

Grades 3-5

Before and After

Objectives

- Gain greater understanding of the connection between recycling and sustainability
- Collaborate on a task and practice critical thinking skills
- Improve recycling practices

Overview



Prep Time

30-45 minutes



Lesson Time

40-50 minutes



Tools & Materials

- Grades 3-5 | Before and After PDF
- Media to show video and/or presentation slides

Start Here

Included in this PDF:

Lesson prep.....	3
Lesson plan.....	4
Take-home handout.....	7
Poster.....	9
Student certificate.....	10
Deck of cards.....	11
<i>Quick Reference: Recycling Card Deck</i>	19
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Students will deepen their understanding of how recycling benefits the environment by identifying new products from recycled materials. They will engage in a group activity using collaboration, critical thinking, and verbal presentation skills to learn what recyclable materials can be turned into. They will receive a handout to share what they've learned with their family and encourage recycling at home.

Lesson Prep

1. Watch *Recycling Simplified Teacher Overview | Grades 3-5* if you haven't yet seen it.
2. Print or copy as many as needed of the following materials:
 - Lesson plan
 - Take-home handout
 - Deck of cards
3. Download or stream *Recycling Simplified Student Video | Grades 3-5*, *Recycling Center Video Tour | Grades 3-5*, 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.

Optional Materials

- Poster
- Student certificate
- *Teacher's Reference Guide*
- *Quick Reference: Recycling Card Deck*

All printed materials available online at RecyclingSimplified.com

Vocabulary

Recyclable and non-recyclable

Recycling facility

Recycling

Sustainability

The Lesson

- 1** If it hasn't been shown before, have students watch *Recycling Simplified Student Video | Grades 3-5* or *Recycling Center Video Tour | Grades 3-5*, and discuss.
- 2** Through guided discussion, assess and broaden students' understanding that recycling benefits the environment by enabling us to produce numerous items from recycled materials, which saves energy, conserves resources, and reduces pollution. Explain to students that recycled items can be turned into many other products, which takes less energy and creates less pollution than manufacturing those products.

What are some examples of items that can be recycled? When we talk about recycling, what do we mean? What do you think happens to those items once they're processed at a recycling facility? Are they reused or do they get turned into other things? Can you give any examples of things that can be made from recycled materials?
- 3** Divide your students into groups and give each group a deck of cards with pictures of recyclable items and pictures of items that can be made from recyclables. Tell students they will work as a group to match each product card with a recyclable card showing what it could be turned into through recycling.
- 4** Lead a discussion of the activity and reveal the correct pairings. If there are any pairings that students don't understand, explain the before-and-after connection.

Was it difficult to match items? What were the biggest surprises?

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 these and other recycling issues and topics, as well as fun facts to share with students.

The *Quick Reference: Recycling Card Deck* identifies the product and recyclable it was made from.

Takeaways

Discuss the concept of sustainability and how recycling supports sustainability. 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)

4-ESS3-1: Earth and Human Activity

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Core Idea ESS3.A:

Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

5-ESS3-1: Earth and Human Activity

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Core Idea ESS3.C:

Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

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)

- **CCSS.ELA-Literacy.SL.3.1**

- **CCSS.ELA-Literacy.SL.4.1**

- **CCSS.ELA-Literacy.SL.5.1**

Engage effectively in collaborative conversations (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly. Follow agreed-upon rules for discussions.

- **CCSS.ELA-Literacy.SL.3.4**

- **CCSS.ELA-Literacy.SL.4.4**

- **CCSS.ELA-Literacy.SL.5.4**

Report on a topic or text with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

- **CCSS.ELA-Literacy.L.3.6**

- **CCSS.ELA-Literacy.L.4.6**

- **CCSS.ELA-Literacy.L.5.6**

Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases.

Yes

No

ALWAYS recycle these things:



Paper



Cardboard Boxes



Metal Cans



Plastic Bottles & Jugs

NEVER recycle these things:



Juice Boxes



Plastic Bags



Clothes & Shoes



Food



Art Supplies



Paper Clips



Dirty Napkins & Tissues



Toys



Greasy Pizza Boxes

FOR PARENTS

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



Before you toss your recyclables in the bin, remember these simple tips:



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



Never bag or bundle your recyclables.



Plastic Bags

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



Batteries & More

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



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.



Pizza Boxes

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



Recycle these things:



Paper



Flattened Cardboard



Metal Cans



Plastic Bottles & Jugs

NEVER recycle these things:



Juice Boxes



Plastic Bags



Art Supplies



Paper Clips



Food



Greasy Pizza Boxes



Dirty Napkins & Tissues



Toys





Expert Recycler

As an expert recycler, you set a positive
example for our community.

You are truly a Recycling Super Star!

RECIPIENT

DATE

PRESENTER

Recycling *Simplified*

Recycling Simplified Education Program | Grades 3-5 | Student Certificate



Small Envelope

Sobre Chico

©2019 RecyclingSimplified.com



Newspaper

Periódico

©2019 RecyclingSimplified.com



Empty Bottle

Botella Vacía

©2019 RecyclingSimplified.com



Metal Can

Lata de Metal

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Soda Can

Lata de Refresco



Cereal Box

Caja de Cereal



Cardboard Box

Caja de Cartón



Paper Bag

Bolsa de Papel



Plastic Jar

Frasco de Plástico



Milk Jug

Jarra de Plástico



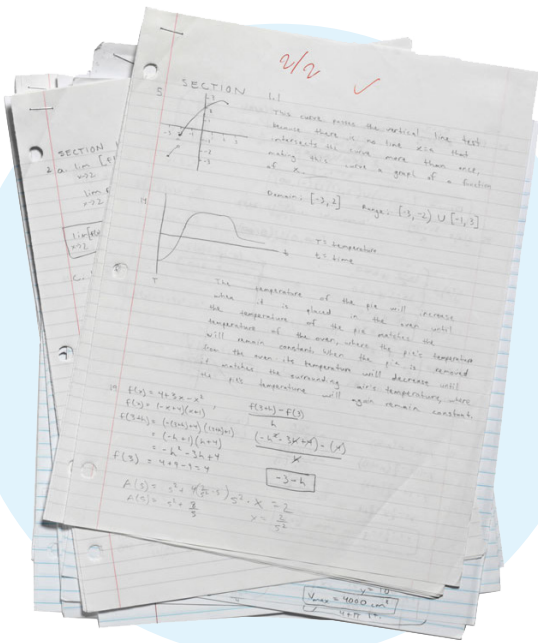
Large Envelope

Sobre Grande



Magazines

Revistas



Notebook Paper

Hojas de Cuaderno



Aluminum Tray

Bandeja de Aluminio



Construction Paper

Cartulina



Scrap Paper

Papel de Desecho

Winter Jacket

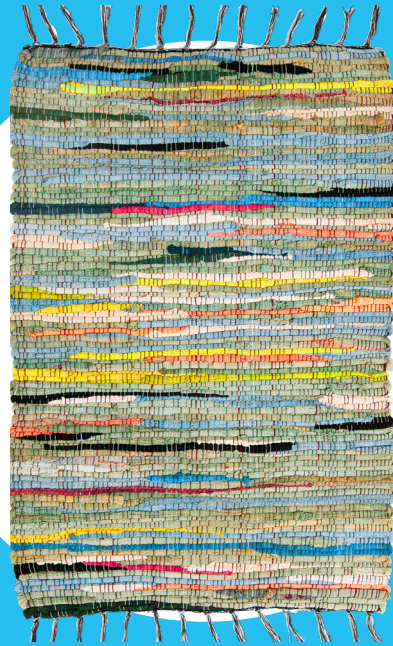
Chaqueta de Invierno



©2019 RecyclingSimplified.com

Rug

Tapete



©2019 RecyclingSimplified.com

Playground Equipment

Equipo de Juego



©2019 RecyclingSimplified.com

Toys

Juguetes



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Bicycle Parts

Partes de Bicicleta



Appliances

Aparatos Electrodomésticos



Baseball Hats

Cachuchas de Béisbol



License Plates

Placas



New Cans

Latas Nuevas



Tissues

Pañuelos de Papel



Egg Cartons

Cajas de Cartón para Huevos



Paperback Books

Libros de Bolsillo



Newspaper

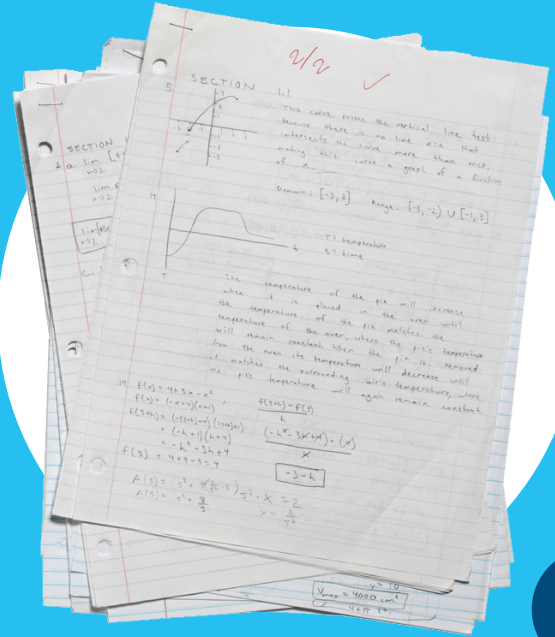
Periódico



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Notebook Paper


















Hojas de Cuaderno



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Quick Reference: Recycling Card Deck

Recyclable

 <p>Small Envelope <i>Sobre Chico</i></p>	 <p>Newspaper <i>Periódico</i></p>	 <p>Empty Bottle <i>Botella Vacía</i></p>	 <p>Metal Can <i>Lata de Metal</i></p>	 <p>Soda Can <i>Lata de Refresco</i></p>
 <p>Cereal Box <i>Caja de Cereal</i></p>	 <p>Cardboard Box <i>Caja de Cartón</i></p>	 <p>Paper Bag <i>Bolsa de Papel</i></p>	 <p>Plastic Jar <i>Frasco de Plástico</i></p>	 <p>Plastic Jug <i>Botellón de Plástico</i></p>
 <p>Milk Jug <i>Jarra de Plástico</i></p>	 <p>Large Envelope <i>Sobre Grande</i></p>	 <p>Magazines <i>Revistas</i></p>	 <p>Notebook Paper <i>Hojas de Cuaderno</i></p>	 <p>Aluminum Tray <i>Bandeja de Aluminio</i></p>
 <p>Construction Paper <i>Cartulina</i></p>	 <p>Scrap Paper <i>Papel de Desecho</i></p>			

Items Made from Recyclables



Plastic bottles



Plastic bottles



Metal cans



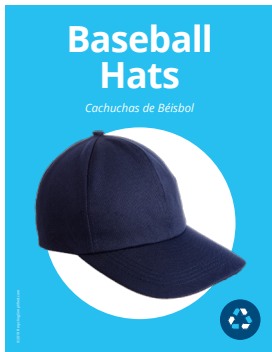
Plastic bottles



Metal cans



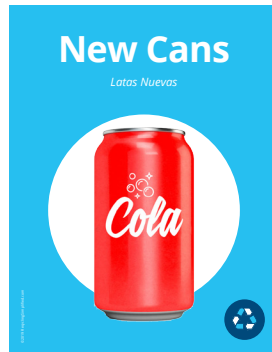
Metal cans



Plastic bottles



Metal cans



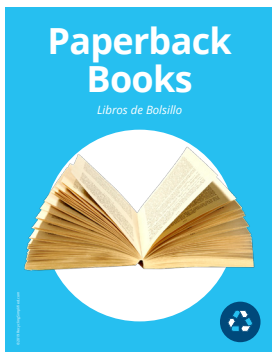
Metal cans



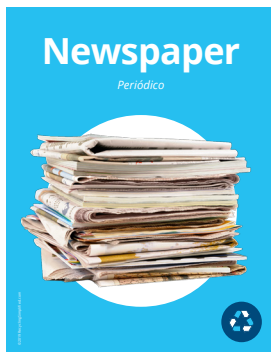
Paper



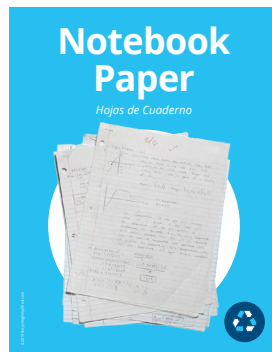
Cardboard



Paper



Paper



Paper

Closing the Loop



Before and After



Always recycle these things:



Paper



Cardboard



Metal Cans



**Plastic Bottles
& Jugs**

Never recycle these things:



Juice Boxes



Plastic Bags



**Clothes
& Shoes**



Food



Art Supplies



Paper Clips



**Dirty Napkins
& Tissues**



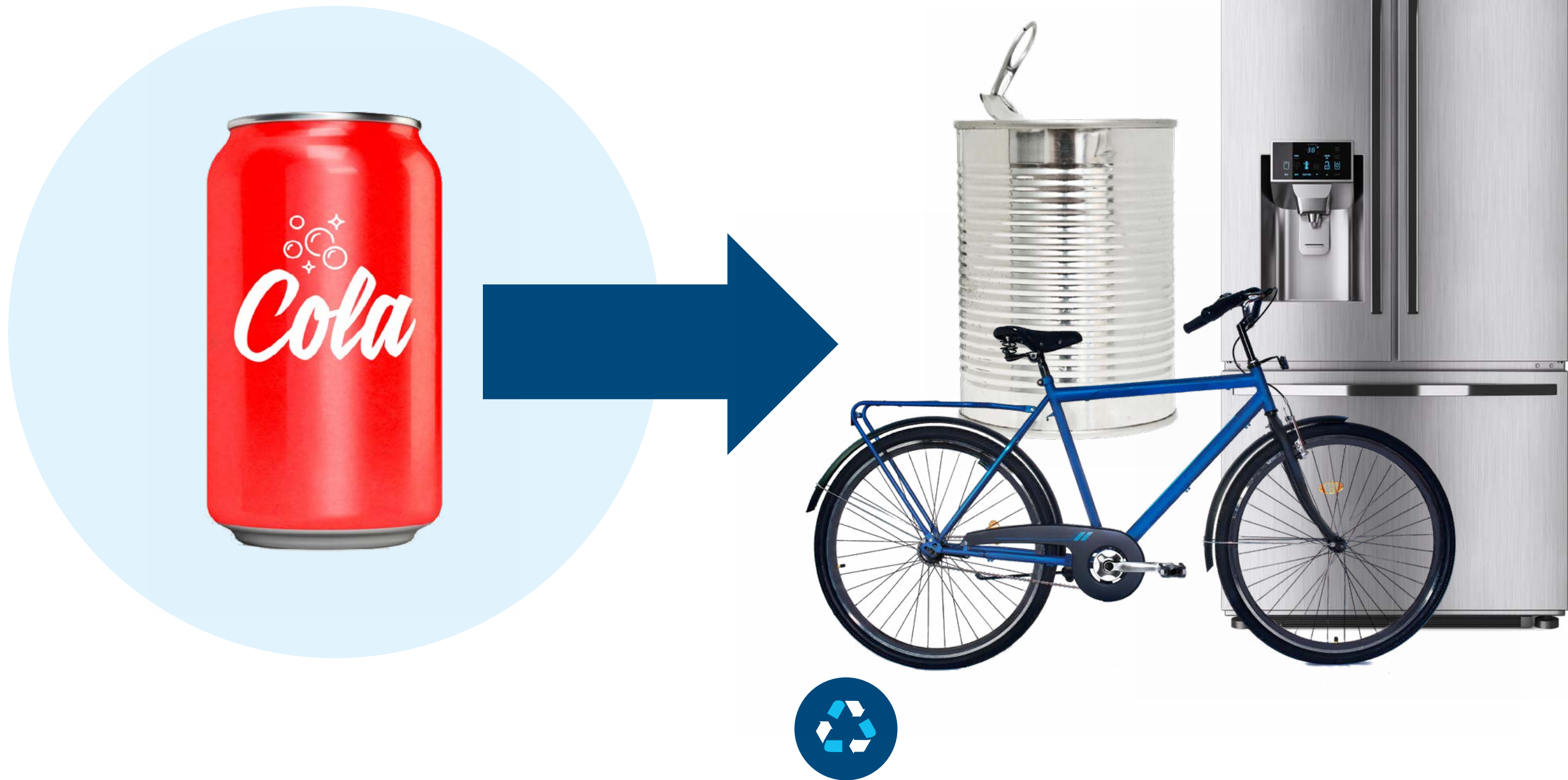
Toys



**Greasy Pizza
Boxes**



Paper and cardboard can be made into cereal boxes, notebooks, and paper towels.



Metal cans might become bicycle or car parts, kitchen products, or new cans.



Clean plastic bottles can be made into backpacks, rugs, sleeping bags, and fleece jackets.

Recycling: Simple as 1-2-3

1

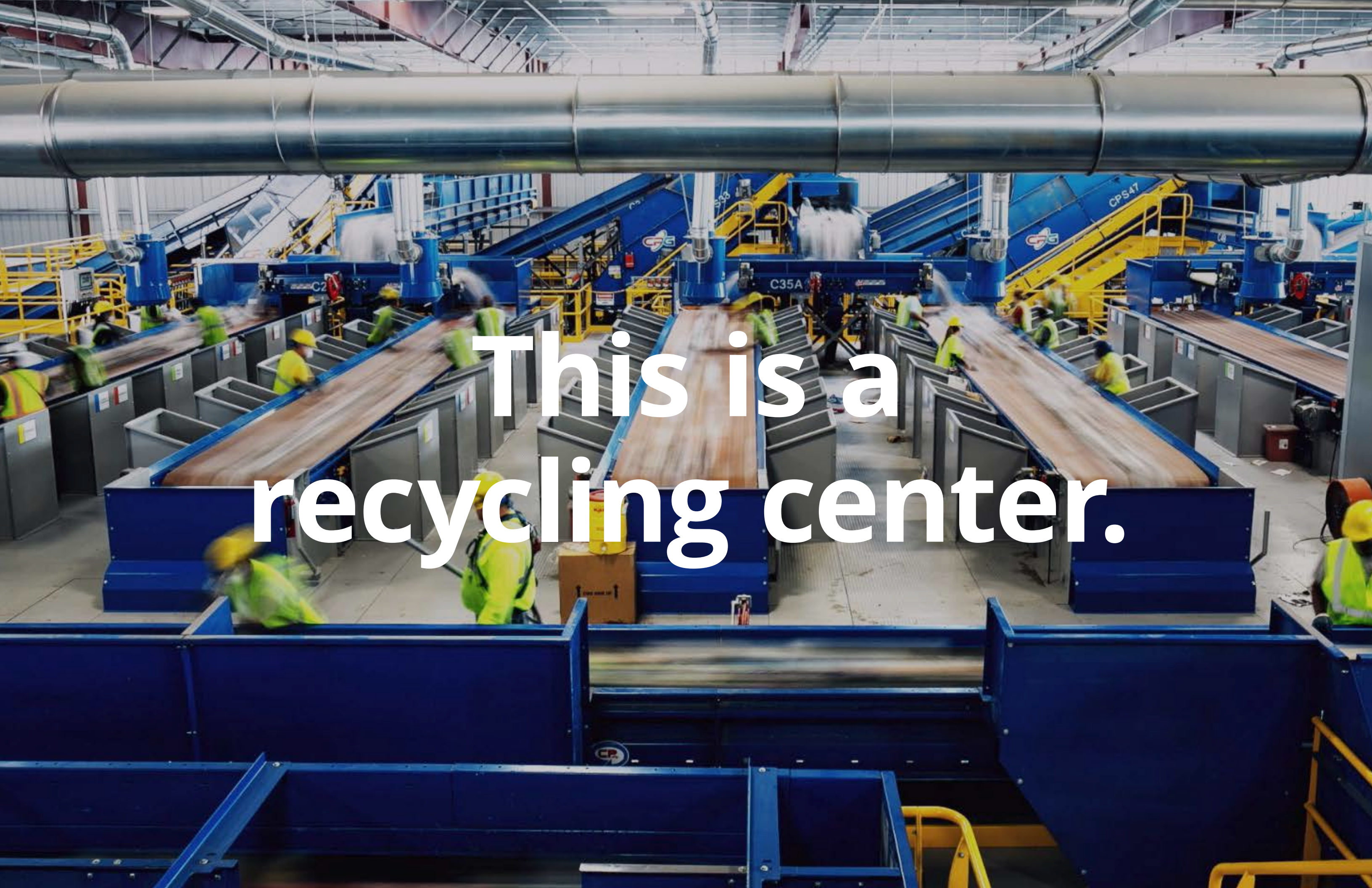
**Know what
to throw**

2

**Empty.
Clean. Dry.**

3

Don't bag it



This is a
recycling center.



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.

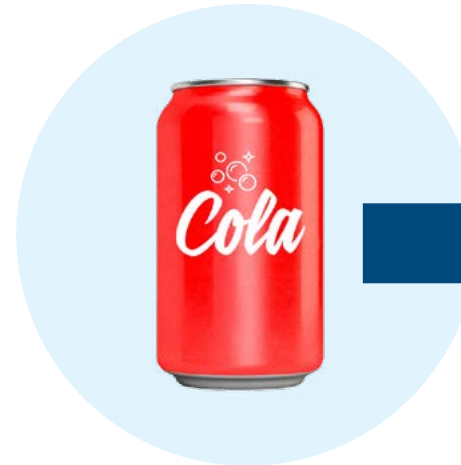


Advanced technology allows access and control from anywhere on-site.



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

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



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!

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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.

<p>Paper and Cardboard</p> 	<ul style="list-style-type: none"> Envelopes (no window) Newspapers Cereal box (liner removed) Cardboard box, flattened Paper bags Manila envelope, no padding Magazines Office paper Miscellaneous paper, flyers, etc.
<p>Metal Cans</p> 	<ul style="list-style-type: none"> Metal can (no label) Soda can Aluminum tray
<p>Plastic Bottles and Jugs</p> 	<ul style="list-style-type: none"> Plastic water bottle with the lid on Condiment bottle (ketchup, salad dressing) Laundry detergent container Plastic milk jug
<p>Non-Recyclables</p> 	<ul style="list-style-type: none"> 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
<p>Paper and Cardboard</p> 	<ul style="list-style-type: none"> Food boxes, such as cereal or cracker boxes Tissues Pencil barrels Egg cartons Paperback books Shopping bags Newspapers (from newspapers) Notebook paper
<p>Aluminum cans</p> 	<ul style="list-style-type: none"> New cans Pots, cookie sheets, and other cooking equipment Foil wrap Barbecue grills Baseball bats and lacrosse sticks License plates Electronic wiring Cars
<p>Steel cans</p> 	<ul style="list-style-type: none"> New cans Construction beams Automotive parts Roadway guard rails Appliances Lighting fixtures and other home furnishings Roofing materials
<p>Plastics</p> 	<ul style="list-style-type: none"> 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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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.

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 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.