Grades 6–8

An Inside Look at a Recycling Center

Objectives

- Gain greater understanding of the connection between recycling and reducing the amount of waste going into landfills
- Collaborate on a task, practicing critical thinking and research skills
- Strengthen presentation skills
- Improve recycling practices

Overview

Prep Time

15–20 minutes

Lesson Time

Two 40-minute sessions

x2

Tools & Materials

- Grades 6-8 | An Inside Look at a Recycling Center PDF
- Media to show video and/or presentation slides
- Materials for student presentations
- Sticky notes

Start Here

Included in this PDF:

Students will learn about the recycling process that begins after material is collected and brought to a recycling center. They will take a video tour of a recycling center, see how various types of recyclable materials are handled, and learn about the problems that may occur when items are not recycled correctly. Students will develop questions related to the recycling process and the facility, and will work in small groups to find information addressing their questions from credible online sources.

Lesson Prep

1. Watch *Recycling Simplified Teacher Overview | Grades 6-8* if you haven't yet seen it.
2. Print or copy as many as needed of the following materials:
   - Lesson plan
   - Lesson handout
   - Take-home handout
3. Download or stream *Recycling Simplified Student Video | Grades 6-8*, *Recycling Center Video Tour | Grades 6-8*, and the presentation slides for this lesson, and set up technology to show them to students.

   The slides provide age-appropriate images and text to reinforce key content in the lesson. You can extract them from the PDF to show on-screen or print and distribute them as you see fit.
4. Gather visual aid materials and sticky notes.

Optional Materials

- Poster
- Student certificate
- *Teacher's Reference Guide*

All printed materials available online at **RecyclingSimplified.com**

Vocabulary

Bales

Contaminants

Conveyor belt

Eddy current separator

Ferrous metals

Materials recovery facility (MRF, pronounced "murf")

Non-ferrous metals

Optical sensor

Recyclable and non-recyclable

Recycling

Recycling center

Single-stream recycling

The Lesson

1 **If it hasn't been shown before, have students watch *Recycling Simplified Student Video | Grades 6-8.* Through guided discussion, assess and broaden students' understanding of how recycled materials are handled after they are collected.**

When we talk about recycling, what do we mean? How are recyclables collected where you live? What do you think happens to recycled items once they are brought to a recycling center? How would you picture that being done – By hand? Machinery? How could machinery recognize and sort different kinds of items?

2 **Explain to students that today they are going to "tour" a recycling center to see what happens there and why it is important for us to recycle properly.**

3 **Show *Recycling Center Video Tour | Grades 6-8* and discuss with students.**

Did the recycling center look like you had imagined? Larger or smaller than you expected? What are some things you learned from the video that you didn't know before? Was there anything that surprised you?

4 **Distribute the *How Recycling Centers Work* handout to students. Use slides to highlight and discuss the following:**

- Many different types of sorting mechanisms, such as fans, filters, screens, and optical scanners
- Contamination sources and consequences
- Biggest problem items for centers (plastic bags, garden hoses, batteries, light bulbs)

You can use the age-appropriate presentation slides throughout your lesson to reinforce key learning content and objectives.

The *Teacher's Reference Guide* contains a wealth of information on recycling and landfills, as well as fun facts to share with students.

5 Distribute sticky notes to students. Ask them what else they would like to know about recycling centers and to write three questions, one per note.

Example questions:
How much material (weight) does the average center handle on an average day? What kinds of knowledge and skills does someone need to manage a center? Are there subject areas that would be especially helpful?

Some categories might be:
- Technical questions
- Facility questions
- Career questions
- Statistical questions

6 Collect the notes and have the students help you create categories for the questions as you read them aloud. Write the categories on the board and place each note under the appropriate heading, eliminating duplicate questions. The categories used will, of course, depend upon the questions submitted, but you may want to broaden or narrow categories.

7 When the sorting is done, create student teams and assign categories to each team, making adjustments as needed to keep the number of questions per team as equal as possible. Explain that they will be doing online research to find answers to their assigned questions and that each will present its findings to the class.

Before students begin their research, discuss with them how to evaluate the credibility of internet sources.

You may wish to provide some suggestions to get them started, such as the EPA website, the local solid waste management agency or department website, national recycling organizations and coalitions, and information websites like Wonderopolis.org and HowStuffWorks.com.

8 Have each team present its findings to the class, and encourage students to ask questions and/or contribute information related to each team's reports.

Takeaways

Discuss the key information presented by student teams. Point out that when we buy products made from or packaged in recycled materials, we are "closing the recycling loop." If you prepared student certificates, distribute them along with the take-home handout. Tell students they can help teach their families about recycling.

Curriculum & Standards Connections

Science – Next Generation Science Standards (NGSS)

MS-ESS3-3: Earth and Human Activity

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Disciplinary Core Idea ESS3.A: Natural Resources

Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes.

Disciplinary Core Idea ESS3.C: Human Impacts on Earth Systems

Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

Connections to Engineering, Technology, and Applications of Science:

All human activity draws on natural resources and has both short- and long-term consequences, positive as well as negative, for the health of people and the natural environment.

Social Studies – National Council for the Social Studies (NCSS)

NCSS Theme: People, Places, and Environments

The study of people, places, and environments enables us to understand the relationship between human populations and the physical world.

NCSS Theme: Science, Technology, and Society

Science, and its practical application, technology, have had a major influence on social and cultural change, and on the ways people interact with the world.

English Language Arts/ Literacy – Common Core State Standards (CCSS)

Reading Informational Text

- **CCSS.ELA-Literacy.RI.6.1**
- **CCSS.ELA-Literacy.RI.7.1**
- **CCSS.ELA-Literacy RI.8.1**

Cite textual evidence to support analysis of what the text says explicitly and inferences drawn from the text.

Curriculum & Standards Connections

Speaking & Listening

- **CCSS.ELA-Literacy.SL.6.1**
- **CCSS.ELA-Literacy.SL.7.1**
- **CCSS.ELA-Literacy.SL.8.1**
  Engage effectively in a range of collaborative discussions (one-on-one, groups, and teacher-led)
- **CCSS.ELA-Literacy.SL.6.5**
- **CCSS.ELA-Literacy.SL.7.5**
- **CCSS.ELA-Literacy.SL.8.5**
  Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

Science & Technical Subjects

- **CCSS.ELA-Literacy.RST.6-8.1**
  Cite specific textual evidence to support analysis of science and technical texts.
- **CCSS.ELA-Literacy.RST.6-8.7**
  Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- **CCSS.ELA-Literacy.RST.6-8.9**
  Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

How Do Recycling Centers Work?

What Is Recycling?

Recycling is a series of activities that includes the collection of used, reused, or unused items that would otherwise be considered waste; sorting and processing those items into raw materials; and remanufacturing the recycled raw materials into new products. Consumers provide the last link in recycling – sometimes referred to as "**closing the recycling loop**" – by purchasing products made from recycled content.

Almost anything can be recycled, but certain things are more common and more cost-effective. These are the materials handled by most recycling centers. There are also specialized recycling facilities that handle less common materials, items that require specific safety measures, etc.

The Recycling Process

If your community allows you to place all your recyclable materials in the same container, that is called “single-stream recycling.” Single-stream recycling means that you don’t need to separate different materials such as paper and plastic into separate bins. That sorting process takes place at the recycling center.

At the recycling center, materials typically begin their journey on a conveyor belt where pre-sorting takes place. As the items pass by, employees at stations along the belt work quickly to weed out non-recyclable items that will cause problems in the center’s machinery. From there on, most of the sorting is done mechanically using various types of machinery.

As the conveyor belt continues, **screens are used to pull out newspaper, cardboard, and other paper items**, while heavier items continue on.

Metals are recovered next. Ferrous metals, such as iron, steel, and tin, are pulled out by powerful magnets. Aluminum, which is non-ferrous and therefore not attracted to magnets, is usually separated out by a large spinning drum called an eddy current separator. Eddy currents create strong fields of energy that do the opposite of magnets – they push hard on aluminum items like cans, forcing them off the conveyor belt and into a different collection area.

Next to be sorted are plastics. Some plastics, such as beverage bottles, are easy to recycle, while others, like polystyrene, are typically thrown away. As the plastics continue along the belt, sophisticated optical sensors recognize and sort the different types of recyclable plastics.

When the sorting process is completed, each type of material is compressed and made into bales. For quality control, the bales are inspected to make sure the materials have been properly sorted and that contaminants – non-recyclables – have been removed. Recyclables are bought and sold, just like other materials used in the manufacturing process. The baled recyclables are sold and turned into new products.

Here are some cool things to know about recycling centers:

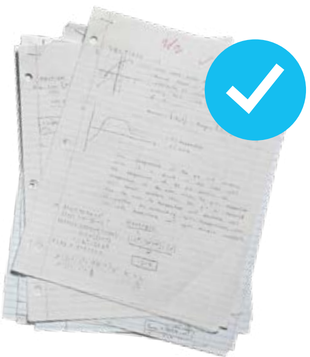
- They can process as much as 350 tons of recyclables each day.
- A typical recycling truck can hold up to 12,000 pounds of material in one load, the contents from about 700 full recycling containers collected from homes.
- Special optical sensors are used to sort plastic bottles, jugs, and other containers. They use light to “see” color, density, and other characteristics of these items.

Recycling: Simple as 1-2-3

1

Know what to throw

ALWAYS recycle these items:



Paper

Flattened Cardboard

Metal Cans

Plastic Bottles & Jugs

NEVER recycle these items:

Plastic Bags

Soiled Paper

Clothes & Shoes

Polystyrene

Greasy Pizza Boxes

Food

Batteries & Electronics

Yard Waste

Toys

2

Empty. Clean. Dry.®
Make sure your recyclables are empty, clean, and dry.

3

Don't bag it
Never bag or bundle your recyclables.

Recycling Simplified

Expert Tips

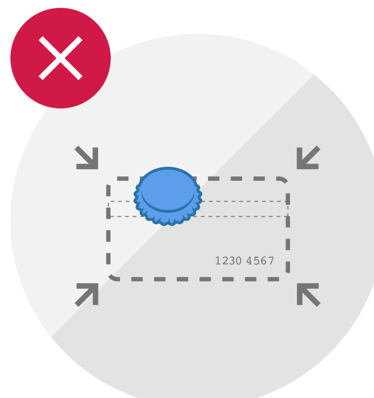
Learn to avoid common mistakes, tell the difference between what's recyclable and what's not, and use best practices for keeping your recycling clean and simple. You can really make a difference.

Separate combined materials
Keep materials in separate categories — hard plastics, metal cans, paper and cardboard.

Keep your recyclables dry – less than a teaspoon of liquid
Don't allow any more than a teaspoon of liquid to collect in cans, bottles, packages or jugs. Recyclables should always be empty, clean and dry.

If your recycling container smells, it's contaminated
If your recycling container stinks, it's contaminated with non-recyclable waste. Remove the waste and rinse out the bin.

If you can poke your finger through it, don't recycle it
If you can push your finger through it, the plastic is too soft and flimsy to be recycled. It would get tangled in the sorting machinery and jam up the operation.



Never recycle anything smaller than an ID card
If the material is too small to go through the sorting equipment, it could get jammed and shut down the whole operation.

Some things can't be recycled in your bin at home, but they can be recycled or reused with proper handling:

Plastic Bags
Plastic bags can often be taken to the supermarket to be recycled with their specialized equipment. Ask your grocery store manager for more details.

Clothing, Shoes & Toys
While these items can't be recycled, they can be reused. Consider donating them to your local thrift store where they can be loved again by someone new!

Food Waste
Contact your local municipality to see if they have a composting program. If not, you can learn about creating your own compost online.

Batteries & More
Batteries, electronics and light bulbs cannot go into your recycling container and require special handling. Check local programs for disposal options.

Pizza Boxes
If you pull the greasy bottom apart from the clean top, you can recycle the top – and trash the rest!

Contact your local recycling program to learn more about specific recyclables and non-recyclables in your city.

Recycling: Simple as 1-2-3

1

Know what to throw

Always recycle these things:

Paper

Flattened Cardboard

Metal Cans

Plastic Bottles & Jugs

2

Empty. Clean. Dry.®

Make sure your recyclables are **empty, clean, and dry.**

3

Don’t bag it

Never bag or bundle your recyclables.

Contact your local recycling program to learn more about specific recyclables and non-recyclables in your city.

Certificate *of* Achievement

This certificate recognizes your achievement of completing the *Recycling Simplified* Education Program and your commitment to being an expert recycler in our community.

RECIPIENT

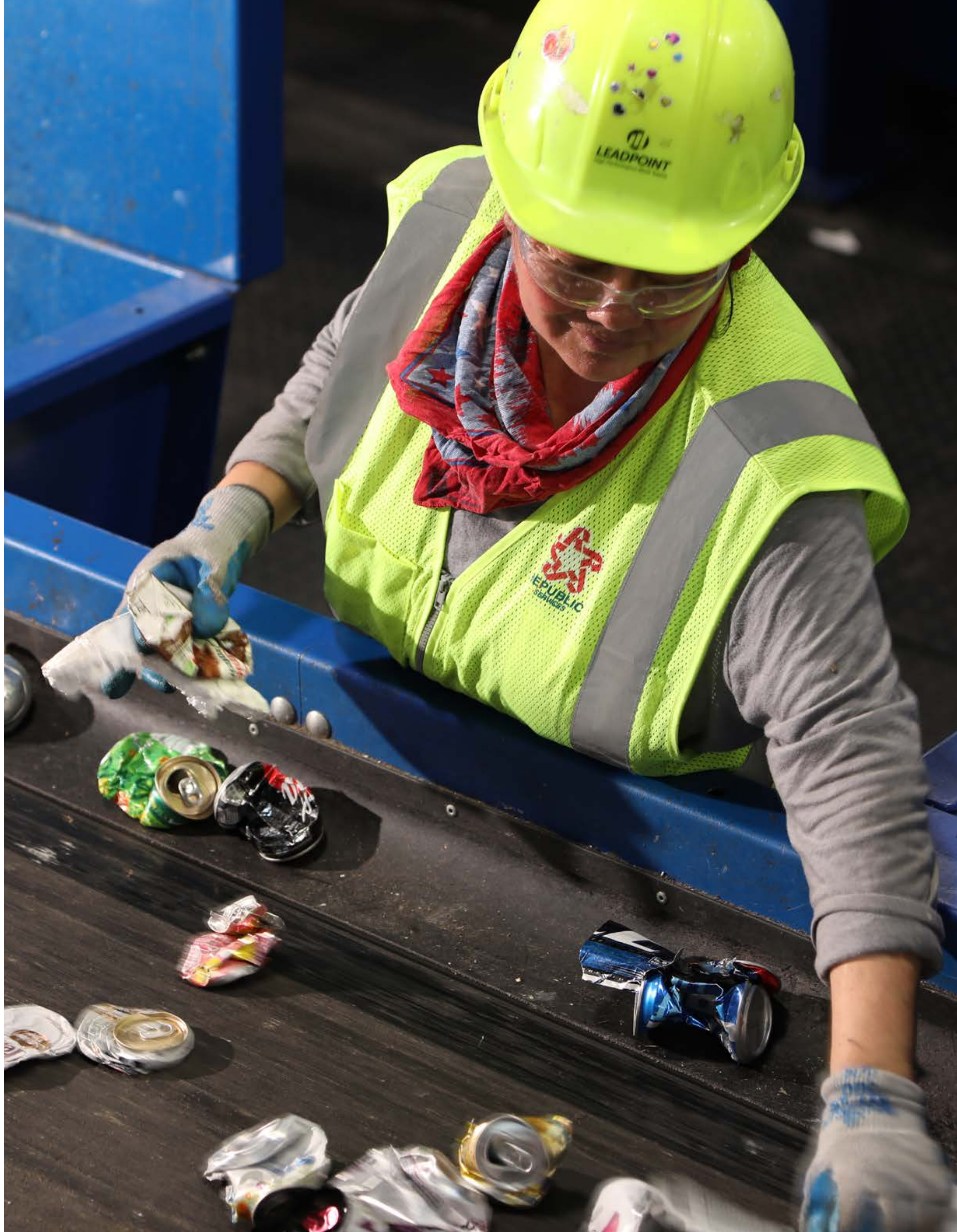
DATE

PRESENTER

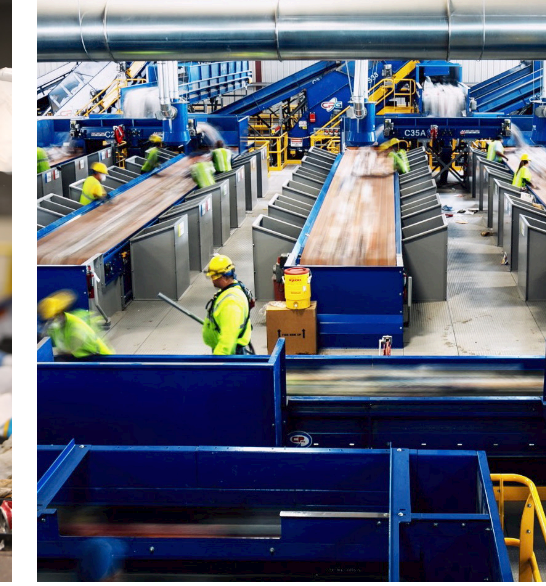
Recycling Simplified

Recycling Process

An Inside Look at a Recycling Center




RECYCLING ONLY
In many places, people place their recycling and trash bins at the curb for pick up.



START

1. Individually placed recyclables are added to the recycling container and taken to the curb for pick up and delivery.

2. Trucks deliver the recyclables to a state-of-the-art facility, dropping them on the tipping room floor.

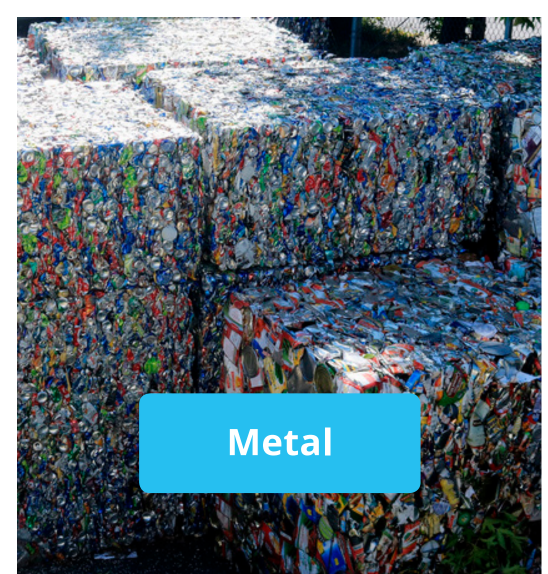
3. Employees hand-sort the materials first, removing any contaminants, such as food waste, diapers and plastic bags.

4. Machinery continues the sorting process, separating paper, cardboard, plastics and metal cans.

5. The materials are separated, flattened and baled.

6. This process produces baled materials that can be purchased.

FINISH




This is a
recycling center.
C35A
CPS47

Recycling centers sort materials using multiple steps and types of machinery.

Trucks and forklifts deliver and move material on the tipping floor.

Employees sort the material first, then machines like vacuums, magnets, and optical sorters categorize the recyclables.

Advanced technology allows access and control from anywhere on-site.

Baling machines prepare the recyclables to be sold to manufacturers and made in to new products.

You can purchase many products made from recycled materials, which closes the recycling loop.

Recycling Simplified

Education Program

Teacher's Reference Guide

Hello!

Welcome to Recycling Simplified, an all-in-one online education program that supports PreK–12 students' real-world learning about recycling and its impact on protecting our environment and conserving natural resources.

In the Recycling Simplified Education Program at RecyclingSimplified.com/for-educators, you'll find everything you need to teach your students about recycling, including step-by-step lesson plans — each of which contains an engaging and hands-on classroom activity — as well as supporting materials, including videos, student certificates, and handouts to extend student learning from school to home. Republic Services® — a leader in the non-hazardous solid waste industry and included on the 2019 World's Most Ethical Companies® list — is pleased to make this program available to you, free of charge.

These lesson plans and activities have been carefully developed and reviewed by educators to be easily incorporated into your existing curricula. Lessons are connected to grade-appropriate standards in multiple disciplines, such as science and STEM, English language arts and literacy, math, and social studies. Lessons for each grade range build on students' previously gained knowledge about recycling to help them gain greater understanding of the broader environmental, sustainability, and societal issues related to our use of natural resources.

Why is it important to teach your students about recycling?

Educators are key to students' success in school and life, helping them develop the knowledge, skills, and character needed to thrive in and contribute to our society. Today, that society is global, interconnected, and constantly changing.

We know that many lifelong beliefs and behaviors gain their foothold in childhood. So, when you deepen your students' understanding of the impact of recycling, you are helping shape our environment and the world around us for generations to come.

Thanks to you, maybe one of your students will make a breakthrough in cleaning up our oceans, reducing air pollution, or finding new and innovative ways to use recycled materials — you never know!

The Ethisphere® Institute is the global leader in defining and advancing the standards of ethical business practices that fuel corporate character, marketplace trust, and business success.

Table of Contents

What Is Recycling?

Recycling is a fairly simple concept – take something that isn't useful anymore and make it into something new instead of just throwing it away.

The recycling process consists of a series of activities beginning with the collection of used, reused, or unused items that would otherwise be considered trash; sorting and processing the recyclable products into raw materials; and remanufacturing the recycled raw materials into new products.

Consumers provide the last link in recycling by purchasing products made from recycled content. This is referred to as "closing the recycling loop."

Why Is Recycling Important?

Recycling has many benefits for both our environment and our economy. Here are a few:

- **Recycling helps to conserve natural resources such as land, trees, and minerals.** For example, the more paper we recycle, the fewer trees that need to be replenished. Recycling also helps prevent the excess mining of ores such as aluminum by recycling the same resource over and over again.
- **Recycling conserves energy.** It takes more energy to make something out of raw materials than something that has already been used. For example, making paper from trees uses approximately 7,000 gallons of water, but it only takes 360 gallons to make paper from recycled paper fiber.
- **Recycling reduces pollution.** When manufacturers use recycled materials to make their products, it creates less pollution than making them from raw materials. It also reduces the amount of greenhouse gases produced in the manufacturing process.
- **Recycling saves landfill space.** In the U.S., we produce roughly 262 million tons of trash each year. Slightly more than half of that is going into landfills. By recycling, we help to conserve space inside the landfill for those items that can't be recycled.
- **Recycling provides jobs and generates revenue.** Recycling and reuse businesses in the U.S. employ approximately 1 million people and generate about $236 billion in annual revenue.

History of Recycling

People often think of recycling as a modern concept, but it has been around for thousands of years. Archaeologists have found evidence of recycling as early as 400 BCE. In the modern era, prior to the Industrial Revolution and mass production, household recycling and reuse were common practices because it was less expensive than buying new things.

The Industrial Age changed all that. Power-driven machinery and mass production made it easier and cheaper to produce – and purchase – goods. When we are able to buy new items at a low cost, it often makes sense to throw away old products and replace them with new ones. Unfortunately, this leads to a "disposable" culture and the challenges of disposing with the country's growing amount of trash.

The following page takes a look at the history of recycling in the U.S., compiled by the Environmental Protection Agency (EPA).

History of Recycling

LATE 1800s TO EARLY 1900s

Before the days of mass production, the economic climate required people to routinely repair, reuse, and recycle their material possessions.

- Scrap yards recycled old cars, car parts, and metal goods.
- The paper industry used old rags as its main source of fiber until the late 19th century.
- Retailers collected used cardboard boxes for recycling.

1914–1918 AND 1939–1945 (WORLD WAR I AND WORLD WAR II)

Patriotism inspired nationwide scrap drives for paper, rubber, and other materials to help the war effort. Many farms melted down and recycled iron or metal pieces of rusted machinery for warships, vehicles, and other military machines.

People even saved grease from meat they cooked, which was used to make munitions.

1960s

Interest in recycling waned as America's peacetime economy soared. Rising incomes and widespread, affordable, mass-produced goods created the "disposable" society.

1970s

Environmental awareness rejuvenated the nation's interest in recycling.

The U.S. Environmental Protection Agency (EPA) was established December 2, 1970.

The first Earth Day was held in 1970, significantly increasing recycling awareness. In the years following, 3,000 volunteer recycling centers opened and more than 100 curbside collection programs were established.

The EPA and some state agencies developed guidelines, technical assistance, and targets for local recycling efforts.

1980s

The national spotlight fell on monitoring trash due to increased awareness of pollution resulting from poor waste management.

Federal, state, and local governments became more and more involved in waste management.

Waste management firms began to offer recycling programs in connection with proposals for new incinerators or landfills.

History of Recycling

1990s

Industry expanded the range of products made from recycled materials instead of virgin raw materials.

The national recycling rate reached double digits (28.2 percent in 1998).

2000s

The most recent EPA-published report on recycling and trash disposal, from 2015, offers the following data:

- The total amount of municipal trash going to landfills has dropped 7.6 million tons since 1990, from 145.3 million to 137 million tons in 2015.
- The national recycling rate has become static at about 35 percent for recycling and composting combined; the rate for recycling alone is about 26 percent.
- Paper and cardboard materials now represent the largest component of solid waste, approximately 26 percent.

Schools and other education facilities are often among the largest waste generators in their city, county or state. At least 40 percent of the typical school waste stream is paper, the largest single component of all school waste.

How Recycling Works

The primary steps in the recycling process are: collecting recyclables, processing recyclable materials, remanufacturing new products from the materials, and purchasing recycled products. These steps create a closed loop that helps ensure the overall success and benefits of recycling.

Collecting Recyclables

Across the country, communities establish their own procedures for how and where recyclables are collected. This is often dependent on the location and capabilities of nearby recycling centers. The most common method today is curbside collection. Residents place their recyclables on their curbs to be picked up by municipal or commercial collectors. They may be provided a single large rolling bin into which all recyclables are placed, referred to as single-stream recycling, or smaller bins for sorting household recyclables by type (plastic, paper, etc.).

Some communities have drop-off centers where residents can bring their recyclables. Less common are buy-back centers, where manufacturers buy their products back from consumers and remanufacture the used products into new products. Other communities, as well as a few states, require consumers to pay a deposit when they purchase products in specified types of containers. The deposit is refunded when the consumer brings back the empty container to the location where it was purchased or other specified locations that collect recyclables.

Processing Recyclable Materials

At the recycling center, the materials that have been collected are sorted by type (plastic, metal, etc.), and non-recyclables are removed. Each type of recyclable material is broken down so it can be used for manufacturing, and then compacted into large bales. The materials are then bought by manufacturers to use in making new products.

Remanufacturing New Products

More and more products are being made using recycled materials. Recycled plastics are the most versatile, with end products ranging from carpeting to backpacks. Cardboard and newspaper are used to make new boxes and paper, as well as other products like tissue, paper towels, and egg cartons. Recycled aluminum cans are among the most successful recyclables because they can be recycled again and again and take very little time to process. In fact, aluminum cans are remade into new cans in as little as 60 days. Glass can also be recycled over and over to make new glass containers as well as products like fiberglass and road filler, but not all communities permit glass items to be placed in recycling containers for collection. (For more examples of how recyclable materials are used, see the section on "What Can Be Made from Recyclables: Before and After.")

Buying Recycled Products

For the recycling process to succeed, we need to purchase and use products made from recycled materials whenever possible. This is often referred to as "closing the loop." To appeal to consumers, many companies now highlight their use of recycled materials in their product and/or packaging, and it is important to understand the terms they use in doing that. The Federal Trade Commission (FTC) has issued guidelines to ensure that these products are properly labeled.

- If a product is described as being made with "recycled content," it must be made from materials recovered or otherwise diverted from the waste stream. This recovery can occur during the manufacturing process or after consumer use (the purchase and use of recycled materials).
- Products labeled "recyclable" are just that; they can be collected for use in manufacturing new products. They do not necessarily contain recycled materials.
- Likewise, products encased in recycled or recyclable packaging do not necessarily contain recycled materials themselves.

Recycling Simplified

In households across the U.S., people are asking about the correct way to recycle. Your own family – and your students' families – have probably asked questions like these from time to time: *"Is this recyclable?" "It's okay to put my recyclables in a bag, right?" "Do I need to do anything to this pizza box before I recycle it?"*

Recycling started as a relatively easy concept — converting discarded resources into reusable material. But over time, two things happened that made recycling more confusing — manufacturers changed the ways of packaging their products and communities across the country began using different recycling guidelines. As a result, many people today are unsure about what to recycle, what not to recycle, and how to recycle.

The one constant is that people genuinely want to recycle. They understand how important it is in protecting our environment. This commitment has, unfortunately, led to an increase in "aspirational recycling" (sometimes called "wish-cycling"). For many people, this means placing an item in a recycling container that does not belong, or an item that is soiled with food, in the hope or mistaken belief that it can be recycled. The unintended consequence of these good intentions is an unprecedented level of contamination in the nation's recyclables. Contamination refers to including non-recyclable materials such as clothing in a recycling container as well as placing food-soiled items like used paper plates in the container – but the latter has far more harmful consequences. Just one ketchup bottle with ketchup left in it could contaminate an entire truckload of otherwise recyclable material, sending it all to the landfill.

To help make things less confusing, Republic Services provides these guidelines for recycling:

It's as Simple as 1-2-3

1. **Know what to throw.** Become familiar with the four major categories of recyclables — paper, flattened cardboard, metal cans, and plastic bottles and jugs.
2. **Empty. Clean. Dry.®** Be sure your recyclables are empty, clean, and dry before you put them in the recycling container. Rinse to remove any residual material. Clean recyclables don't contaminate other types of materials, so the recycle stream stays out of the landfill.
3. **Don't bag it.** No bags go in the recycling container, and never put recyclables in bags or containers.

Every community has its own rules and requirements concerning how and where recyclables are collected as well as what items are accepted. Since the Recycling Simplified Education Program was designed for teachers nationwide, it is important that you find out the recycling rules for your particular location and apply them in the lessons. Check with your local municipal government for information. Another source of information on local recycling services is the Earth 911 website [https://earth911.com]. Individuals can search for recycling services by zip code, which is particularly helpful when you're interested in recycling items that require special handling, like electronics, batteries, computers, etc.

Recyclable and Non-Recyclable Items

Make sure you're putting the right materials in your recycling container. The four main categories of recyclables are paper, cardboard, metal cans, and plastic bottles and jugs. Examples of each category are shown below.

Paper and Cardboard 	Envelopes (no window) Newspapers Cereal box (liner removed) Cardboard box, flattened Paper bags Manila envelope, no padding Magazines Office paper Miscellaneous paper, flyers, etc.
Metal Cans 	Metal can (no label) Soda can Aluminum tray
Plastic Bottles and Jugs 	Plastic water bottle with the lid on Condiment bottle (ketchup, salad dressing) Laundry detergent container Plastic milk jug
Non-Recyclables 	Banana peel Paper towels, napkins Plastic cup Loose cap (small) from plastic bottle or jug Juice box Paper "to-go" coffee cups Batteries Light bulbs Spray cans Plastic grocery bags Polystyrene container Clothing, shoes Garden hose Pencil Yard waste (grass cuttings, weeds, etc.)

This chart shows the materials most commonly accepted for recycling. Each community has its own guidelines on materials accepted for recycling and may accept materials not shown here, such as glass. Please check with the agency responsible for waste management and recycling in your community.

What Can Be Made from Recyclables: Before and After

BEFORE	AFTER
Paper and Cardboard 	Food boxes, such as cereal or cracker boxes Tissues Pencil barrels Egg cartons Paperback books Shopping bags Newspapers (from newspapers) Notebook paper
Aluminum cans 	New cans Pots, cookie sheets, and other cooking equipment Foil wrap Barbecue grills Baseball bats and lacrosse sticks License plates Electronic wiring Cars
Steel cans 	New cans Construction beams Automotive parts Roadway guard rails Appliances Lighting fixtures and other home furnishings Roofing materials
Plastics 	Insulation for sleeping bags, ski jackets, etc. Shoes and clothing Backpacks Carpeting Playground equipment Bike racks Car bumpers Park benches Snowboards Toys Kitchenware, such as mixing bowls and cutting boards Countertops Traffic cones

This chart shows the materials most commonly accepted for recycling. Each community has its own guidelines on materials accepted for recycling and may accept materials not shown here, such as glass. Please check with the agency responsible for waste management and recycling in your community.

Interesting Facts and Figures

Trash

- On average, each one of us produces 4.5 pounds of solid waste each day. For the entire U.S. population, that adds up to about 262 million tons of trash each year.[1]
- Here are some other ways to look at the amount of trash we produce.[2]
  - The amount of trash we each produce yearly comes to about 1,640 pounds – about the weight of an average cow.[3]
  - For a family of four, the yearly total comes to about 6,500 pounds – nearly the weight of a hippopotamus.[4]
  - A typical family consumes 182 gallons of soda, 29 gallons of juice, 104 gallons of milk, and 26 gallons of bottled water a year. That's a lot of containers – and a lot of opportunities for recycling.[5]

Aluminum and Steel

- Recycling one aluminum can saves enough energy to keep a 100-watt bulb burning for almost 4 hours or running your television for 3 hours.[6]
- Twenty years ago, it took 19 aluminum cans to make a pound. Today's cans are lighter, and it now takes 29 cans to make a pound – wasting less aluminum and saving energy.[7]
- A recycled aluminum can is back on a grocery shelf as a new can in as little as 60 days.[8]
- Steel is the most recycled material in the world, with a recycling rate of 86 percent. In North America, all steel products contain recycled steel.[9]
- Like all metals, aluminum and steel can be recycled indefinitely. In fact, nearly 75 percent of all the aluminum produced since 1888 is still in use today.[10]
- Enough energy is saved each year by recycling steel to supply the city of Los Angeles with almost a decade's worth of electricity.[11]
- Recycling one ton of steel saves 2,500 pounds of iron ore, 1,400 pounds of coal, and 120 pounds of limestone.[12]
- The Gateway Arch in St. Louis used 900 tons of stainless steel in construction — at the time, more stainless steel than any project in history. Enough stainless steel is recycled in the United States each year to build nearly 1,500 Gateway Arches.[13]

Paper

- Each ton of recycled paper can save 17 trees, 380 gallons of oil, 3 cubic yards of landfill space, 7,000 gallons of water, and 4,000 kilowatts of energy – enough to heat an average home for 6 months.[14]
- The 17 trees that would be saved (above) can absorb a total of 250 pounds of carbon dioxide from the air each year. Burning that same ton of paper would *create* 1,500 pounds of carbon dioxide.[15]
- We use more than 85 million tons of paper and cardboard per year In the U.S.[16]
- We use approximately 65 billion sheets of paper each day. That's enough paper to fill the 838 miles of shelves in the Library of Congress nearly five times.[17]
- If all our newspaper was recycled, we would save about 250 million trees each year. If each of us recycled just one-tenth of our newspapers, we would save about 25 million trees a year.[18]
- The amount of wood and paper we throw away each year is enough to heat 50 million homes for 20 years.[19]
- The construction cost of a paper mill designed to use waste paper is 50 to 80 percent less than the cost of a mill using new pulp.[20]

Interesting Facts and Figures

Plastics

- A single recycled plastic bottle saves enough energy to run a 100-watt bulb for 4 hours. It also creates 20 percent less air pollution and 50 percent less water pollution than would be produced in making a new bottle.[21]
- Five recycled plastic soda bottles provide enough fiber to make one extra-large T-shirt, one square foot of carpet, or filling for one ski jacket.[22]
- It takes approximately 1,050 milk jugs and other bottles, or 400 pounds of plastic bottle caps, to make a 6-ft. recycled plastic park bench.[23]
- In the U.S., we use 2.5 million plastic bottles every hour. Most of them are thrown away rather than recycled.[24]
- Recycling one ton of plastic saves the equivalent energy usage of a two-person household for a year.[25]
- We use over 500 million plastic straws every day in the U.S., which would fill over 127 school buses each day or more than 46,400 school buses each year! Most of them end up in our oceans. In 2018, Seattle banned single-use plastic straws and utensils in food service, and other cities are considering or in the process of doing the same.[26]

Miscellaneous

- If the U.S. recycling level reaches 75 percent, that would be equivalent to removing 55 million cars from our roads each year, in terms of reducing the amount of carbon dioxide in our air.[27]
- Much of New York City is built on landfills, including the West Side Highway and FDR Drive. The most recent addition was Battery Park City, built on top of landfill and waste from the construction of the original World Trade Center in 1973. And Ellis Island grew from its original size of about 3 acres to its current 28 acres thanks to a landfill that began in the 1890s, soon after the dedication of the Statue of Liberty, which stands on nearby Liberty Island.[28]
- We have all seen the three-arrow image universally recognized as the recycling symbol, but you may not know about its origin. In 1970, the Container Corporation of America (CCA) sponsored a design competition for a graphic symbol that would be used on recycled paper products. More than 500 designs were submitted. The winning design, which was submitted by a graduate student named Gary Anderson, was given over to the public domain and has never been copyrighted. Anderson went on to a distinguished career as an architect and urban planner.[29]

  Each of the three arrows can represent a step in the process that forms the recycling loop: (1) collecting recyclables, (2) processing recyclable materials and remanufacturing new products, and (3) buying recycled products. (For more information about the recycling process, see earlier "How Recycling Works" section.)

Interesting Facts and Figures

Sources

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[29]"Recycle Man," Red Flag Magazine, Spring/Summer 2012. redflag.org/magazine/issue-6/recycle-man

Key Vocabulary and Recycling Terms

Common Recyclable Materials and Related Terms

Recyclables
Discarded materials that still have useful physical or chemical properties after serving their original purpose and can be reused or remanufactured to make new products. Plastic, paper and cardboard, and steel and aluminum cans are examples of recyclable materials. Glass can also be recycled, but not all communities permit glass items to be placed in recycling containers for collection.

Non-recyclables
Materials that cannot be recycled or are not cost-effective to recycle. Typically refers to items and materials that cannot be placed into a recycling container for collection, such as plastic bags, disposable utensils and foam cups, clothing, etc.

Aluminum
Lightweight durable metal that makes up approximately 7 percent of the Earth's crust. Aluminum is used in a variety of ways, but perhaps most familiarly in the manufacture of soft drink cans.

Bauxite
Rock in which aluminum is found in high concentrations.

Cardboard
Thin, stiff material made of paper pulp and used in making cartons and other forms of packaging.

Fibers
The long, thick-walled cells that give strength and support to plant tissue. The fibers of wood and cloth are used in making paper.

Glass
Hard, brittle, generally transparent or translucent material typically formed from the rapid cooling of liquefied minerals. Most commercial glass is made from a molten mixture of soda ash, sand, and limestone.

Metal
Element that usually has a shiny surface, is a good conductor of heat and electricity, and can be melted down, fused, or hammered. Metals include iron, gold, silver, copper, magnesium, tin, and aluminum, and can be recycled indefinitely.

Paper
Thin material made of pulp from wood, rags, or other fibrous materials and used for writing, printing, or wrapping.

Plastic
Material made from petroleum and capable of being molded, extruded, or cast into various shapes. There are many different kinds of plastic made from different combinations of compounds.

Pulp
Mixture of fibrous material such as wood, rags, and paper, that is ground up and moistened to be used in making paper or cardboard.

Steel
Strong, durable metal made of iron and carbon, and often other metals, to achieve different properties. Steel is often used as a component in cans and as a structural material in construction.

Tin
Soft metal, capable of being easily molded and having a low melting point. Tin is often used together with other metals in making cans for packaging.

Definitions are applicable to all grade levels unless specified.

Key Vocabulary and Recycling Terms – cont.

Audit/"trash audit"
Collecting, weighing, and examining trash produced in a specified time period (day, week, etc.) to identify portion that is recyclable.

Bales
Large blocks – pressed, compacted, and bound – of a single recyclable material so it is ready for transport.

Biodegradable
Organic materials – such as wood, food scraps, paper, and grass clippings – that decompose or decay under normal conditions.

Byproduct
Excess material or waste produced in addition to the primary product. Sludge is a byproduct from the manufacture of paper, for example. Many manufacturers look for innovative ways to reuse or recycle the byproducts created during the production process to reduce waste.

Closing the recycling loop
Purchasing products made from recycled materials. Recycling is a cycle. It is not enough simply to collect recyclables for manufacture into new products. People must then buy products made with recycled content, thus closing the loop.

Combustion / incineration
A rapid chemical process that produces heat, gas, ash, and usually light through burning. This process is one option for the disposal of municipal solid waste. It can also be used as a treatment or disposal option for hazardous waste. See combustor, waste-to-energy.

Compost / composting
The controlled biological decomposition of organic material; this material is broken down into compost (also known as humus). Compost can improve the texture, water-retaining capacity, and aeration of soil.

Conservation
Protection (from harm or destruction) or wise use of natural resources that ensures their continuing availability to future generations; the intelligent use of natural resources for long-term benefits.

Contaminant / contamination
A substance, or the addition of a substance to another substance, that produces a harmful effect on the second substance and makes it unfit for its intended use. For example, motor oil is a contaminant of water. In recycling, food residue would be a contaminant of plastics, paper, etc.

Conveyor belt
Often made of rubber, large conveyor belts transport materials through the sorting equipment at a recycling facility.

Data
Information gathered to find the answer to a scientific question.

Decay
The gradual breakdown of dead organic material.

Decompose / decomposition
The process of materials being broken down into basic components, making nutrients more available to plants; refers to materials such as food and other plant and animal matter. Decomposition happens all the time in nature and in human-managed systems, such as compost bins.

Disposable
Products or materials that can be or are usually thrown away after one use or a limited amount of time, such as paper plates.

Disposal
The throwing away of unwanted materials. These materials are placed in a landfill or combusted (burned) rather than recycled, reused, or composted.

Dump
Site where garbage is disposed of in an unmanaged, uncovered area. Landfill requirements and restrictions have made dumps illegal in the U.S.

Eddy current separator
Component of the recycling facility process using a powerful magnetic field to separate non-ferrous metals from other recyclables. In contrast with the magnets that attract ferrous metals like steel cans, the eddy current separator pushes or throws non-ferrous metals like aluminum cans off the line and into a container.

Energy
The capacity for a system or object to do work. Energy generated from a landfill incineration system can be harnessed to provide electrical power for communities.

Environment
The external conditions that influence and affect the development and survival of organisms and populations; usually refers to air, water, land, plants, and animals.

Environmental impact
Effect of an activity or substance on the environment.

Key Vocabulary and Recycling Terms – cont.

Ferrous/non-ferrous metals
Ferrous metals contain iron, which means they are attracted by magnets, while non-ferrous metals do not contain iron. Steel and cast iron are ferrous metals; aluminum, copper, and tin are nonferrous metals.

Fossil fuels
Fuels such as petroleum or coal, formed over millions of years from the remains of ancient organic materials.

Greenhouse effect
The excessive trapping of heat in the Earth's atmosphere by a blanket of gases. These gases, such as methane and carbon dioxide, exist naturally and help maintain the Earth's normal surface temperature. But when they increase in volume as the result of certain human activities, they contribute to global climate change.

Greenhouse gas
Any gas, such as methane and carbon dioxide, that has a negative effect on the environment by contributing to the greenhouse effect.

Groundwater
The fresh water found beneath the Earth's surface; flows naturally to the surface via springs and can also be collected through wells, etc. Many communities depend on groundwater for their drinking water.

Humus
The organic portion of soil; a substance resulting from the decay of plant and/or animal matter by microorganisms. See compost.

Incineration
See combustion / incineration.

Inorganic
Any material that is not composed of matter that was once living or produced by a living organism.

Landfill (PreK-2)
A special place where garbage is safely buried so it won't hurt the soil or water.

Landfill
A site where waste is managed to prevent or minimize health, safety, and environmental impacts; also referred to as a sanitary or modern landfill. Soil is excavated and an impermeable liner, made of plastic or clay is installed, to prevent the contamination of groundwater. Waste is deposited in different cells and covered daily. Modern landfills have monitoring systems to track performance and collection systems for leachate and methane gas. There are approximately 2,000 active municipal solid waste (MSW) landfills in the US, which are designed to accept primarily household waste. There are also other landfills specially designed to handle industrial waste or hazardous waste. Even after landfills are closed, they continue to be monitored for as long as 30 years as required by EPA regulations.

Landfill cell
A fixed area in a landfill where waste is disposed of, compacted into the smallest space possible, and then covered on a daily basis.

Leachate
Liquid that passes through and escapes from a landfill; it is created from rainfall and liquids present in the waste and collects contaminants as it seeps down through the soil and garbage. A sanitary landfill has a collection system for collecting and treating leachate to prevent it from contaminating groundwater.

Leachate collection system
System of layers and pipes designed to capture leachate and pump it to the surface for treatment.

Liner
Impermeable layer of plastic or clay placed in a landfill to prevent leachate from escaping and contaminating surrounding groundwater.

Materials recovery facility (MRF)
Processing plant where recyclables are sorted and prepared as marketable commodities for manufacturing.

Methane
Colorless, odorless, flammable gas formed by the decomposition of organic waste in a landfill. Methane is also a greenhouse gas that contributes to global climate change. A sanitary landfill typically has a system for collecting methane gas, which may be sold as a source of energy for heating buildings, manufacturing products, or other uses.

Key Vocabulary and Recycling Terms – cont.

Mixed-materials packaging
Product wrapping or container that is made of different types of materials, such as a clear plastic cover protecting the item and stapled to a cardboard backing. The different recyclable materials should be separated before being placed in a recycling container for collection.

Municipal solid waste (MSW) landfill
Landfill site primarily designed to accept household waste. Some MSW landfills also receive nonhazardous commercial waste.

Natural resources
Raw materials or energy supplied by nature and its processes (water, minerals, plants). Trees are a natural resource used to make paper, and sunlight is a natural resource that can be used to heat homes (solar power).

Nonrenewable resources
Naturally occurring raw materials that are exhaustible and become depleted more quickly than they naturally regenerate. Some nonrenewable resources, such as petroleum and metals, take billions of years to form and are only available in limited quantities.

Optical sensor
Sophisticated technology in a recycling facility that uses light to sort certain items as they are pass by. The sensors are able to sort different types of plastic containers by color, density, and other characteristics.

Organic
Any material that was once living or produced by a living organism, such as food, leaves, yard trimmings, hair, clothing fibers, paper, etc.

Organic waste
Wastes made of natural products such as food, leaves, and yard trimmings.

Petroleum
A fossil fuel extracted from natural deposits deep in the Earth and consisting of a mixture of solids, liquids, and gases; these are physically separated (refined) into products such as gasoline, wax, asphalt, and petrochemical feedstocks that are the building blocks of many plastics.

Pollution (PreK-2)
Something harmful that mixes with something healthy and pure, like air or water.

Pollution
Contamination of soil, water, or the atmosphere by the discharge of substances that are harmful to the environment and/or the health of living organisms.

Pulp
Mixture of fibrous material, such as wood, rags, and paper, ground up and moistened to be used in making paper or cardboard.

Raw materials
Unprocessed materials or natural substances that are mined or harvested for use in producing a product; some examples are bauxite (source of aluminum), iron ore, silica, or trees.

Recyclables (PreK-2)
Things that can be recycled, like paper, cardboard that is flat, metal cans, and plastic bottles and jugs.

Recyclables
Discarded materials that still have useful physical or chemical properties after serving their original purpose and can be reused or remanufactured to make new products. Paper, flattened cardboard, metal cans, and plastic bottles and jugs are examples of recyclable materials.

Recycle/Recycling (PreK-2)
Taking something that would have been thrown away as trash and making it into something new and usable again.

Recycle/Recycling
Process of collecting, sorting, and processing used material and producing new products from that material; recycling also includes the process of remanufacturing used materials into new products. Some used materials can be made into new items of the same product, while others are used for making into entirely new items.

Recycling container
A bin or other type of container for placing recyclable items that will be collected and made into new products.

Recycling center/facility
Site where recyclable materials are sorted using sifters, optical sensors, magnets, and other specialized machinery, and then pressed into large bundles called bales.

Recycling loop
The cycle of collecting, processing, and producing new products using recycled material, and the purchase of these products. Consumers "close the recycling loop" when they buy items made with recycled materials.

Regulation
Oversight of waste reduction and disposal by the U.S. Environmental Protection Agency (EPA), including placement, construction, maintenance, and monitoring of landfills.

Key Vocabulary and Recycling Terms – cont.

Reduce
The preferred level of the waste management hierarchy – use less "stuff" and produce less waste. There is a growing consensus that unless we significantly reduce the amount of waste we produce, there will be no way to keep up with it through other means (recycling, combusting and use as energy, and landfills).

Renewable resources
Naturally occurring raw materials or forms of energy that have the capacity to replenish themselves within a relatively short amount of time (a human lifetime) through ecological cycles and sound management practices; examples include trees and agricultural crops. In contrast, metals and petroleum – which take billions of years to form – are examples of nonrenewable resources.

Single-stream recycling
Collection system in which recyclables of different materials are fully intermixed in a single container and separated later.

Solid waste
Unwanted or discarded material, such as durable goods, disposable goods, containers, packaging, food scraps, etc., some of which is recyclable.

Sorting
Separating recyclables by type of material, such as paper, plastic, and metal.

Sustainability
Social and environmental practices that protect and enhance the human and natural resources needed by future generations to enjoy a quality of life equal to or better than our own.

Storm water
Rainfall and melted snow and ice. Modern landfills include systems to remove storm water before it infiltrates the landfill as well as systems to collect and control the amount of surface runoff.

Trash
Material that is considered worthless and is thrown away; typically considered to have same meaning as garbage, rubbish, refuse, etc.

Glass can also be recycled, but in many communities it cannot be placed in the recycling bin for collection.

Waste management hierarchy
The preferred way to manage solid waste – first by reducing the amount of waste produced – referred to as source reduction, then by recycling, and finally by combusting it for use as an energy source or placing it in a landfill.

Waste stream
The complete flow of waste from domestic or industrial areas through to final disposal. The intervention of recycling may act to lessen the content of a waste stream as it moves down the line.

Wish-cycling
(Also referred to as "aspirational recycling") Placing items in a recyclables collection container that you hope are recyclable but are not.

Additional Information Sources

Here are some resources you might find helpful:

Recycling Simplified
https://recyclingsimplified.com/

U.S. Environmental Protection Agency (EPA) – Reduce, Reuse, Recycle
https://www.epa.gov/recycle

University of Colorado – Boulder
https://www.colorado.edu/ecenter/zero-waste/research-resources

University of Michigan Center for Sustainable Systems
http://css.umich.edu/factsheets

University of Florida – Florida Energy Systems Consortium (FESC) – FESC
http://floridaenergy.ufl.edu/public-outreach

Keep America Beautiful
https://berecycled.org/

Be sure to check with your state and local agencies responsible for overseeing recycling and waste disposal programs. They may offer educational materials or resources specific to your area and will also be able to provide specific information on your community's recycling programs.