to the U.S. Environmental Protection Agency (EPA). It also is important to remember that yard trimmings are biodegradable and generally clean. Disposing of them in landfills often is unnecessary and is a waste of space.
- You save money. You save money by buying fewer bags for garbage and leaves. You also save money by buying fewer bags of compost from retail outlets. You make your own valuable product at home for free.

Did You Know?

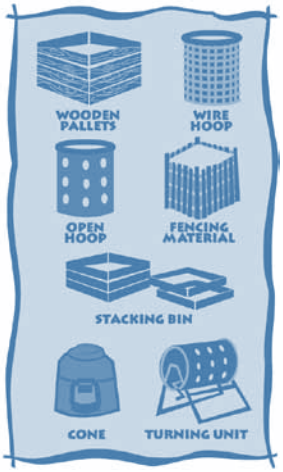
South Carolina and most other states – in order to encourage recycling and save landfill space – do not allow grass clippings and other yard trimmings to be disposed of in Class 3 landfills. The intent of the law is to encourage local governments to set up large-scale mulching and composting operations. Unfortunately, in many South Carolina counties that has not happened and the yard trimmings are disposed of at a different type of landfill. There are counties, however, that divert yard trimmings to mulching or composting facilities that use the end product beneficially in landscaping and other similar applications.

Want to get started? Let's break it down.

Backyard composting can be as basic or as fancy as you like. How much time and effort do you want to spend on it? How quickly do you want results? You may want to begin with a simple approach.

- Location, location, location. Pick a spot in your yard (you will need an area about 3 feet by 3 feet) that is at least 2 feet from a structure like your house or a fence. The spot should be partially shaded so that the sun doesn't dry your compost too quickly (but try to stay away from large trees that may penetrate your compost with roots). The spot should be convenient for you to add materials, have access to water and have good drainage. You may want to plan for extra space around your pile to make turning and harvesting your compost easier.

- Begin with the bin. You can build a compost pile on the ground, but using a compost bin will help keep your compost pile neat and tidy, deter rodents from digging into your pile and help your pile retain heat and moisture. Compost bins can be homemade or purchased. Homemade bins can easily be built out of wood, wire mesh and scrap pallets. You even can build a compost corral with concrete blocks or chicken wire. Some manufactured bins include turning units, cone shaped bins and bins with stacking tiers. Some are wood and some are plastic (sometimes recycled plastic). These bins can be purchased at nurseries and garden centers or directly from the manufacturer. Bins are available in a wide range of prices. Take the time to consider your options and what works best for you.



- Size matters. Ideally, your compost pile should be at least 3 feet wide, 3 feet deep and 3 feet tall – big enough to work and small enough to be easily turned. Backyard compost piles probably should not be larger than 5 X 5 X 5 feet.

- Guess who's coming to dinner? Making compost is a lot like cooking a meal. You take some basic ingredients, add water, mix well and let it cook over a given period of time. You could have finished compost ready to use in as little as 12 weeks.

Four basic ingredients are required for composting – greens, browns, water and air. Mixing the proper amounts of these ingredients will provide the composting organisms (microbes and insects) with enough nitrogen, moisture and oxygen to break down the material effectively.

Greens include green leaves, fresh clippings and vegetable scraps. Do not add any meat or dairy products. Browns include dead leaves, wood chips, dry twigs and paper.

Water is important. Too little moisture will inhibit the composting process. Too much moisture will cause the compost pile to smell. Here's a simple rule to follow – the pile should be as moist as a sponge.

Air is essential. Turn your compost pile once or twice a week to inhibit odor-causing bacteria and to speed up the composting process.

Where can you get help?

The S.C. Department of Health and Environmental Control's Office of Solid Waste Reduction and Recycling (Office) offers workshops, printed materials and other assistance on composting through its Smart Gardener Program.

To learn more about composting or the Smart Gardener Program, call **1-800-768-7348** or visit **www.scdhec.gov/environment/lwm/recycle/compost.htm**. The Office also offers a composting guide "Home Composting Made Easy" at no charge. (Call for availability.)

Many local governments also offer workshops with opportunities to buy compost bins at reduced prices or at cost. Check with your local recycling coordinator.

Clemson University Extension Service offers composting and mulching information at **www.clemson.edu/extension** or **hgic.clemson.edu**.

The EPA offers a wealth of composting information on its Web site. You can begin at **www.epa.gov/epaoswer/non-hw/composting/backyard.htm**.

Garbage 101

Let's talk trash. One of the things that we probably do every day is throw away garbage. The act is so common that it doesn't even register. We've all heard the cliché: "Out of sight, out of mind." Well, even when garbage is in sight, it seemingly passes under our eyes virtually unnoticed. But it's there. Then it's gone.

How much garbage do we make?

That question is not as simple to answer as it would seem. Just think of all the different sources – or generators – of garbage. You make garbage, right? And your family makes garbage. And schools, businesses, organizations and industries make garbage. Everybody makes garbage. And everybody makes different kinds of garbage.

Before reading any further, here's a term you need to know. What you call trash or garbage, professionals call solid waste. There are different kinds of solid waste, but one type measured nationwide by the U.S. Environmental Protection Agency (EPA) and in South Carolina is municipal solid waste (MSW).

What is MSW? MSW has many definitions throughout the nation. In South Carolina, however, MSW is defined as the combined residential, commercial, institutional/non-profit and industrial packaging/office waste that is generated. This includes paper, cans, bottles, food scraps, yard trimmings, packaging and other items. It does not include industrial process waste like scraps and by-products from the manufacturing process, construction and demolition (C&D) debris, automobile bodies, agricultural waste, combustion ash, mining waste and sewage sludge as well as hazardous, infectious and radioactive waste.

According to the S.C. Solid Waste Policy and Management Act of 1991 (Act), county governments are required to report annually to the S.C. Department of Health and Environmental Control (DHEC) the amount of MSW recycled within their county. Permitted solid waste facilities also are required to report the amount of waste disposed of at their facilities annually to DHEC.

Where does the garbage (MSW) go?

Of the 4.2 million tons of MSW generated in South Carolina in FY11, 1,172,768 tons or 28 percent of the state's MSW stream was recycled. Of the remaining amount, nearly 3.1 million tons of MSW or 72 percent was disposed of in the state's 24 Class 3 landfills.

There are other places MSW – which can be moved by truck, rail or barge – may go before being disposed of in a landfill, sent to an incinerator or

And the number is ...

So, how much MSW did we make? South Carolinians generated about 4.2 million tons of MSW in fiscal year (FY) 2011 (July 1, 2010 - June 30, 2011) according to the S.C. Solid Waste Management Annual Report for FY11. The amount of MSW generated in (calendar year) 2010 (the latest numbers available) nationwide was 250 million tons according to the EPA.

How much MSW do we dispose of every day? South Carolinians disposed of 3.6 pounds of MSW per person per day (p/p/d) in FY11. By comparison, Americans discarded 2.9 p/p/d in 2010 according to the EPA.

recycled. Some MSW is taken to a transfer station where it is compacted and loaded on large trailers. This is done usually when the community is a long distance from a landfill. Some MSW is taken to a material recovery facility where recyclables are sorted from the garbage. The recyclables are taken to companies who process the materials and make them into new products while the garbage goes to a Class 3 landfill or MSW incinerator.

What's in our garbage?

The EPA calculates – by weight – what makes up the nation's MSW stream. In 2010, of the total MSW generated before recycling, paper and paperboard (which includes office paper, newspaper and cardboard boxes) was the largest category, comprising 29.0 percent or 71.3 million tons. Food scraps were second (13.9 percent or 34.76 million tons) followed by yard trimmings (13.4 percent or 33.4 million tons), plastic (12.4 percent or 31.04 million tons) and metal (including aluminum cans and steel cans – 9.0 percent or 22.4 million tons). Rubber, leather and textiles (8.4 percent or 20.9 million tons), wood (6.4 percent or 15.88 million tons) and glass (4.6 percent or 11.53 million tons) rounded out the top eight categories. The remaining amount (3.4 percent or 8.63 million tons) was classified as "other."

South Carolina measures the total MSW generated, but not the total amount of a specific waste category. To estimate how much of a specific category of material is being generated in South Carolina, we can use the national percentages determined by the EPA. There were 4.2 million tons of MSW generated before recycling in South Carolina in FY11. That means that by using the EPA's figure of 29.0 percent of the total MSW generated being paper and paperboard products, South Carolinians generated an estimated 1.17 million tons of paper and paperboard products in its MSW waste stream. This is only an estimate, but should serve as a reasonable guide.

Other estimates of what South Carolinians generated before recycling include food scraps (583,800 tons), yard trimmings (562,800 tons), plastic (520,800 tons), metal (378,000 tons) and glass (201,600 tons). Again, these are estimates based on the EPA's national numbers.

THINK BEFORE YOU THROW ...

You know the three Rs – reduce, reuse and recycle. Waste reduction, which is making less garbage in the first place, is the preferred option of waste management. Reduction is followed by reuse, which means repairing items, donating them to a charity or selling them. Reuse is followed by recycling and composting – both of which turn materials that would become waste into valuable new resources.

Disposing of garbage at a landfill or burning it at an incinerator should be the last option for waste management. To learn more about garbage and ways you can reduce the amount you generate at home, at school and at work or more about recycling, composting and buying recycled, call DHEC's Office of Solid Waste Reduction and Recycling at **1-800-768-7348** or visit **www.scdhec.gov/recycle**.

Landfill 101

In an ideal world, we wouldn't throw anything away. We would reuse or recycle it. In the real world, however, some things are thrown away and usually end up in a landfill.

All of us make solid waste – commonly known as trash or garbage. The waste we make is managed for us. How? What we don't reuse or recycle is burned (sent to an incinerator) or disposed of (sent to a landfill).

Just what is a landfill? A landfill is a large, outdoor site designed for the disposal of waste. There are different kinds of landfills that accept different material including construction and demolition (C&D) debris landfills, industrial, hazardous waste and land-clearing debris. But, generally, the trash and garbage that we throw away every day – also known as municipal solid waste (MSW) – is disposed of in a Class 3 landfill. For more information on how much we dispose of in Class 3 landfills, see the "Garbage 101" Lesson Resource page.

Landfills are a fact of life. Although waste reduction, reuse, recycling and composting divert large amounts of MSW from disposal, some waste still must be disposed of in landfills.

Landfills are not just holes in the ground.

In the past, there were few or no regulations regarding landfills. It showed. Many people remember smelly, unlined dumps that contaminated groundwater and caused other environmental problems. It's different today. Modern landfills are well-engineered facilities that must meet strict U.S. Environmental Protection Agency (EPA) and S.C. Department of Health and Environmental Control (DHEC) regulations that were established to protect human health and the environment. All landfills must be approved (receive a permit) from DHEC. When you think of it this way – and most of us don't – garbage disposal is no less an essential public service than police or fire protection.

Class 3 landfills must be built in suitable geological areas away from faults, wetlands, flood plains and other restricted areas. The design of landfills includes plastic liners and other materials like clay to prevent groundwater contamination. Monitoring is required to test groundwater quality and determine if there is any contamination. Daily operation of landfills includes compacting (crushing) and covering waste with several inches of soil or other cover material to reduce odor, litter and control rodents and pests. Closed landfills must have a final cover that includes a synthetic cap and a soil layer. Once the landfill is closed, the responsibility of the landfill operator doesn't end. Landfill operators must set aside funding to provide environmental protection during and after the closing of a landfill. In short, today's landfills are expensive to design, build and maintain.

The Myth of Biodegradation

Most of us assume that when we throw something away, it will eventually break down or decompose in the landfill. You know, a return to nature kind of thing. Well, not necessarily. It depends on what was thrown away – and a lot of other things.

One of the most recognized research efforts on decomposition – also called biodegradation – has been the work done as part of the Garbage Project at the University of Arizona. Researchers mined local landfills to learn about modern civilization. Among their findings – garbage does not break down in landfills.

The Garbage Project discovered that landfills are a much more static structure and that biodegradation takes a lot longer than previously thought. Air and water are necessary for biodegradation. Under normal landfill conditions – that is when the garbage is covered by dirt and the landfill is relatively dry – the only garbage that truly decomposes are certain types of food scraps and yard trimmings (banned from Class 3 landfills in South Carolina) and even that takes a long time. Hot dogs and pastries, buried as long as 15 years before the project took place, were still recognizable. Grass clippings were still green. Newspapers, long thought to be easily biodegradable, were found in landfills virtually intact after being buried for decades. The bottom line is this: throwing something away is a lifetime decision in more ways than one.

Beyond the expense, landfills also are difficult to build simply because the public frequently opposes new construction. People remember the poor practices of the past and are concerned about their health and the environment as well as property values, noise, odor and traffic if a landfill is built near their community. But the modern landfill was designed to lessen or overcome these problems, particularly open dumps and garbage incinerators that polluted the air.

What's going on today?

Nationwide, the number of active landfills has shrunk from nearly 8,000 in 1988 to 1,908 in 2010 according to the EPA. There are thousands of closed landfills. In South Carolina, there were 24 permitted Class 3 landfills operating in fiscal year 2011 (July 1, 2010 to June 30, 2011). But what landfills lack in numbers is made up in size. Landfills are much bigger today than they were in the past. As such, today's landfills have a much longer lifespan and frequently accept waste from a much larger geographical area.

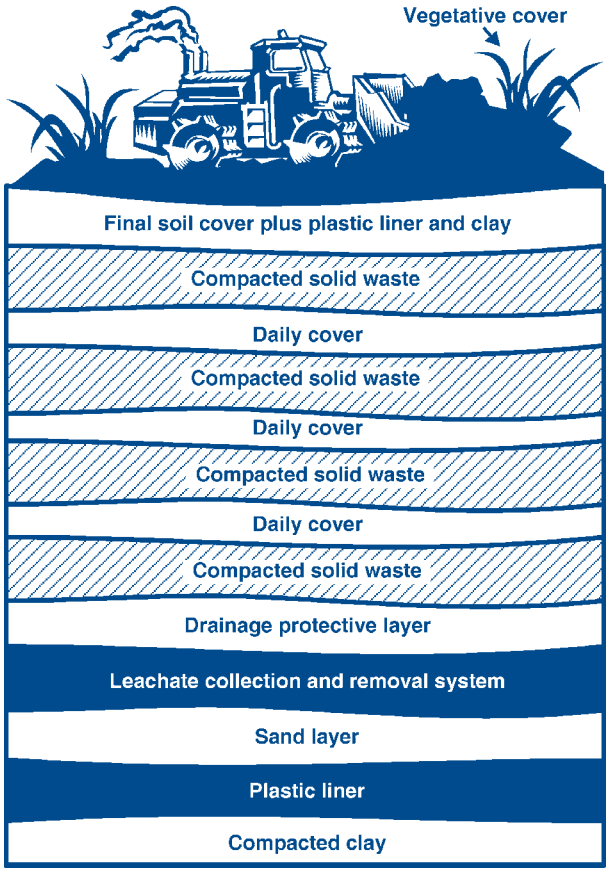
Think before you throw.

For now, like them or not, there is a need for landfills. But each of us should do our part to reduce, reuse, recycle and compost whenever possible to save landfill space as well as natural resources and energy. For more information, visit DHEC's Office of Solid Waste Reduction and Recycling Web site at **www.scdhec.gov/recycle** or call **1-800-768-7348**.

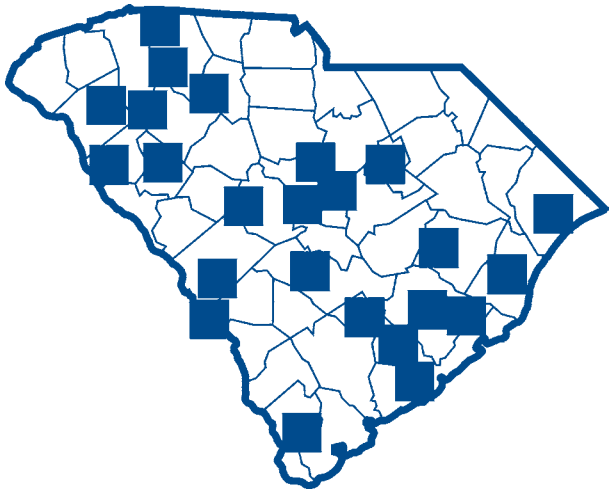
A BRIEF HISTORY OF LANDFILLS

Who invented the modern landfill that led to the landfills of today? No one knows. Some experts say the British did in the 1920s. Others say there were "sanitary" landfills (landfills where the new garbage is covered daily by some material) in the U.S. earlier than that, for example, in Champaign, Illinois in 1904.

This much is certain – wherever and whenever the first modern landfill was built and all those built afterwards, the drive to build them was public health. People realized that open dumps were causing sickness in the community. "Sanitary" landfills gradually caught on in the 1930s but got their biggest boost from the U.S. Army Corps of Engineers, which made sanitary landfills the disposal method of choice for military facilities during World War II. By 1945, about 100 American cities had "sanitary" landfills. Within 15 years, that number had increased to about 1,400.



South Carolina's Permitted Solid Waste Disposal Facilities



■ Class 3 Landfill

SOURCE: "S.C. Solid Waste Management Annual Report for Fiscal Year 2011"

Natural Resources

Natural resources are materials from the Earth that are used to support life and meet people's needs.

Any natural substance that humans use can be considered a natural resource. Oil, coal, natural gas, metals, stone and sand are natural resources. Other natural resources are air, sunlight, soil and water. Animals, birds, fish and plants are natural resources as well.

Natural resources are used to make food, fuel and raw materials for the production of goods. All of the food that people eat comes from plants or animals. Natural resources such as coal, natural gas and oil provide heat, light and power. Natural resources also are the raw materials for making products that we use everyday from our toothbrush and lunch box to our clothes, cars, televisions, computers and refrigerators.

Renewable and Nonrenewable Resources

Renewable resources are those natural resources such as trees, water, sun and wind that can be replenished at about the same rate at which they are used. Renewable resources, however, can be depleted if not properly managed or conserved.

Nonrenewable resources are those natural resources that are depleted more quickly than they can regenerate. Fossil fuels like oil and natural gas were formed over millions of years. Once mined and used completely, nonrenewable resources are gone forever.

The Challenges of Using Natural Resources

Extracting, processing and using natural resources can cause environmental problems such as: air, land and water pollution; disruption or destruction of ecosystems; and a decrease in biodiversity.

For example, carbon dioxide – which is produced from burning coal, oil and natural gas (fossil fuels) – is a critical greenhouse gas. Greenhouse gases absorb and retain heat from the sun. Examples of greenhouse gases include methane, ammonia, sulfur dioxide and certain chlorinated hydrocarbons. Many scientists believe that the build up of greenhouse gases in the atmosphere can cause global climate change (change in the average global temperature of the atmosphere near the Earth's surface). Over time, this condition could pose dangers around the world such as flooding, drought and disease.

Extracting and using natural resources also can disturb relationships within ecosystems. What are ecosystems? Ecosystems, which include ponds, wood lots and fields, are self-regulating communities of

Natural Resources in South Carolina

- Forests – a renewable resource – cover almost two-thirds of South Carolina's land area and are used to produce lumber and pulpwood for paper production.
- The state has large deposits of kaolin (a type of clay) as well as peat, sand, limestone and gravel.
- Granite is mined throughout the state for crushed stone used in construction or dimension stone used in monuments – including the World War II Memorial in Washington, DC.
- South Carolina is the nation's leading producer of vermiculite, which is used for insulation and as a medium for planting.
- In addition, there is a limited amount of gold mining in the state.

South Carolina has no known economic deposits of mineral fuels such as coal or natural gas.

plants and animals that interact with each other and their non-living environment. For example, trees cleared from a field can destroy habitats used by many animals, forcing them to find homes elsewhere. If these animals leave the ecosystem, further disturbances can occur within plant and animal populations that depend on these species.

Extracting and using natural resources – along with other human activities – may decrease biodiversity – that is the variety of organisms that live on the Earth. Diminishing the Earth's biodiversity has a substantial human cost because wild species and natural ecosystems are important resources. Some economists, for example, estimate that the lost pharmaceutical value from plant species extinctions in the United States is about $12 billion.

How can you help?

There are many ways each of us can conserve natural resources. Reducing our consumption – that is reducing what we buy, buying products with less packaging, reusing what we can, composting and recycling – is one of the easiest ways.

Information for part of this Lesson Resource page was provided by "The Quest for Less: A Teacher's Guide to Reducing, Reusing and Recycling," 2005 edition, U.S. Environmental Protection Agency (EPA).

Products Made from Natural Resources

People use an abundance of resources to survive in a continually developing world. Globally, however, some people live simpler lifestyles than others and therefore use fewer resources. This table lists some natural resources and the products and services people produce from them.

NATURAL RESOURCE	PRODUCT/SERVICE
Trees	Paper, furniture, fuel
Cotton	Clothing
Oil/petroleum	Plastic, fuel
Natural gas	Fuel
Coal	Fuel
Iron ore	Steel products (cans, bridges)
Bauxite ore	Aluminum products (cans, car parts)
Gold	Jewelry, dental material
Copper	Wire, coins, electrical equipment
Manganese	Steel, cast iron
Cobalt	Steel, jet engine parts, cutting tools
Platinum	Air pollution control and telecommunications equipment, jewelry
Chromium	Stainless steel, green glass, leather treatment
Diamonds	Jewelry, mechanical equipment

SOURCE: "The Quest for Less: A Teacher's Guide to Reducing, Reusing and Recycling," 2005 edition, EPA.

RESOURCE RECOVERY

Natural resources used for the first time are considered virgin resources and their extraction, processing and use require a great deal of energy and can create pollution.

Resource recovery is a practice that conserves natural resources by extracting material (e.g., paper, glass, aluminum and steel) from the waste stream and recycling it into other materials or using it to produce energy. More and more companies are developing new and innovative technologies that use recycled materials in the manufacturing of products. Many steel mills, for example, use a manufacturing process that uses virtually 100 percent recovered steel as the raw material.

Here's another example. A company can create plastic from oil, a virgin natural resource, or it can use recovered plastic from recycling programs. If a company uses recovered plastic, it is recycling material that would otherwise become waste, helping prevent the depletion of natural resources, conserving energy and preventing pollution that would have been created in the extraction and processing of oil from the ground.

RESOURCE RECOVERY IN ACTION

- Recycling or reuse of 2,000 pounds of paper saves 7,000 gallons of water and 380 gallons of oil.
- Using recovered aluminum cans saves 95 percent of the energy required to make the same amount of aluminum from bauxite ore – its virgin source.
- Steel is the most recycled material in North America, with a national recycling rate of 88 percent.
- For every ton of recovered glass (cullet) used to make new glass, more than 2,000 pounds of raw materials are saved – including 1,300 pounds of sand, 410 pounds of soda ash, 380 pounds of limestone and 160 pounds of feldspar. Using recovered glass also saves energy and reduces greenhouse gas emissions.

SOURCE: American Forest and Paper Association; Aluminum Association; Steel Recycling Institute; and Glass Packaging Institute.

Recycling 101

What is recycling? Recycling is placing items that can be made into new products or materials in the recycling bin or taking them to a drop-off center.

But, there's a little more to it than that.

Recycling is a three-step process. The first step is collection – that's when you put your recyclables into the bin or take them to a drop-off center. The second step is manufacturing – that's when the recyclables are processed into raw materials that are manufactured into new products. The third step is buying recycled. You are not really recycling unless you are buying recycled-content products.

You have seen the recycling symbol ♻, right? The arrows represent the three steps that complete the recycling loop.

Why should I recycle?

Recycling has many environmental benefits. It reduces the need to build landfills and incinerators. Recycling conserves natural resources as well as energy. Recycling reduces pollution caused by the extraction and processing of virgin materials as well as the manufacturing of products using virgin materials.

Recycling also has many economic benefits. First, recycling turns materials that otherwise would become waste into valuable resources. That's right – recyclables have value. The recyclables you place in the bin or take to the drop-off center end up on the market as commodities that are bought and sold.

Recyclables, in fact, make up an essential part of today's marketplace according to the 2001 "U.S. Recycling Economic Information Study." In the United States, the recycling and reuse industry consists of about 56,000 businesses that employ more than 1.1 million people. These businesses have an annual payroll of $37 billion and gross more than $236 billion in annual revenues.

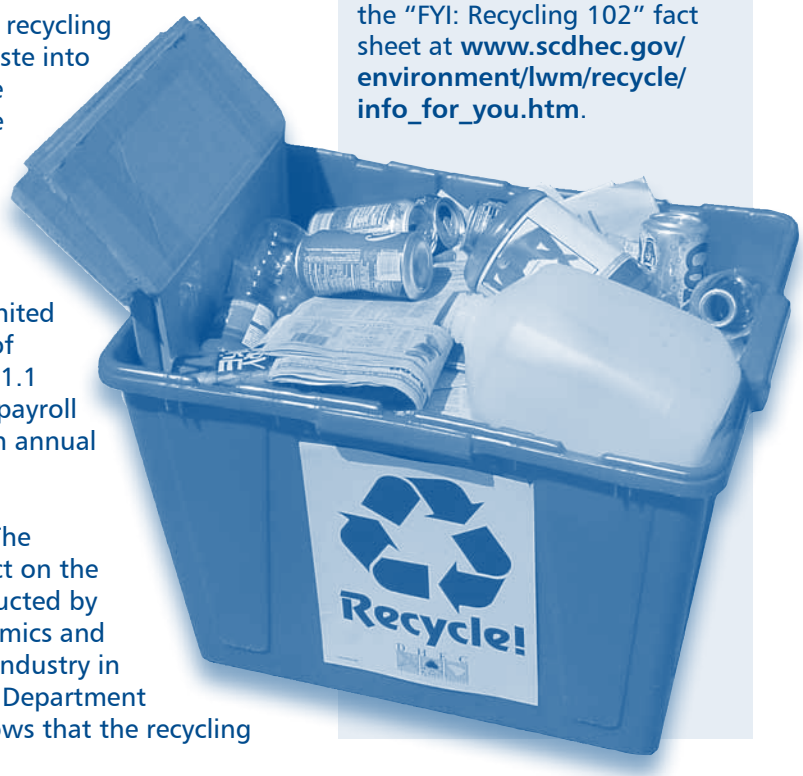
Recycling is big business in South Carolina, too. The recycling industry has a $6.5 billion annual impact on the state's economy according to a 2006 study conducted by the College of Charleston's Department of Economics and Finance. "The Economic Impact of the Recycling Industry in South Carolina" study, commissioned by the S.C. Department of Health and Environmental Control (DHEC), shows that the recycling

Recycling works.

Recycling, in fact, is one of the nation's best environmental success stories. Americans recycled more than 85 million tons of municipal solid waste (MSW) in 2010 (the latest data available) – more than double the amount recycled in 1990 according to the U.S. Environmental Protection Agency.

South Carolinians recycled 1,172,768 tons of MSW in fiscal year (FY) 2011 (July 1, 2010 to June 30, 2011) and about 17 million tons of material since FY98.

To learn more about MSW, MSW recycling totals and MSW recycling goals, see the "FYI: Recycling 102" fact sheet at **www.scdhec.gov/environment/lwm/recycle/info_for_you.htm**.



industry is directly responsible for more than 15,000 jobs, $1.5 billion in annual personal income and $69 million in tax revenue each year.

To learn more about why we should recycle, see the "FYI: Environmental Benefits of Recycling" fact sheet and the "FYI: Economic Benefits of Recycling" fact sheet, both available at **www.scdhec.gov/environment/lwm/recycle/info_for_you.htm**.

What should I recycle?

The most common materials collected for recycling include cardboard boxes, newspapers, steel (fruit, vegetable, soup and other food) cans, aluminum cans, plastic bottles, glass bottles, lead-acid batteries (car and truck), tires, used motor oil and large appliances.

Some local programs also collect non-traditional items for recycling. These items may include cooking oil, electronics, antifreeze and paint.

Where do I recycle?

South Carolina has more than 4.6 million residents and most have curbside recycling or recycling drop-off centers in their communities. Many South Carolinians also take advantage of recycling programs at work, school, state parks and welcome centers.

What happens to my recyclables after I recycle them?

Well, they begin a circular journey. Here's the short version. The materials are collected and sorted at the curb, drop-off center or processing facility. They may be baled and sold for processing. Manufacturers purchase these processed materials and make them into new recycled-content products that they sell.

Here's where you come in again. You must buy recycled-content products to make it all work. (To learn more about buying recycled, see the "Buy Recycled ... and Beyond" Lesson Resource page.)

What and where can I recycle?

If you don't know what or where you can recycle in your community, here's some help. Each of South Carolina's 46 counties and some municipalities have a recycling coordinator who can answer your questions. Look in the telephone book for your public works director, solid waste director or recycling coordinator.

You also can call DHEC's Office of Solid Waste Reduction and Recycling (Office) at **1-800-768-7348** or visit **www.scdhec.gov/recycle** and click on RECYCLING WHERE YOU LIVE for information about local programs in the state.

HOW CAN I START A RECYCLING PROGRAM?

Want to set up a program at your school, office or in your community? The Office can provide education and awareness programs and materials, technical assistance and grant funding.

Please call **1-800-768-7348** or visit **www.scdhec.gov/recycle**.

R-E-C-Y-C-L-E. IT BEGINS WITH YOU AND ME.

Government, businesses, organizations, schools, colleges/universities and consumers each play an important role in making recycling work. The role can vary – from participating in collection programs, to making recycled-content products to buying those products. Regardless, everyone needs to do their part. Remember, it's just right to recycle.

GLOSSARY

A

aerate – To expose to the circulation of air, as in aerating a compost pile.

aeration – A process that promotes biological degradation of organic matter in water. The process may be passive (as when waste is exposed to air) or active (as when a mixing or bubbling device introduces the air).

aerobic – Able to live and grow in the presence of free oxygen. Aerobic bacterial decomposition results in the conversion of organic wastes to compost.

air – A colorless, odorless, gaseous mixture, mainly nitrogen and oxygen.

airborne – Carried by or through the air.

Air Quality Index – A guide used to show the amount of air pollutants in the outside air as well as to provide information about possible health effects.

albedo – The fraction of incident electromagnetic radiation reflected by a surface, especially of a celestial body.

algae – Any of various chiefly aquatic, eukaryotic, photosynthetic organisms, ranging in size from single-celled forms to the giant kelp. Algae were once considered to be plants but are now classified separately because they lack true roots, stems, leaves and embryos.

altitude – The height of something measured in relation to a reference level, such as above the Earth's surface.

aluminum – A light, strong, silver-colored metal made mostly of bauxite ore. One of the most common materials accepted for recycling.

aluminum can – A container to hold a soft drink and other beverages. Aluminum cans can go from the recycling bin to a store shelf in as little as 60 days – again and again.

ambient air – Air that surrounds us.

America Recycles Day (ARD) – A day held nationally every November 15 to celebrate the importance of recycling and buying recycled. Events are held throughout the country. People are asked to sign challenge cards electronically, pledge to recycle and buy recycled.

anaerobic – Able to live and grow only in the absence of free oxygen; anaerobic decomposition of organic wastes by bacteria results in the production and release of methane gas.

avoided waste disposal costs – The amount of money that is saved by not disposing of recyclables as trash. Waste haulers charge customers a disposal fee for each pound or ton disposed or the number of times a waste container is picked up. Thus, it is important to include the avoided disposal cost as part of the savings that result from recycling.

B

backyard composting – The act of composting at the household level using bins or piles of organic matter (yard trimmings, food scraps).

biodegradable – Capable of being broken down by microorganisms into simple, stable compounds such as carbon dioxide and water.

Btu (British thermal unit) – The amount of heat needed to increase the temperature of 1 pound of water 1^0 Fahrenheit at sea level.

burn barrel – A barrel, usually a 55-gallon drum, in which household garbage is burned. It is against the law to burn household garbage in South Carolina.

buy recycled – Purchasing products made from or that contain materials with recycled content.

C

cadmium – A soft, bluish-white metallic element occurring primarily in zinc, copper, and lead ores, that is easily cut with a knife and is used in low-friction, fatigue-resistant alloys, solders, dental amalgams, nickel-cadmium storage batteries, nuclear reactor shields and in rustproof electroplating.

carbon – A nonmetallic element found in some inorganic and all organic materials. Occurs naturally as diamonds and graphite.

carbon dioxide (CO_2) – A common, colorless, odorless gas formed by respiration, combustion and decomposition, comprises 0.03 percent of air.

carcinogen – A substance that can cause cancer.

caution – In hazardous household products labeling, caution means be careful. The product should be used with care.

cell – An area in a landfill where solid waste is disposed of each day.

chasing arrows – The universal recycling symbol. The three arrows symbolize the steps that complete recycling – collection; processing and manufacturing; and buying recycled. Also known as closing the loop.

chemicals – Substances with a distinct molecular composition that are produced by or used in a chemical process.

chlorofluorocarbons (CFCs) – Any of various compounds comprised of carbon, hydrogen, chlorine and fluorine

that were once used as coolants for refrigeration and air conditioning as well as in some products like aerosol hair spray. CFCs are harmful to the ozone layer.

Class 3 landfill – Any landfill, publicly or privately owned, that receives household waste – also known as municipal solid waste. The landfill may also receive other types of solid waste, including commercial waste, non-hazardous sludge and industrial solid waste.

climate change – Refers to any significant change in measures of climate (e.g., temperature, precipitation, wind) lasting for an extended period (decades or longer).

compost – The product resulting from the decomposition of organic materials such as yard trimmings and food scraps. Compost can be used as a soil conditioner.

composting – The conversion of organic materials to humus by microorganisms. Composting is an effective solid waste management method for reducing the organic portion of garbage, including lawn clippings, leaves, food scraps and manure.

compost pile – A place, such as an outside pit or bin, set aside for composting food scraps and yard trimmings.

consumer – A person who buys goods or services.

consuming/consumption – Buying and using goods or services.

corrosive – In hazardous household products labeling, corrosive means that a product may eat through other items.

D

danger – In hazardous household products labeling, danger means that exposure or unsafe use may cause injury, illness or death.

debris – Leftover waste, often from a storm or building construction or deconstruction.

decompose – To break down into component parts or basic elements; decomposition of organic waste materials by bacteria is a fundamental life process because it makes essential nutrients available for use by plants and animals.

DHEC (The S.C. Department of Health and Environmental Control) – DHEC was created in 1973 when the State Board of Health and the Pollution Control Authority merged. DHEC is responsible for protecting the state's environment and the health of South Carolinians.

dioxin – A group of compounds that are extremely toxic.

disperse – To drive off or scatter in different directions.

disposal – The act or process of getting rid of something.

do-it-yourselfer (DIYer) – A term for people who choose to change their own motor oil. These people are the focus of campaigns to get people to recycle their used motor oil.

dump – An open, unmanaged, illegal disposal site used instead of a permitted landfill.

E

Earth Day – Held on April 22 each year to promote awareness of environmental issues, the first Earth Day was in 1970.

embedded energy – The total amount of energy an item uses during its lifetime.

endanger – To expose to harm or danger.

environment – All the conditions, circumstances and influences surrounding and affecting the development or existence of people or other living things.

environmental impact – A positive or negative effect on an environment.

environmental shopping – The practice of making purchasing decisions based on a commitment to preserving the environment. Environmental shopping includes buying recycled products, products with a minimum of packaging and products that are not harmful when manufactured locally and can be recycled.

erode – The wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice and other mechanical and chemical forces.

estimate – To make a judgment.

e-waste – Electronic waste such as televisions and computers.

explosive – In hazardous household products labeling, explosive means to product can explode if used, stored or disposed of improperly.

F

fall line – A line connecting the waterfalls of nearly parallel rivers that marks a drop in land level.

fertilizer – A material such as compost or a chemical compound added to soil to increase its fertility.

filter – A porous substance through which a gas or liquid is passed in order to remove its contaminants.

finite – Having bounds, limited. Finite commonly refers to non-renewable energy sources, such as fossil fuels.

flammable – In hazardous household products labeling, flammable means the product is easily ignited and capable of burning rapidly.

fog – Condensed water vapor in cloud-like masses lying close to the ground and limiting visibility.

fungus – Any of numerous eukaryotic organisms of the kingdom Fungi, which lack chlorophyll and vascular tissue and range in form from a single cell to a body mass of branched filamentous hyphae that often produce specialized fruiting bodies. The kingdom includes yeasts, molds, smuts and mushrooms.

G

garbage – Another word for solid waste, particularly household waste.

generation – The act or process of producing solid waste.

glass – The container or packaging for many products including beverages and food. Glass can be recycled again and again with no loss in quality or purity. Glass containers go from the recycling bin to a store shelf in as little as 30 days – again and again.

glassphalt – A highway paving material in which recovered ground glass replaces some of the gravel in asphalt.

global warming – An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is most often used to refer to the warming predicted to occur as a result of increased emissions of greenhouse gases.

grasscycling – Refers to a method of source reduction whereby grass clippings are left on the lawn rather than bagged and set out for collection.

greenhouse effect – The trapping of heat on the surface of the earth.

greenhouse gas – A gas that absorbs and retains heat from the sun. Greenhouse gases include methane, ammonia, sulfur, dioxide and certain chlorinated hydrocarbons. A buildup of these gases traps warmth in the Earth's atmosphere changing the global climate.

ground-level ozone – Also known as "bad" ozone, it is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors and chemical solvents are some of the major sources of NOx and VOC. Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema and asthma.

groundwater – Water beneath the Earth's surface, often between saturated soil and rock that supplies wells and springs

H

hazardous – Dangerous.

hazardous household products – Products found around the home, usually in small amounts, that can harm people or the environment. Examples of hazardous household products include paint, pesticides, cleaning supplies and batteries. Hazardous household products are not regulated as hazardous materials by South Carolina law, but are considered part of the municipal solid waste stream. Because of the nature of hazardous household products, they should be stored properly and disposed of separately from solid waste.

humus – Organic material consisting of decayed vegetable matter that provides nutrients for plants and increases water retention. A natural, rich, soil conditioner that is the result of composting.

I-K

incineration – The burning of waste.

incinerator – A furnace for burning garbage or other waste under controlled conditions. A waste-to-energy incinerator burns waste to produce useful energy. Incinerators are federally regulated.

inversion – In the atmosphere, a layer of warm air that lies over a cooler air mass. An inversion traps pollutants close to the Earth's surface.

L

landfill – A large, outdoor site for the burial of solid waste.

lapse rate – The rate of decrease of atmospheric temperature with increase in altitude.

leachate – Water that collects contaminants as it trickles through garbage, pesticides or fertilizer. Leachate can occur in farming areas, feed lots and landfills, and may result in hazardous substances entering surface water, groundwater or soil.

lead – A heavy metal that is hazardous to human health if breathed or swallowed. Its use in gasoline, paints, and plumbing compounds has been sharply restricted or eliminated by federal laws and regulations.

lichen – A fungus that grows symbiotically with algae, resulting in a composite organism that characteristically forms a crust-like or branching growth on rocks or tree trunks.

litter – Waste thrown away in an inappropriate place; improperly stored waste that has escaped from its container; misplaced solid waste. Littering is against the law in South Carolina.

littering – The act of intentionally or carelessly discarding solid waste in an inappropriate place.

M

man-made – Made by human beings rather than occurring in nature.

materials recovery facility (MRF, pronounced 'murf') – A facility that sorts and processes collected recyclables for end users.

methane – The major component of natural gas.

methane gas – A colorless, odorless, flammable and explosive gas produced by decomposing garbage and other organic materials.

MRF – See materials recovery facility.

mulch – A layer of material such as wood chips or straw placed around plants to hold moisture, prevent weeds and enrich the soil.

municipal solid waste (MSW) – The combined residential and commercial solid waste generated in an area. MSW includes paper, cans, bottles, food scraps, yard waste and other items. Industrial process waste, agricultural waste, mining waste and sewage sludge are not MSW.

N

natural – Present in or produced by nature.

natural resources – Valuable, naturally-occurring items such as plants, animals, minerals, water and air that are used by people to help make things such as energy, food, clothing and buildings.

newspaper – A publication, usually issued daily or weekly, containing current news, editorials, feature articles, and usually advertising. Newspapers are printed on newsprint – an inexpensive paper made from wood pulp.

nitrogen – A colorless, tasteless, odorless element that, as a gas, is relatively inert. Nitrogen makes up 78 percent of the atmosphere by volume and occurs as a constituent of all living tissues.

nonpoint source pollution – Contamination or water pollution that comes from many diffuse sources rather than a specific point such as a factory discharge pipe. Also known as runoff pollution.

nonrenewable resources – Natural resources which, because of their scarcity, the length of time required to form them, or their rapid depletion, are considered finite in amount, such as petroleum, coal, natural gas and copper.

O

Office of Solid Waste Reduction and Recycling – An office established by the S. C. Solid Waste Policy and Management Act of 1991. The office is non-regulatory and non-enforcement. It is responsible for public awareness and education, technical assistance and grant funding to local governments, public and private schools, colleges and universities regarding solid waste management issues.

oil – Any of the various kinds of greasy, combustible substances obtained from animal, vegetable and mineral sources. Oils are liquid at ordinary temperatures and can be dissolved in certain organic solvents, but not in water. Petroleum is the most common form of oil.

open burning – The uncontrolled burning of household and other types of waste, e.g., burning household garbage in a barrel or burning leaves. It is against the law to burn household garbage in South Carolina.

open dump – A large open area where trash is illegally thrown. These areas are also called illegal dumps.

organic – An object containing the element carbon, such as plants and animals. Made from living organisms.

organic material – Discarded living material such as yard trimmings and food scraps.

oxygen – A non-metallic element constituting 21 percent of the atmosphere by volume that occurs as a diatomic gas, O2, and in many compounds such as water and iron ore. It combines with most elements, is essential for plant and animal respiration, and is required for nearly all combustion.

P-Q

packaging – The wrapper, container or plastic film used to protect, identify and advertise a product.

particulate matter – Small solid particles, like dust or liquid droplets, that are suspended in the air.

pesticide – Any substance designed to kill living organisms, including insects (insecticides), plants (herbicides), fungi (fungicides), rats and mice (rodenticides), and bacteria (germicides).

petroleum – A natural, flammable, liquid hydrocarbon mixture found principally beneath the earth's surface and processed to make gasoline, natural gas, naphtha, fuel and lubricating oils. Also called crude oil.

photosynthesis – The process by which green plants synthesize carbohydrates from carbon dioxide and water using light as an energy source and releasing oxygen as a by-product.

plankton – The collection of small or microscopic organisms, including algae, that float or drift in great numbers in fresh or salt water and serve as food for larger organisms.

plastic – A material made from hydrocarbons known for its light weight and durability. Plastic can be rigid or pliable.

plastic bottles – Containers used to hold soft drinks, water, milk and other beverages as well as other products such as laundry detergent and shampoo.

point source water pollution – A type of water pollution that results from discharges in receiving water from easily identified points.

poison – A substance that can cause injury, illness or death.

pollutant – A liquid, gas, dust or solid material that causes contamination of air, water, earth and living organisms.

pollute – To make unfit for or harmful to living things, especially by the addition of waste.

polluted runoff – The part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface water carrying pollutants from the air and land into receiving waters.

pollution – Harmful substances deposited in the air, water, or on land, leading to contamination of the environment.

pollution prevention – Identifying areas, processes and activities that create excessive waste products or pollutants in order to reduce or prevent them through alteration or eliminating a process.

population – All of the people inhabiting a specified area; the total number of such people.

population growth rate – A measurement on how quickly or slowly the population is increasing in a specific area.

post-consumer materials – Recovered materials collected from consumer oriented recycling collection system or drop-off center.

pre-consumer materials – Recovered materials obtained from manufacturers, such as cutting scraps from printers. Waste generated before the product reaches the consumer.

precycle – To reduce waste at the source by changing buying habits.

R

raw material – An unprocessed natural resource used in manufacturing.

reactive – In hazardous household products labeling, reactive means a product is unstable and may undergo violent chemical change.

recyclables – Products or materials that can be collected, separated and processed to be used as raw materials in the manufacture of new products.

recycle – To collect, separate, process and market materials so they can be used again.

recycled content – The percent of a product's weight or package's weight that is composed of materials that have been recovered from waste. Recycled content may include pre-consumer and post-consumer materials.

recycling center – Drop-off sites that accept recyclables. Some sites also accept household garbage providing a one-stop service.

recycling loop – The cycle of collecting and processing, manufacturing products with recycled content and purchasing products containing recycled materials. Consumers "close the recycling loop" when they buy recycled-content items.

reduce – To lessen in amount. Reducing trash is a major solid waste management goal.

reject – To refuse to accept, submit to, believe or make use of.

renewable – Energy resources that can be replenished, such as sunlight, water, geothermal heat and biomass.

renewable resource – A natural resource derived from an endless or cyclical source (e.g., sun, wind, trees, fish); with proper management and wise use, replacement of these resources by natural or human-assisted systems can be approximately equal to their consumption.

resource – A supply of something that can be used or drawn upon. Something that can be used to make something else such as wood into paper, bauxite ore into aluminum, old bottles into new ones and sand into glass.

resource recovery – A practice that conserves natural resources by extracting used materials such as paper, glass and metals as well as energy from the waste stream and reprocessing them for reuse.

reuse – The use of a product more than once for any purpose. Examples include using a butter tub as an alternate food container or reusing a coffee can to hold nuts and bolts.

runoff – The portion of rainfall, melted snow or irrigation water that flows across land and eventually runs into streams. Runoff may pick up pollutants from the air or land and carry them to receiving waters.

S

sediment – Soil, sand and minerals washed from land into water, usually after rain. Sediment piles up in reservoirs, rivers and harbors destroying fish, nesting areas and holes in which animals live. It also clouds the water so that needed sunlight may not reach aquatic plants.

signal words – Specific words used on hazardous household products to warn consumers on the proper use, storage and disposal of the product, e.g., CAUTION, EXPLOSIVE, FLAMMABLE, REACTIVE, POISONOUS and TOXIC.

smog – A mixture of air pollution, principally ground-level ozone, produced by chemical reactions in the air of smog-forming chemicals. Smog can harm health, damage the environment and cause poor visibility.

smoke – The vaporous system made up of small particles of carbonaceous matter in the air, resulting from the burning of organic material.

soil – The top layer of the Earth's surface.

solid waste – Garbage or trash. In the S.C. Solid Waste Policy and Management Act of 1991, solid waste is defined as any garbage, refuse, or sludge from a waste treatment facility, water supply plant or air pollution control facility; and other discarded material. It also includes solid, liquid, semi-solid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations and community activities.

solid waste management – The supervised handling, processing and disposal of all solid waste.

source reduction – The practice of designing, manufacturing, buying and using materials (e.g., products and packaging) in ways that reduce the amount of waste generated.

source water – Untreated water from a river, stream or lake that is used to produce clean drinking water.

S.C. Solid Waste Policy and Management Act of 1991 – The first comprehensive law dealing with solid waste management in South Carolina. The law established a policy of promoting solid waste reduction, recycling and reuse of materials before landfilling or incineration. It set a goal of reducing the amount of solid waste being received at municipal solid waste landfills and incinerators by 30 percent, calculated by weight, by May 1997. It also set a goal of recycling 25 percent, calculated by weight, of the total waste stream by May 1997.

stagnant – Not moving or flowing, motionless.

storm drains – Gutters and underground pipes that carry storm and runoff water away from streets into nearby streams, rivers and lakes.

surface water – Surface waters include streams, rivers, ponds, lakes and reservoirs. All fresh water that is not absorbed into the earth (becoming groundwater) or returned to the atmosphere as part of the water cycle is considered surface water. Only about 0.02 percent of all water on Earth is surface (fresh) water.

sustainability – The ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. An environmental protection strategy designed to protect the Earth's resources.

sustainable development – An environmental strategy designed to protect natural resources.

T

temperature inversion – An atmospheric condition in which the air temperature rises with increasing altitude, holding surface air down and preventing dispersion of pollutants.

tipping fees – The price paid to dispose of waste in a landfill.

tires – As used in recycling, passenger car and truck tires (excludes airplane,

bus, motorcycle and special service military, agricultural, off-the-road and-slow speed industrial tires). Car and truck tires are recycled into rubber products such as trash cans, storage containers, rubberized asphalt or used whole for playground and reef construction.

topography – Detailed description or representation of the physical features of a region.

toxic – Capable of causing injury or death, by chemical means, poisonous.

transfer station – A facility where waste is removed from small collection vehicles and loaded onto larger transport vehicles or rail cars.

trash – Material considered worthless, unnecessary or offensive that is usually thrown away.

U

EPA – The acronym for the U.S. Environmental Protection Agency. It is the federal agency of the U.S. government that sets environmental protection and enforcement standards. The EPA was created in 1970 and serves the entire country through its regional offices. South Carolina is in Region IV. The agency's headquarters is in Washington, D.C.

used motor oil – Motor oil that has been used in an engine and is considered to be waste. This oil can be recycled.

V

vermicomposting – The production of compost using worms to digest organic waste.

virgin materials – Any basic material for industrial processes that has not previously been used. Another term for raw materials. Examples include timber or metal ore.

volatile organic compounds (VOCs) – gases released by certain solids or liquids, some of which may have a negative short- and long-term impact on health.

W-X

warning – In hazardous household products labeling, warning means a stronger risk than caution, use with added care.

waste – Anything which is discarded or not considered useful.

waste audit – A process that will provide data on how much and what kind of waste is generated, disposed of and recycled as well as identify opportunities to reduce waste and recycle.

waste minimization – The reduction of the amount of waste generated by pollution prevention methods or recycling of by-products that would otherwise be added to the waste stream.

waste reduction – An important waste management strategy that encourages people to generate less trash through practices such as reuse, recycling and buying products with less packaging.

waste stream – All waste generated in an area or a facility.

waste-to-energy facility: Facility where recovered municipal solid waste is converted into a usable form of energy, usually via combustion.

wastewater: The spent or used water from a home, community, farm or industry that contains dissolved or suspended matter.

water pollution – Generally, the presence of a substance in the environment that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and human health effects. Under the Clean Water Act, the term has been defined as the man-made or man-induced alteration of the physical, biological, chemical and radiological integrity of water.

watershed – A ridge of high land dividing two areas that are drained by different river systems.

water table: The level of groundwater.

waterway – A navigable body of water, such as a river, channel or canal.

wedge – An elongated zone of relatively high atmospheric pressure. Also called ridge.

wetland – Areas covered with water for periods long enough to support plants and animals that thrive in wet soils. The areas may include bogs, swamps, marshes and wet meadows, but it is a misconception that all wetlands have standing water throughout the year.

wind – Moving air.

worm castings – Worm manure.

Y-Z

yard trimmings – Grass clippings, shrub prunings, leaves, tree branches and other discarded material from yards and gardens.