

High School Science Edition

2018

Recycle Today



Tampa Bay
Times
NIE
newspaper in education
tampabay.com/nie



Pinellas County's guide to
resource management

ALSO AVAILABLE ONLINE

Save this guide to use year-round • pinellascounty.org/recycle

Inside this guide

- 3** How Waste-To-Energy works
- 4** Activity: Think like an environmental engineer
- 5** Tours and presentations: Information for schools, community groups and civic organizations
- 6-7** Activity: America's food waste problem
- 8** The whys behind recycling right
- 9** Activity: Student waste journal
- 10-11** Pinellas County Solid Waste 2016 accomplishments
- 12-13** Activity: The pros and cons of plastic packaging
- 14** Trash the bags
- 15** What happens in a recycling facility
- 16** Activity: The economics of recycling
- 17** Activity: Air pollution and weather
- 18** Household electronics and chemical collection
- 19** A to Z Guide to Recycling & Disposal in Pinellas County
- 20** How to recycle right in Pinellas County



Use the information and activities in this guide to sharpen your recycling skills and environmental knowledge.

CONTACT US

 **727-464-7500**

 **recycle@pinellascounty.org**

ABOUT NIE

The Tampa Bay Times Newspaper in Education program (NIE) is a cooperative effort between schools and the Times Publishing Co. to encourage the use of newspapers in print and electronic form as educational resources – a “living textbook.” Our educational resources fall into the category of informational text, a type of nonfiction text. The primary purpose of informational text is to convey information about the natural or social world.

NIE serves educators, students and families by providing schools with class sets of the Pulitzer Prize-winning *Tampa Bay Times* plus award-winning original educational publications, teacher guides, lesson plans, educator workshops and many more resources – all at no cost to schools, teachers or families. In 2016-2017, NIE provided more than 1.8 million print copies and 10 million digital editions of the *Times* to area classrooms free of charge thanks to our generous subscribers and individual, corporate and foundation sponsors. NIE teaching materials cover a variety of subjects and are aligned to the Florida Standards.

Tampa Bay Times subscribers can support NIE by adding a donation to their subscription renewal amount

or by donating their newspapers while on vacation.

For more information about NIE, visit tampabay.com/nie, call 727-893-8138 or email ordernie@tampabay.com. Follow us on Twitter at [Twitter.com/TBTimesNIE](https://twitter.com/TBTimesNIE).

NIE staff

Jodi Pushkin, manager, jpushkin@tampabay.com
Sue Bedry, development specialist, sbedry@tampabay.com
Noelle Sansom, coordinator, nsansom@tampabay.com

Credits

Written by Pinellas County Solid Waste Staff and Sue Bedry, *Times* staff
Activities by Sue Bedry and Jodi Pushkin, *Times* staff
Designed by Stacy Rector, Fluid Graphic Design, LLC

© *Tampa Bay Times* 2018

EDUCATORS

Share 100 words about how you used this resource in your classroom for a **chance to win a \$15 gift card!** Visit tampabay.com/nie for details and to enter.

WASTE-TO-ENERGY



The Pinellas County WTE facility:

BURNS ^{UP TO}
3,150
TONS OF GARBAGE
EVERY DAY



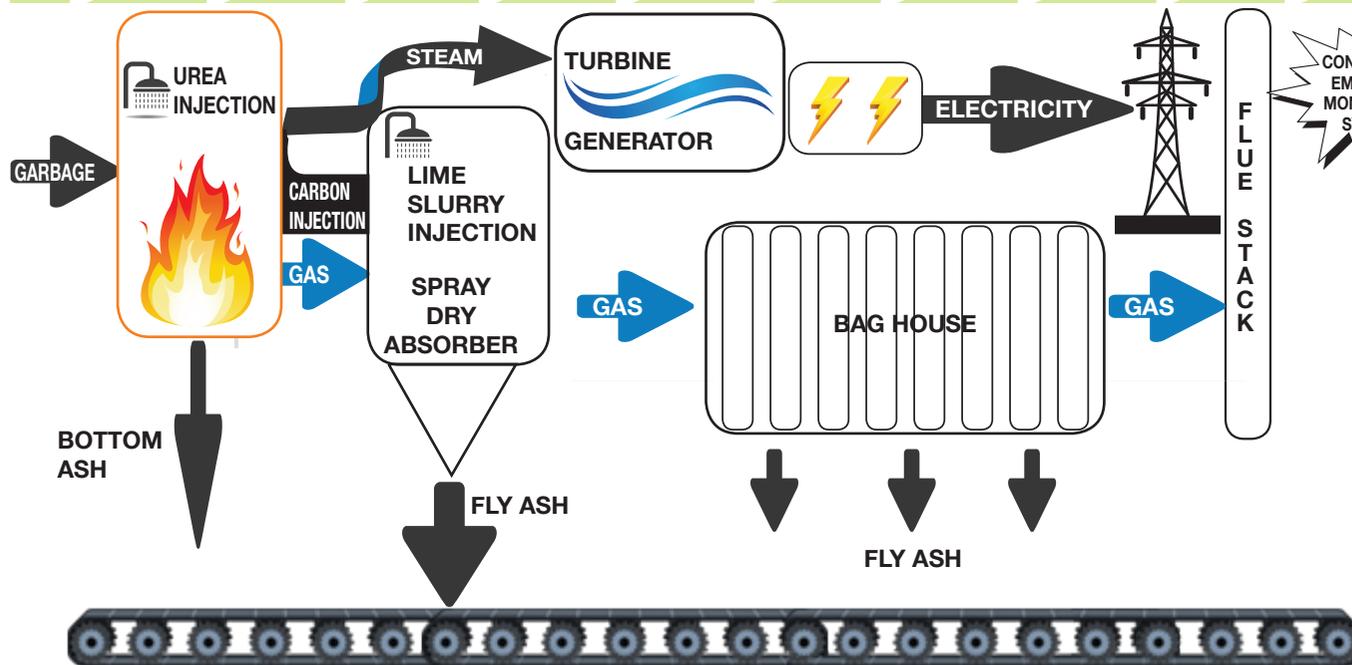
Waste-To-Energy (WTE) facilities burn municipal solid waste (trash) and use the heat to create steam and generate electricity.

WTE offers many environmental benefits over landfilling trash. WTE reduces greenhouse gases that contribute to climate change, conserves land by reducing the amount of landfill space used and generates clean, renewable energy.

REDUCES
the volume of trash by
90%



PRODUCES UP TO
75 MEGAWATTS
OF ELECTRICITY PER HOUR



POWERS
up to
45,000
homes and
businesses
EVERY DAY



UREA INJECTION [reduces Nitrogen Oxide (NO_x)] | **CARBON INJECTION** (helps reduce heavy metals)
LIME SLURRY INJECTION (reduces the acidity of gases) | **BAG HOUSE** (filters out particulate matter including heavy metals)

How does Waste-To-Energy work?

- 1 Waste is burned, creating thermal energy (heat) and leaving ash and metals behind.
- 2 The heat is used to turn water into high-pressure steam in a boiler.
- 3 The rising steam turns the blades of a turbine, converting the thermal energy into mechanical energy (energy of motion).
- 4 The turbine powers a generator, producing electrical energy.
- 5 The electricity is sold to Duke Energy. Some is also used to power the WTE facility and an electric vehicle charging station.
- 6 Metals are recovered from the ash and sold to smelters for recycling.
- 7 The remaining ash is landfilled or used for landfill cover.

You Tube

Virtual tour of Pinellas County Solid Waste

youtube.com/watch?v=_48r7fj-xLg

Explore Pinellas County Solid Waste in this 360-degree video where you hover over the tipping floor next to the 6-ton "claw" at the Waste-to-Energy facility, go behind the scenes at our Household Electronics and Chemical Collection Center (HEC₃), and feel the speed of the more than 1,100 vehicles that go through the Scalehouse every day.

ACTIVITY:

THINK LIKE AN ENVIRONMENTAL ENGINEER



Environmental engineering is the application of science and engineering knowledge and concepts to care for our natural environment, restore our natural environment or solve environmental problems. Environmental engineers use the principles of engineering, soil science, biology and chemistry to develop solutions to environmental problems. They work to improve recycling, waste disposal, public health, and water and air pollution control. They also address global issues such as unsafe drinking water, climate change and environmental sustainability. Products such as hybrid and electric vehicles, energy-saving light bulbs, programmable thermostats, biofilters and low-flow bathroom fixtures are all products that were created to address environmental problems. On a larger scale, green building and landscape design can improve energy efficiency, cut water usage and improve the health of people working or living there. In this activity, you'll think like an environmental engineer to design a product or service that people in your community can use to help solve an environmental issue.

STEPS OF THE ENGINEERING DESIGN PROCESS

1

ASK:

Identify the need

2

LEARN:

Research the problem

3

IMAGINE:

Brainstorm possible solutions

4

PLAN:

Evaluate the alternatives and select the most promising solution

5

CREATE:

On paper, design your product or service

6

ANALYZE:

Present your ideas to the class and receive feedback

7

IMPROVE:

Redesign as needed

As engineers follow the steps of the engineering design process, they consider the requirements, limits, constraints, feasibility and sustainability of potential solutions, and use the critiques and suggestions of others to improve their designs.

ASK

1 Working in small groups, brainstorm recycling, waste disposal or environmental issues that face your school or community. Write down all your ideas – there are no bad ideas when brainstorming. Think about all of the steps in resource management, recycling and waste reduction – from the home or business consumer to the Material Recovery Facility to the Waste-To-Energy facility to the landfill. Use the information on Pages 3, 8, 14 and 15 to help you.

LEARN

2 Next, choose one of the issues you brainstormed to focus on. What specific part of this issue are you looking to solve? Use this publication, the *Tampa Bay Times* and the Internet to research the issue.

IMAGINE

3 With your group, brainstorm possible products or services that could help to solve the issue.

PLAN

4 Choose the product or service that you feel is the most promising solution to the issue. Define how your product or service will help to solve this problem. Consider the end life of any product.

CREATE

5 On paper, design your product or service. If a product, draw a blueprint or illustration. If a service, use a flowchart or diagram to explain how it will work. Create an advertisement or public service announcement (PSA) for your product or service that explains how it will help to solve the environmental issue you identified. Use the advertisements in the *Tampa Bay Times* as models.

ANALYZE

6 Present your solution to your class for constructive feedback by reading or performing your advertisement or PSA. The class should consider: cost (is it affordable?), positive or negative impact on the environment (is it green?), positive or negative effects on the community (is it sustainable?) and the ease or difficulty of implementation (is it feasible?).

IMPROVE

7 Use the class feedback to improve or redesign your solution.

Adapted from: "Creative Engineering Design," "Introduction to Environmental Engineering" and "Thinking Green," TeachEngineering.org, University of Colorado Boulder

Additional sources: The Nature Conservancy, U.S. Bureau of Labor Statistics Occupational Outlook Handbook.

Think about it

In their 2002 book *Cradle to Cradle: Remaking the Way We Make Things*, architect William McDonough and chemist Michael Braungart presented an integration of design and science that provides enduring benefits for society from safe materials, water and energy in circular economies and eliminates the concept of waste.

Research the concept of Cradle to Cradle design and watch McDonough's TED Talk at ted.com/talks/william_mcdonough_on_cradle_to_cradle_design.

How can you integrate the principles of Cradle to Cradle design into your group's product or service?

Florida Standards: This activity incorporates the following Florida Standards for high school students. **Science:** SC.912.L.17.11; SC.912.L.17.12; SC.912.L.17.13; SC.912.L.17.14; SC.912.N.1.4; SC.912.N.4.2 **Social Studies:** SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2 **Language Arts:** LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5

YOU REDUCE, REUSE, RECYCLE - WE RECOVER!



DROP IN FOR A TOUR!



Learn about Pinellas County's award-winning integrated solid waste management facility by joining a **FREE TOUR THE FIRST FRIDAY OF THE MONTH** from 11:30 a.m. to 1 p.m. (ages 7 and up)

To register for a Friday tour, visit eventbrite.com and type "Pinellas County Solid Waste" or call 727-464-7500.

SCHOOLS and COMMUNITY GROUPS

Join us for a tour, or let us come to you for a presentation.

TOURS (ages 7 and up, grades 3 and up)

- FREE educational field trips and tours
- FREE bus transportation to and from Solid Waste (within Pinellas County) for classes of more than 20
- Pre-approved field trip for Pinellas County schools

PRESENTATIONS (all ages)

- Customized for your group's age range and technical interests
- Suggested topics include recycling, environmental protection, environmental stewardship, waste-to-energy and landfill technology

To schedule a tour, field trip or presentation, call 727-464-7500 or visit pinellascounty.org/solidwaste/educational/tours.

ACTIVITY:

AMERICA'S FOOD WASTE PROBLEM

Every year in the United States, approximately 31 percent, or 133 billion pounds, of the overall food supply is wasted. About 95 percent of the food we throw away is landfilled or incinerated.

Researchers estimate that individual Americans throw out between 20 and 25 percent of all the food they purchase.

Reducing the amount of

food waste sent to disposal facilities can help feed hungry people, conserve natural resources and ease the impact of climate change.

In 2015, the Environmental Protection Agency and the U.S. Department of Agriculture called for a 50 percent reduction in food waste by the year 2030.

In this activity, you will chart what you personally throw out at lunch over a five-day period

and analyze the results.

Download the Cafeteria Waste Activity Sheet from readwritethink.org/files/resources/30950_cafeteria.pdf. Each day over the study period, record the date, chart the percentage of food that you actually consumed by shading in that portion of the circle graph and note the approximate percentage of food wasted.

After five days of data

collection, work in small groups to compile and analyze the information collected by determining the overall percentage of food wasted by the group. Synthesize your findings into a pie chart that can be displayed. What conclusions can you draw about your findings? What steps can you take as an individual, class and school to reduce food waste? Discuss as a class.

Name: _____ Date: _____

Cafeteria Waste Activity Sheet

What Do You Throw Away?



You've probably been told more than once to "clean your plate" during a meal, but the fact of the matter is that our country is one of the biggest food wasters in the world. Researchers estimate that Americans throw out about 20–25% of all the food they purchase. That means that every day our country wastes enough food to fill a football stadium like the Rose Bowl. Over the course of just one year, the average U.S. household will waste about 474 pounds of food, a daily average of 1.5 pounds per person.

Let's explore this phenomenon here at our own school by looking at food waste in our cafeteria. Chart what you personally throw out at lunch for the next five days using the circle graphs below. Show the percentage of food you estimate that you actually consumed by shading in that portion of the graph. Note the date and the approximate percentage of waste each day.

Example

Date	Graph of food eaten	Details
Day 1: 3/13/12		Percent discarded: <u>25 %</u> Notes: <u>Didn't finish the apple; the pizza was gross so I only took three bites.</u>

readwritethink.org/files/resources/30950_cafeteria.pdf

Adapted from: "Finding Solutions to Food Waste: Persuasion in a Digital World," ReadWriteThink.org

Additional sources: Environmental Protection Agency, U.S. Department of Agriculture

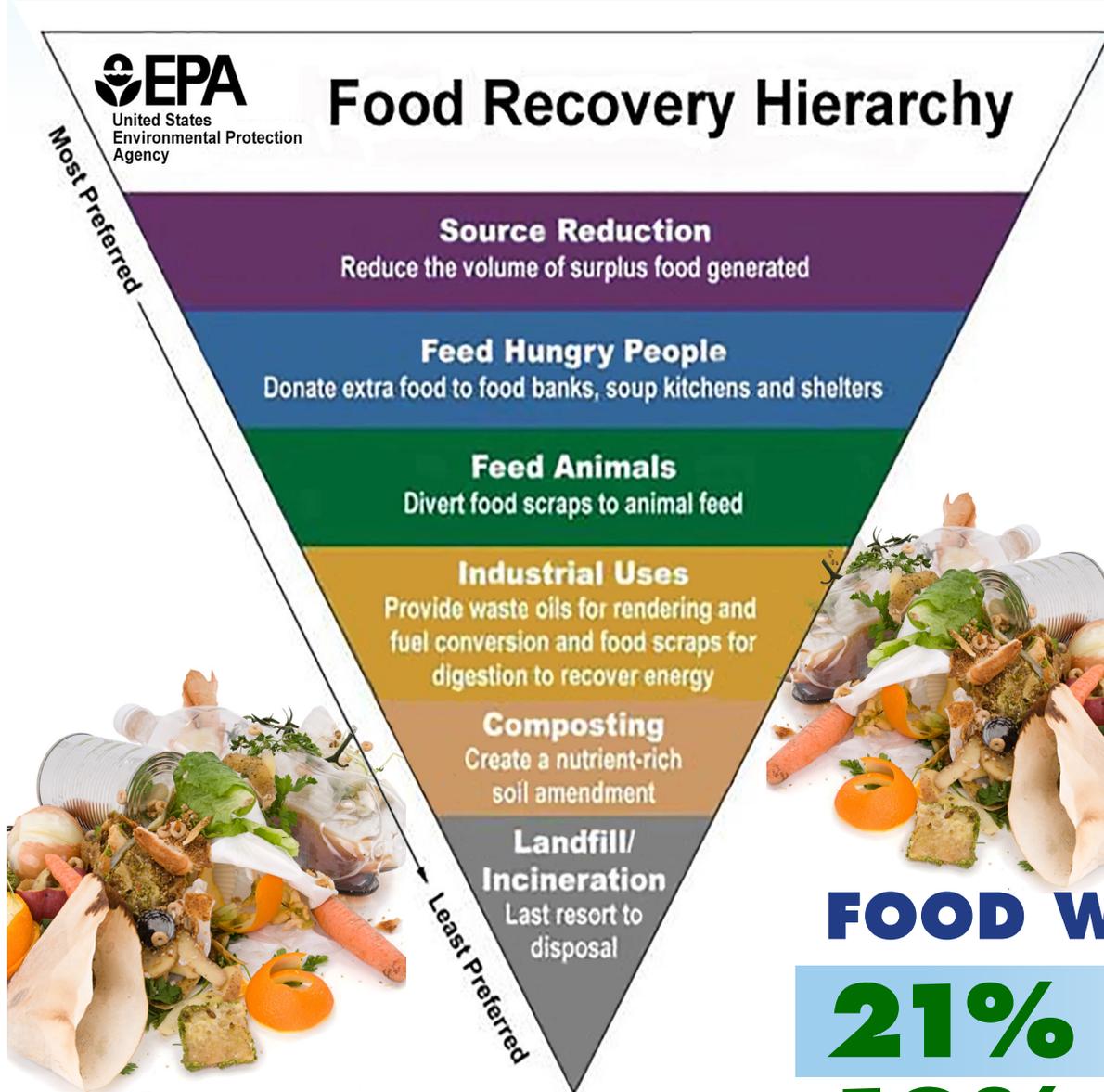
Florida Standards: This activity incorporates the following Florida Standards for high school students. Science: SC.912.L.17.14; SC.912.L.17.18; SC.912.L.17.19; SC.912.N.1.4; SC.912.N.4.1
Social Studies: SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2
Language Arts: LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5



FOOD RECOVERY HIERARCHY

The Food Recovery Hierarchy prioritizes actions organizations can take to prevent and divert wasted food. Each tier of the Food Recovery Hierarchy focuses on different management strategies for your wasted food. The top levels of the hierarchy are the best ways to prevent and divert wasted food because they create the most benefits for the environment, society and the economy.

Visit epa.gov/sustainable-management-food/food-recovery-hierarchy and refed.com for more information.



U.S. FOOD WASTE CHALLENGE

The U.S. Food Waste Challenge calls on entities across the food chain – farms, agricultural processors, food manufacturers, grocery stores, restaurants, universities, schools and local governments – to join efforts to reduce and better manage food loss and waste in the United States.

To join the U.S. Food Waste Challenge, organizations and businesses provide information on what they are doing in their operations to reduce, recover and/or recycle food loss and waste. The challenge’s inventory of activities will help disseminate information about best practices and stimulate the development of more.

For more information or to register your school as a participant in the U.S. Food Waste Challenge, visit usda.gov/oce/foodwaste/Challenge/index.htm.



Going beyond the text: Spreading the word

Using the editorials in the *Tampa Bay Times* as models, write an editorial to encourage the other students at your school to participate in the U.S. Food Waste Challenge. Use the information you have learned throughout this lesson and through your research to support your points.

FOOD WASTE CONSUMES:

21% OF ALL FRESH WATER

19% OF ALL FERTILIZER

18% OF CROPLAND

21% OF DISPOSAL FACILITY VOLUME

EVERY YEAR, AMERICAN CONSUMERS, BUSINESSES AND FARMS:

Spend \$218 billion growing, processing, transporting and disposing food that is never eaten

Send 52 million tons of food to a disposal facility

Source: Rethink Food Waste Through Economics and Data (ReFED)

Source: Rethink Food Waste Through Economics and Data (ReFED)

The whys behind recycling right

Single-stream recycling means that all processable materials (plastic, metal, paper, glass and cartons) can be placed in a single bin for recycling. Here are the answers to some of your most common questions.

Recycling is a four-step process:

- 1 Assess if the item can be recycled.
- 2 Place the correct materials in your recycling containers.
- 3 The materials go to a facility where they are sorted, baled and sold to manufacturers that turn them into new products.
- 4 The new products made with recycled content are purchased by the consumer.

It takes all four steps for a material to truly be recycled!



1 Why can't I recycle pizza boxes, paper towels or paper plates and cups?

The most important reason for not being able to recycle these items is that they contain food and grease residue. When paper is recycled, batches are placed in a bath that allows the paper items to break down into long fiber strands. When paper is soiled, the food or

grease soils the paper in the bath. Soiled paper can ruin entire batches during the paper recycling process.

2 Why do I have to rinse out my container? Just how clean do they need to be?

The most important reason that you need to rinse out your container is because the food and liquid residues soil paper items in your recycling container. Even with those stubborn laundry detergent bottles, a quick rinse is all it takes. As long as the containers are dry, some residue is fine because plastic, metal and glass are able to be cleaned during the recycling process.

3 Why can I only recycle certain types of materials in single-stream recycling? Plastic is plastic, right?

Materials that are placed in single-stream containers are taken to a Material Recovery Facility (MRF), where they are sorted. Most

of the sorting is done by machines that are designed to sort certain types of materials (paper and cardboard, metal cans, plastic food and liquid containers, glass bottles and jars, and cartons). When you place other items in the recycling container, they are not properly sorted and mix with other materials or even damage equipment. This increases recycling costs and degrades the quality of materials, reducing the ability of the materials to be recycled. When it comes to home recycling, stick to the basics. And when in doubt, throw it out.

4 Why can't I recycle shredded paper in single-stream recycling?

Shredded paper is so small that it gets tangled in the sorting equipment. Shredded paper can be recycled if placed in containers that accept only paper because it is not combined with other materials.

The 4 Rs: ways that you can

REDUCE • REUSE • RECYCLE • RECOVER

Following the 4 Rs reduces waste, conserves natural resources, reduces pollution and decreases the demand for energy.

REDUCE:

Buy only what you need. Select items that have the least packaging. Ask businesses to use less packaging. Purchase recycled or upcycled products.

REUSE:

Choose reusable products. Before you throw items away, think whether or not they can be reused or repurposed. Donate unwanted clothing and furniture.

RECYCLE:

Materials such as cans, bottles and paper are recyclable in Pinellas County. Ask your community, local businesses and event planners to provide recycling.

RECOVER:

After you reduce, reuse and recycle, Pinellas County recovers energy and metals from the remaining waste. Learn more about recovery at pinellascounty.org/solidwaste/wte.

ACTIVITY:

STUDENT WASTE JOURNAL

When your study period is finished, answer the following questions:

- How many items did you dispose of over the study period?
- What were the main components of your waste?
- What steps can you take to reduce your waste?
- What percentage of your waste was composed of recyclables? What percentage was food waste?
- What were some of the items that could have been reused or recycled instead of thrown away?
- Why do you think you didn't recycle those items?
- What steps can you take to increase your recycling rate?

Write a short lab report to share your results. Be sure to discuss the purpose and method of your study, the observations that you made and the conclusions that you drew from the data you collected.

Adapted from: "Student Waste Journal," *Recycling Champions Green Team Advocacy Action Kit*, GrowNYC

Municipal Solid Waste (MSW), more commonly known as trash or garbage, consists of everyday items that we use and then throw away.

The average Pinellas County resident generates 5.65 pounds of waste every day, of which only 1.75 pounds is recycled or composted.

A waste journal serves as a great way to study and analyze what we are throwing away and how it could be minimized. In this activity, you will record all items (including any food) that you throw away over a two- to three-day period and analyze the results.

Create a chart or spreadsheet with five columns. In the first column, record the name of each item you dispose of. In the next three columns, record where the item should go (recycling, food waste or trash). In the final column, record where you actually disposed of the item.

Waste item	Where SHOULD the item have gone?				Where DID the item go?
	Recycling	Reused	Food waste	Trash	
Water bottle	X				Trash
Chip bag				X	Trash



Florida Standards: This activity incorporates the following Florida Standards for high school students. **Science:** SC.912.L.17.14; SC.912.L.17.18; SC.912.L.17.19; SC.912.N.1.4; SC.912.N.4.1; SC.912.N.4.2 **Social Studies:** SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2 **Language Arts:** LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5

Doing things: Pinellas County Solid

Yard Waste-to-Mulch Processing Area

Recycled 70.6 million pounds of yard waste into mulch.

Waste-to-Energy (WTE) Facility

- Reduced 1.5 billion pounds of garbage by 90 percent volume
- Recovered 442,526 megawatt hours of electricity.
- Recovered 46 million pounds of metal from ash.

Landfill

Recycled 84 million pounds of ash as daily cover.

Tour Classroom

Educated 9,675 people about the 4 Rs through tours and presentations.

Recycling Drop-off Sites

Collected 3.6 million pounds of materials for recycling at 14 sites.

Household Electronics & Ch Collection Center (HEC₃)

- Recycled 1.5 million pounds of hou
- Recycled 432,000 pounds of house
- Provided 280,000 pounds of partic for reuse by residents for free at the

Waste Accomplishments in 2016

Citizen Hand Unload Area

Recycled 2.5 million pounds of metal from incoming waste.

Electric Vehicles and Charging Stations

Reduced the use of fossil fuel-derived gasoline by 709 gallons.

Scalehouse

Processed 353,876 truckloads of material. *These vehicles end-to-end would stretch from Pinellas County to New York.*

Reef Construction

Recycled 3.8 million pounds of concrete to build and expand 42 reefs in the Gulf of Mexico.

Chemical

Household electronics.
Household chemicals.
Daily used chemicals
at the Swap Shop.

Industrial Water Treatment Facility

Treated 5.5 billion gallons of water from the site to use in the Waste-to-Energy facility.

Pinellas County has led the state of Florida with the No. 1 recycling rate for the last two years.



The 4 Rs Reduce, Reuse, Recycle and Recover

ACTIVITY: THE PROS AND CONS OF PLASTIC PACKAGING

Since World War II, the number of products – and in particular, food products – packaged in plastic has increased exponentially.

Food products such as dry goods, deli items, bread, meat, fruits and vegetables that used to be sold loose or in paper now come wrapped in plastic film or packaged in plastic bags.

In 2013, more than 85 million tons of plastic packaging was produced worldwide.

Plastic packaging has benefits for both industry and consumers. For example, plastic packaging reduces food waste by extending the shelf life of products. According to the Flexible Packaging Association, a cucumber wrapped in plastic film will last 14 days, compared to three days for an unwrapped one.

Plastic packaging is also strong and durable, so it protects products from contamination and damage during shipping and storage.

In addition, because it is lighter than many alternative materials, plastic packaging can reduce fuel consumption for transportation, resulting in decreased energy consumption and greenhouse gas emissions.

On the other hand, plastic packaging places a huge burden on our environment.

Most of today's plastics are made of hydrocarbon molecules derived from fossil fuels, which are nonrenewable resources. Eight percent of world oil production is used to manufacture plastics.

In addition, chemicals in some plastic

bottles and containers can leach into food and drinks and be absorbed by human bodies. Some of these compounds have been found to be potentially harmful to human health.

However, the largest environmental problems caused by plastic packaging have to do with how it is disposed of.

Of the more than 85 million tons of plastic packaging produced worldwide in 2013, only 14 percent was collected for recycling. Another 14 percent was incinerated for energy, and 40 percent was sent to disposal facilities.

Almost one-third – 32 percent – ended up in the environment as pollution in our streets, parks, beaches and waterways. Today, plastic pollution is found everywhere on Earth, from Mount Everest to the bottom of the sea. Packaging accounts for more than 60 percent of the plastics recovered in coastal cleanup operations. Plastic debris clogs storm drains and other drainage areas, causing flooding.

Chemicals found in plastics can leach



into soil and groundwater, with potentially harmful effects to both wildlife and human health.

Plastic pollution also injures and kills wildlife, either through entanglement or by being mistaken for food. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), plastic debris causes the deaths of more than a million seabirds and more than 100,000 marine mammals every year.

Since plastics are largely nonbiodegradable and photodegrade only slowly, plastic pollution is a long-term environmental problem.

As consumers, we can have an impact on how much plastic packaging ends up in disposal facilities or in our natural environment by selecting products that have less packaging, are contained in recyclable or reusable containers and are packaged in recycled materials.



Going beyond the text: Extension activity

Now that you and your classmates are becoming experts in ways to identify packaging that is reusable, recyclable, nonrecyclable, compostable and made from recycled content, go through the advertisements in the *Sunday Tampa Bay Times* and make a list of the items you find in both the main section of the newspaper and the inserts. Identify the types of packaging used in these items. Working in small groups, create a chart of these items to share with your class. Discuss with your group which items use the most packaging and which use the least. Share what you have learned with your class in an oral presentation.

Florida Standards: This activity incorporates the following Florida Standards for high school students. Science: SC.912.L.17.14; SC.912.L.17.18; SC.912.L.17.19; SC.912.N.1.4; SC.912.N.4.1; SC.912.N.4.2 **Social Studies:** SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2 **Language Arts:** LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5



Keep plastic bags out of recycling

TampaBayRecycles.org

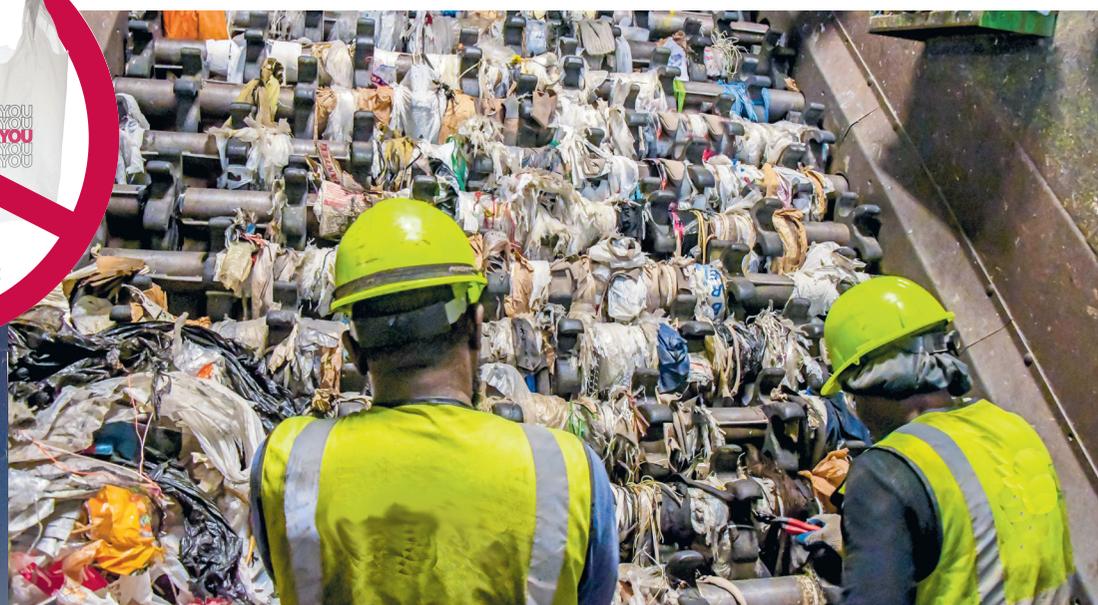


Trash the bags! Plastic bags and plastic wraps don't belong in your recycling. They damage recycling equipment and hurt recycling efforts throughout Tampa Bay. Reuse your plastic bags or return them to the store. Better yet, take a reuseable bag with you when you go shopping.

Learn more about keeping your recycling bag-free at
TampaBayRecycles.org

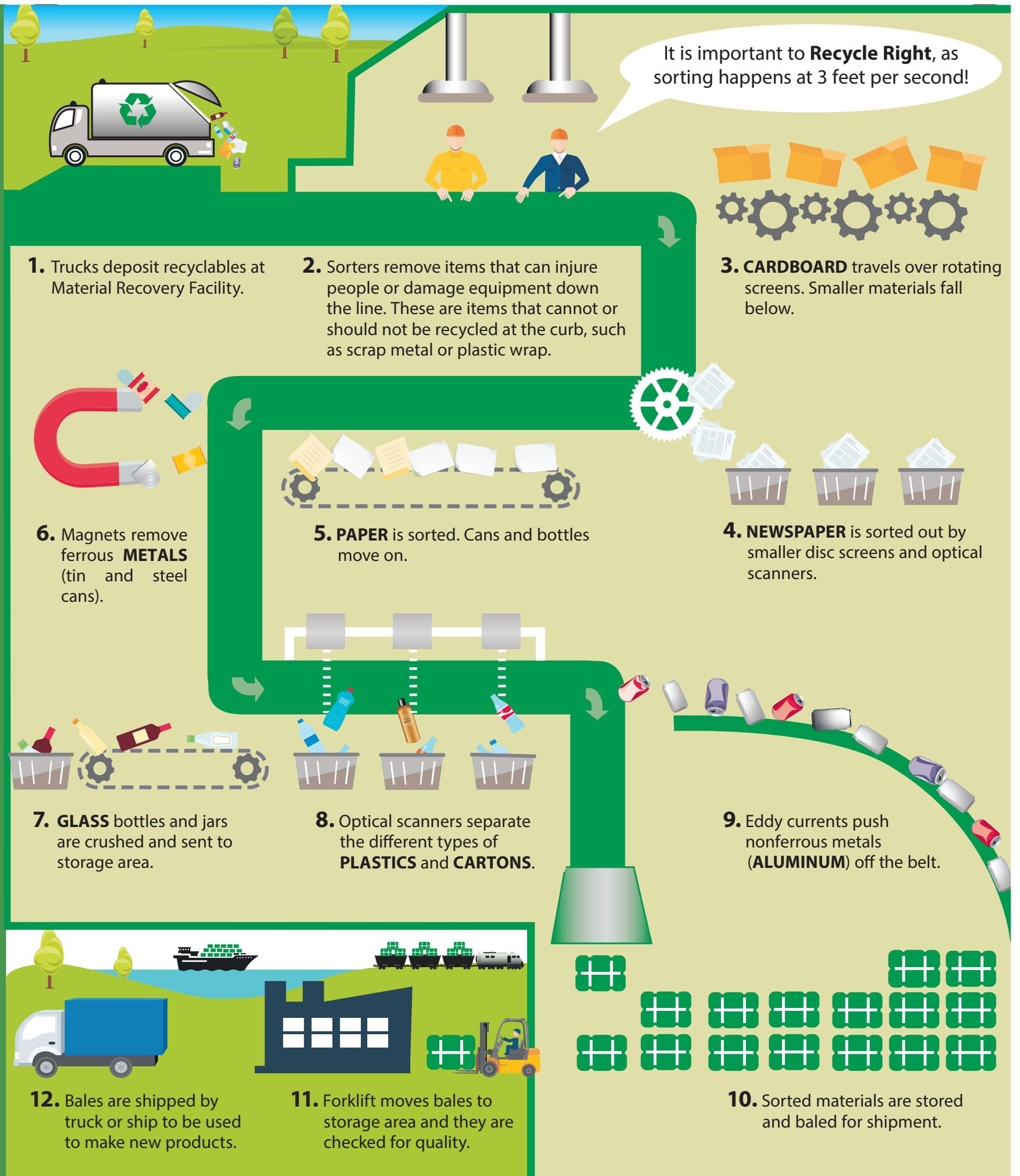
Residential recycling programs are designed to process certain program items. Bagged recyclables cannot be sorted by the recycling equipment. Plastic bags also tangle up in the sorting equipment, which causes equipment damage, creates safety hazards, reduces the amount of material that can be successfully recovered and increases the overall cost of the recycling process.

Join the social media conversation, share recycling tips and ask questions by using
#TampaBayRecycles



WHAT HAPPENS IN A RECYCLING FACILITY

Learn how recycled items go through a Material Recovery Facility (MRF).



Important: Plastic bags and plastic film can wrap around sorting equipment and jam the machines. They are particularly harmful to the recycling process and should not be recycled in curbside or drop-off center locations. Please return plastic bags to participating stores for recycling.

ACTIVITY:

According to the Environmental Protection Agency's "2016 Recycling Economic Information Report"

RECYCLING ACTIVITIES CONTRIBUTED TO THE U.S. ECONOMY:

757,000
JOBS

\$36.6
BILLION IN WAGES

\$6.7
BILLION IN TAX REVENUES

EVERY 1,000 TONS OF RECYCLED MATERIAL CREATES:

1.57
JOBS

\$76,030
IN WAGES

\$14,101
IN TAX REVENUES

ECONOMICS OF RECYCLING

In addition to its environmental benefits, recycling plays an important part in the U.S. and world economies. Recycling may help businesses and communities reduce costs associated with disposal facilities. Recycling also produces significant economic benefits by creating jobs, generating tax revenues, building more competitive manufacturing industries and stimulating the development of green technology.

Recyclables, such as aluminum cans, plastic bottles, glass jars, newspaper and cardboard, are commodities that have value and can be sold – if someone wants to buy them. The value of a particular recyclable depends on several factors, including:

QUALITY – One of the largest challenges facing recycling programs today is contamination. Contamination occurs when people place items in their recycling containers that are not accepted in their local recycling program. An example of contamination is when someone places shredded paper in his or her container. Shredded paper attaches to bottles, making them unrecognizable to sorting equipment and unlikely to be recycled.

SUPPLY AND DEMAND – Recycling is market driven. The price for a recyclable, such as cardboard or glass, may drop if there is an overabundance of it in a given market. If the market price drops below the cost of recovering the recyclable, local programs may decide not to collect it. Conversely, if there is a need for a material and it is not easily recovered or available, the price may increase. A critical component of successful recycling is finding markets for the collected material and balancing supply, processing capability and demand.

RECYCLING MARKETS are customers that are willing to buy recyclables. There are two types of recycling markets: processors and end users.

PROCESSORS buy recyclable materials and process them into new products or materials. For example, a processor might grind plastic soft drink bottles and form them into small pellets.

END USERS use processed recyclable materials to manufacture new products. For example, an end user would buy plastic pellets, melt them and use them as a component in fiber used in clothing and carpets.

Individually or as a group, use the Internet to research a specific recyclable material as far as possible from collection, to processing, to end use.

1. Provide examples of who purchases this material.
2. What is the value of this material?
3. What happens to the material next? What form does it take and where does it go?
4. What is the final end use of the material? Who is the buyer for the end product? Is it a consumer or a manufacturer?



Using the information you have learned, write a newspaper article about the journey of your recyclable. Use the articles in the *Tampa Bay Times* as models for your article. Make sure you answer the basic journalism questions: Who, what, where, when, why and how.

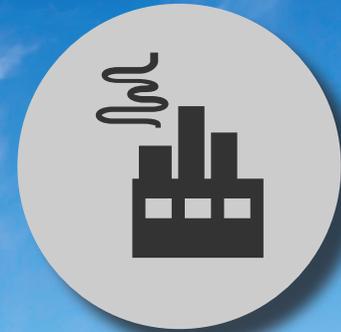
Source: "Advancing Sustainable Materials Management: 2016 Recycling Economic Information (REI) Report," Environmental Protection Agency <https://www.epa.gov/smm/advancing-sustainable-materials-management-facts-and-figures-report>

Adapted from: "The Economics of Recycling," *Action in the Classroom: An Introduction to Environmental Science for High School Students*, South Carolina Department of Health and Environmental Control's Office of Solid Waste Reduction and Recycling

Florida Standards: This activity incorporates the following Florida Standards for high school students. **Science:** SC.912.L.17.14; SC.912.L.17.18; SC.912.L.17.19; SC.912.N.1.4; SC.912.N.4.1; SC.912.N.4.2 **Social Studies:** SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2 **Language Arts:** LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5

ACTIVITY:

AIR POLLUTION AND WEATHER



In this activity, you will track AQI values and weather information for a 14- to 30-day period to understand the impact of meteorological activity on air pollution control and prevention.

Create a chart or spreadsheet with eight columns: Date, AQI, Ozone, Particles, Temperature, Humidity, Pressure and Wind Speed. Each day for 14 to 30 days, repeat the following steps. Try to do this around the same time each day.

At the end of the 14-30 days, graph each data type by date. Using your tables and graphs, what trends can you identify in your air quality and weather data? What possible causes can you think of for any trends? Do you notice any relationships between your weather data and your air quality data? What might these relationships mean? Were there any other factors (e.g., forest fires, hurricanes) that might have affected the AQI during the study period? Present your findings to your class and compare the results from each city. Think critically: Was your city urban or rural? Was it a coastal city or an inland city? Discuss what different factors may have affected each city's air quality.

1 Visit airnow.gov. Choose a city in the country to study, pick a ZIP code from that city, type the ZIP code in the search box and click Go.

2 Record the current AQI, the current ozone value and the current particles value.

3 Visit tbo.com/weather. Type your chosen ZIP code in the search box and click Go.

4 Record the current temperature, humidity, pressure and wind speed of the city you chose.

Reducing, reusing and recycling improves our environment in a way you might not expect – it can help improve our air quality!

Collecting, processing and shipping recycled materials to industrial users requires less energy than mining, refining, processing and shipping raw materials, reducing the demand for power generated by burning fossil fuels. The burning of fossil fuels is one of the main causes of air pollution.

Air pollution destroys our environment and poses serious health threats to humans and other living organisms. Air pollutants may cause a variety of adverse human health effects, such as cancer, asthma and birth defects. Effects on the environment include acid rain, which damages trees, plants and buildings and harms waterways; thinning of the ozone layer, which increases Earth's exposure to ultraviolet radiation and can cause both environmental and health problems; and climate change, which contributes to rising sea levels and extreme weather.

The Air Quality Index (AQI) is an index for reporting daily air quality and the health effects that you may experience within a few hours or days after breathing polluted air.

The Environmental Protection Agency (EPA) calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide. Ground-level ozone and particulate matter are the two pollutants that pose the greatest threat to human health in this country.

AQI values range from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy.

Daily weather conditions directly affect the quality of the air. Shifting air masses and wind can move air pollutants from one location to another, while stagnant air can result in increased concentrations of harmful pollutants.

Adapted from: "What Color Is Your Air Today?" and "Weather Watchers," TeachEngineering.org, University of Colorado Boulder

Additional sources: Environmental Protection Agency, Sciening.com

• airnow.gov

• pinellascounty.org/environmental/airquality/daily-readings.htm

Florida Standards: This activity incorporates the following Florida Standards for high school students. Science: SC.912.L.17.14; SC.912.L.17.18; SC.912.L.17.19; SC.912.N.1.4; SC.912.N.4.1; SC.912.N.4.2 **Social Studies:** SS.912.E.1.4; SS.912.E.2.1; SS.912.E.2.2; SS.912.E.2.11; SS.912.FL.2.1; SS.912.FL.2.2 **Language Arts:** LAFS.912.L.1.1; LAFS.912.L.1.2; LAFS.912.L.2.3; LAFS.912.L.3.4; LAFS.912.RI.1.1; LAFS.912.RI.1.2; LAFS.912.RI.1.3; LAFS.912.RI.2.6; LAFS.912.RI.3.7; LAFS.912.RST.1.3; LAFS.912.RST.3.7; LAFS.912.RST.3.9; LAFS.912.SL.1.1; LAFS.912.SL.1.2; LAFS.912.SL.1.3; LAFS.912.SL.2.4; LAFS.912.SL.2.5; LAFS.912.SL.2.6; LAFS.912.W.1.1; LAFS.912.W.1.2; LAFS.912.W.1.3; LAFS.912.W.2.4; LAFS.912.W.2.5; LAFS.912.W.2.7; LAFS.912.W.3.9; LAFS.912.WHST.1.2; LAFS.912.WHST.2.4; LAFS.912.WHST.2.5

Household Electronics & Chemical Collection Center (HEC₃)



2855 109th Ave. N, St. Petersburg
pinellascounty.org/solidwaste/swapshop

HOURS: Mon.– Sat. 7 a.m. to 5 p.m.

Pinellas County residents may drop off household electronics and chemicals at no cost for recycling and proper disposal.



What TO BRING to HEC₃



Paint Products
 Limit is five 5-gallon and 20 1-gallon containers



Mercury-Containing Devices



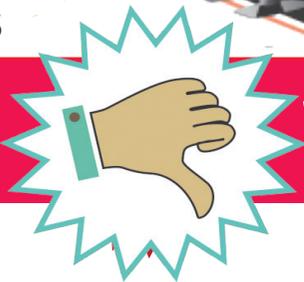
Lawn & Garden Supplies



Electronics with screens, CPUs and Rechargeable Batteries
 Limit 6 TVs/5 computers



Automotive Products
 Limit is five 5-gallon containers of fuel and one 5-gallon container of oil or other fluid.



What NOT TO BRING



Pool & Spa Products



Medicine & Sharps



Fire Extinguishers



Appliances (Large or small)



Batteries
 Alkaline batteries go in garbage



Household Electronics such as vacuums and audio/video equipment



Propane Tanks (over 1 pound) or other compressed gases

For more information, call Pinellas County Solid Waste at **727-464-7500** or visit pinellascounty.org/solidwaste.





VOLUNTEER OPPORTUNITIES

Check out Pinellas County's volunteer opportunities by calling 727-582-2910 or visiting pinellascounty.org/volunteer.

Pinellas County also has many opportunities to take part in community restoration and cleanup events through local nonprofit organizations such as Keep Pinellas Beautiful, the Tampa Bay Estuary Program, Tampa Bay Watch, the Clearwater Audubon Society and the St. Petersburg Audubon Society.



In Pinellas County, we make it easy to find out how to recycle or dispose of just about anything from your home.

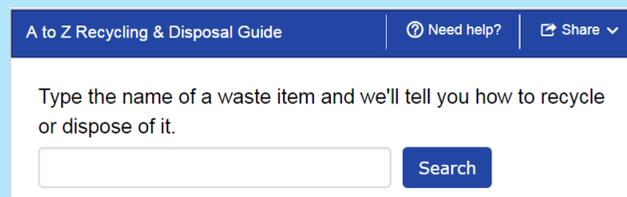


A to Z GUIDE

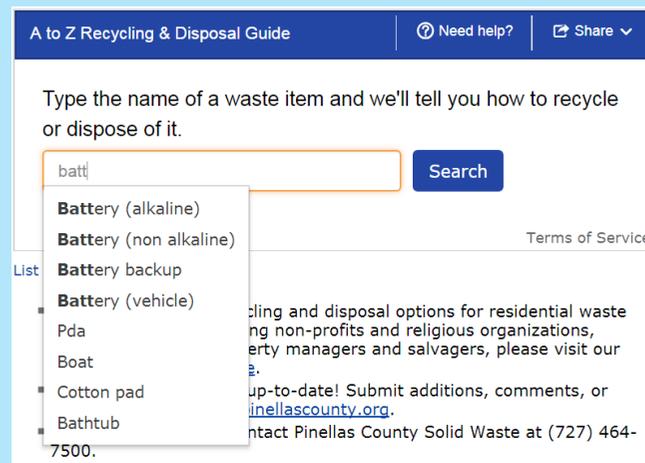
Recycling & Disposal in Pinellas County

pinellascounty.org/solidwaste/getridofit

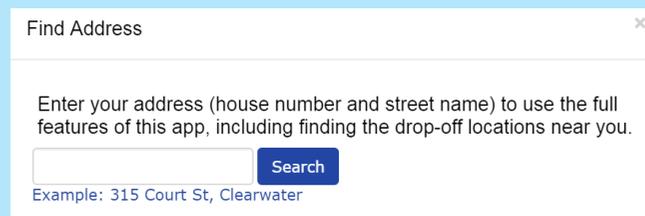
1 Visit pinellascounty.org/solidwaste/getridofit



2 Type in the name of the item you're looking to recycle or dispose of



3 Enter your address to find drop-off sites near you



How to Recycle Right in Pinellas County

Recycling programs are always changing. Whether you've been recycling for two months or 20 years, it's worth taking a second look at what your program accepts.

YES

Place clean and empty items loose in recycling containers.



Aluminum, Tin & Steel Cans



Cardboard (Flattened)



Cartons (NO straws)



Glass Bottles & Jars
(NO other types of glass)



Newspaper, Mixed Paper & Paperboard (Cereal boxes)



Plastic Bottles
(Plastic containers #1-7)

NO



No plastic bags, wrap, packaging or film



No paper towels, plates, cups, tissue or wax paper



No Styrofoam, foam containers or packaging