Grade: 6-8 | Time: : 2-3 hours
(plus homework/research)

RECYCLING METALS

Essential Question:

Does your community recycle?

Overview

Students conduct a study of metal recycling in their community and create a new or improved plan for recycling or a public awareness campaign.

Vocabulary

- Royalty
- Metals
- Recycle Process
- Conservation of Mineral Resources
- Community Planning

Assessment

Can students:

- Describe the impacts of recycling or using common metal products?
- Develop ways to involve their community in reducing metal wastes?

Teacher Information and Procedure

Prior knowledge for students: None

Source: New. Aluminum and Steel Recycling pages from NEED. (Graphics from Depositphotos.com)

Materials needed: Internet access.

Alaska Standards Addressed

Science GLEs
The student demonstrates an understanding
D5) -of how to integrate scientific knowledge and technology to address problems by: [6] SE1.1 recognizing that technology cannot always provide successful solutions [7] SE1.1 describing how public policy affects the student's life. (e.g., public waste disposal). (L) [8] SE1.1 describing how public policy affects their lives and participating diplomatically in evidence-based discussions relating to their community.

Geography F
3) analyze resource management practices to assess their impact on future environmental quality;

Government and Citizenship
C7) understand the obligations that land and resource ownership place on the residents and government of the state; and E2) recognize that it is important for citizens to fulfill their public responsibilities;

Alaska English/Language Arts and Mathematics Standards (2012)
RSL.6-8.1, RSL.6-8.4, RSL.6-8.7
SL.6-8.1, SL.6-8.4

What to do in advance

Find people and organizations in your community that students can contact about past and present solid waste disposal and recycling of metals.

Teaching the Lesson

Gear-up

Ask students to brainstorm reasons for recycling metals. Then, read and discuss the Metal Recycling Facts. After the discussion, see if you can add reasons for recycling to your list.

Explore

Choose categories of metal waste that are relevant to your community. For example: - Aluminum cans, - Steel ("tin") cans, - Junk vehicles

Assign students to teams to conduct studies of each category by talking to emailing and interviewing organizations, city officials, or village leaders, and using information available on the internet.

As part of their study they should try to find out:

- How much of the waste is generated each year in the community?
- What happens to the waste: where is it disposed of, how is it reused, and how is it recycled?
- What types of recycling programs for the metal have been considered, planned, or carried out in the past in your community. How successful have they been?

- What are the costs of shipping the material to the nearest recycling facility?
- What are the potential benefits of recycling the material?

After collecting information, the team will then use it to develop one of the following:

1. A public awareness campaign (brochure, poster, and/or presentation) to inform their community about how to recycle the material and to motivate them to recycle.
2. A plan for creating a recycling program for the community, if one does not already exist, or for improving and expanding a program that does exist.

Generalize

Discuss ways to reduce the amount of waste metal generated at home, at school, and in your community.

Assess

Develop and discuss criteria for the final product with the students. Some suggested criteria are:

Public Awareness Campaign

- Uses facts and information from the local community
- Gives compelling reasons for recycling
- Gives accurate and complete information about how to recycle
- Visually pleasing
- Well organized
- Communicates effectively

Community Recycling Plan

- Uses and facts and information from the local community
- Considers and describes:
  - ◊ Expenses and how they would be paid
  - ◊ Who would be in charge, who would do the work
  - ◊ Location for drop off, or a pick-up plan
  - ◊ Equipment, containers, facilities needed
  - ◊ Destination for recycled materials.
- Well organized
- Logical and communicated clearly
- Realistic

Extensions, adaptations, and more resources:

EPA's "Make a Difference" campaign is aimed at educating and engaging 6-8 graders in resource conservation and environmental protection. It includes activities and resources for reducing, reusing, and recycling solid wastes.
http://www.epa.gov/osw/education/mad.htm

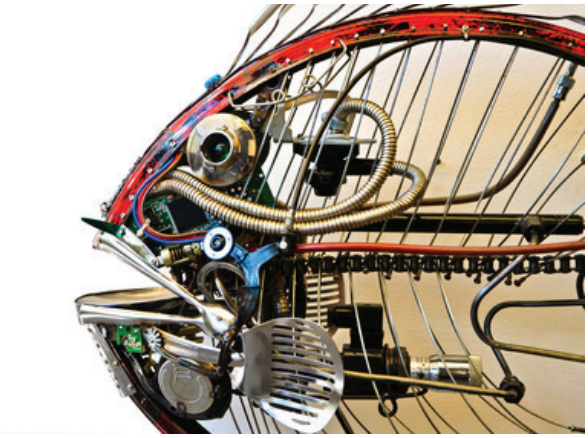
All the information you ever wanted about cans
http://www.cancentral.com

How does recycling in the United States compare with other countries?

How does Alaska compare with other states?

Visit a large recycling facility.

Pick up trash around your community. Weigh the amount of aluminum, steel, and other metals. Begin a project to do this 3 or 4 times a year and compare the amounts of metal collected each time.



Metal Recycling Facts

In 2003, we generated 18,880,000 tons of metal waste, or about 130 pounds per person in the United States from homes, businesses and institutions.

In 2012, Americans generated about 251million tons of trash (Municipal solid waste), we recycled and composted almost 87 million tons, a 34.5% recycle rate.

Worldwide, we use 5 billion aluminum cans a day, enough to reach to the moon and back if stacked end to end.

Americans consume about 100 billion cans a year, or 340 per person, 10 times more than the average European and twice as much as the average Canadian, Japanese, or Australian.

American consumers and industry throw away enough aluminum to rebuild the entire U.S. commercial air fleet every 3 months.

It requires only 25% as much energy when a can is made of recycled aluminum as compared to virgin ore!

A "tin" (steel) can takes about 100 years to decay on its own and an aluminum can takes 200-500 years.

About 44% of aluminum beer and soft drink cans were recycled in 2003 in the United States.

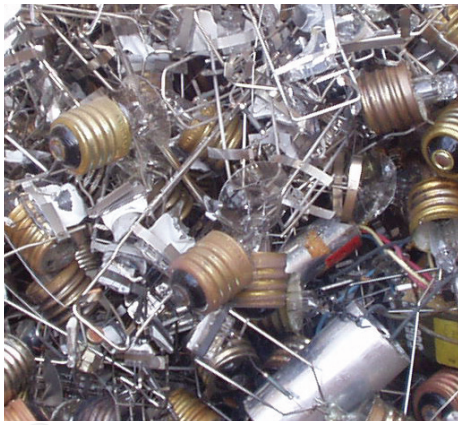
Recycling one aluminum can saves enough energy to keep a 100-watt bulb burning for almost four hours or run your television for three hours.

The average family in the United States uses 90 pounds of steel cans a year. Recycling that steel would save: 144 KWh of electricity, 63 lbs of coal, 112 lbs of iron, 5.4 lbs of limestone per family.

For every ton of post-consumer waste there are 20 tons of hidden pre-consumer waste, as the manufacturing process makes its way from forest, field and mine to supermarket shelf. Each ton of material that the average American consumes leaves 32 tons of waste in its trail.

Sources

ALPAR Website ..... http://www.alparalaska.com/
Tufts University ..... http://sustainability.tufts.edu/get-involved/green-guide/recycle/
USEPA ..... http://www.epa.gov/waste/
Anchorage Recycling Center Homepage ..... http://centralrecyclingservices.com/
EPA Fact sheet ..... http://www.epa.gov/wastes/nonhaz/municipal/pubs/2012_msw_fs.pdf



Recycling Metal in Alaska

In Alaska, many metal products including cars, appliances, and bicycles are collected, sorted, reused, repaired, and re-sold. Cans and scrap metal are collected, processed, and shipped to the lower 48 to be used in the manufacture of new cans and other products.

The cost and use of energy for transporting recyclables in Alaska is often prohibitive, particularly from small and remote communities. The "Flying Can" program was started a number of years ago to help solve the challenges of recycling aluminum in rural Alaska. Empty bush planes and cargo jets carry aluminum cans from villages free of charge to larger towns and on to Anchorage. The Anchorage Recycling In Alaska, many metal products including cars, appliances, and bicycles are collected, sorted, reused, repaired, and re-sold. Cans and scrap metal are collected, processed, and shipped to the lower 48 to be used in the manufacture of new cans and other products.

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Many recycling programs have been initiated throughout the state, including:

Alaskans for Litter Prevention And Recycling

Programs include : Flying Cans, Can-Do Kids program, Youth Litter Cleanups, Backhaul to the Lower 48, Anchorage School recycling program.

http://www.alparalaska.com/
PO Box 200393,
Anchorage, AK 99520
Phone (907) 274-3266
Fax (907) 274-8023
Email: alpar@gci.net

The Anchorage Recycling Center

Takes aluminum cans, "tin" cans, aluminum, copper, and brass

http://centralrecyclingservices.com/
2400 Railroad Avenue
Anchorage, AK 99501
Phone: (907) 748-7400
Fax: (907) 748-5084

Green Star

A non-profit organization that recognizes and rewards businesses and schools committed to environmental responsibility.

http://www.akforum.org/green-star/
Email: greenstar@akforum.org
PO Box 212409
Anchorage, AK 99521-2409
Phone: 888.301.0185

Valley Community Recycling Solutions (VCRS)

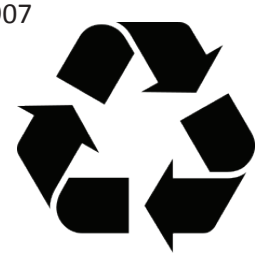
A non-profit organization devoted to establishing recycling as a part of daily life in the Mat Su Valley region of Alaska.

http://www.valleyrecycling.org/
9465 E. Chanlyut Circle
Palmer, AK 99645
Phone: (907)745-5544
Email: solutions@valleyrecycling.org

Schnitzer Alaska

Previously: Alaska Metal Recycling
Alaska's largest recycling facility. Processes ferrous and non-ferrous metals of all kinds, and car bodies.

http://www.schnitzersteel.com/company_locations.aspx?View=Detail&ID=5 Schnitzer Alaska
9705 King Street,
Anchorage, AK 99515 US
Phone:(907) 349-4833
Fax (907)344-9907



Recycling Metals

In the U.S., the metals we mainly recycle are aluminum and steel. Some other metals—like gold, silver, brass, and copper—are so valuable that we rarely throw them away. They do not create a trash problem.

We use a lot of aluminum and steel. Americans use 100 million steel cans and 200 million aluminum cans every day. Recycling is the best way to deal with aluminum and steel waste.

Burning metal trash is not good because metals do not provide any heat energy. Aluminum melts and steel just gets very hot.

Burying is usually not a good idea either. Aluminum, especially, is so valuable that it does not make sense to bury it.

Recycling Aluminum

Like most metals, aluminum is an ore. An ore is a mineral that is mined for a valuable material in it. Bauxite, a reddish clay-like ore, is rich in aluminum. To get the aluminum out, though, takes a huge amount of energy.

That is why recycling aluminum makes sense. It saves energy—a lot of energy. Recycling just four aluminum cans saves as much energy as the energy in one cup of gasoline. Companies save energy and money by using recycled aluminum, so they will pay you for your old cans—about a penny for every can.

After you have put your old aluminum cans in a recycling bin, what happens next? The old aluminum cans are taken to an aluminum plant. The cans are shredded into potato chip sized pieces and put into a furnace. The melted aluminum is made into thin sheets.

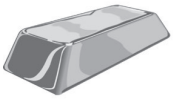
The sheets are usually made into new aluminum cans. This is called closed-loop recycling because the old cans are turned into the same thing again. Aluminum cans are recycled into new cans and put back onto store shelves within 60 days!

Aluminum Can Recycling

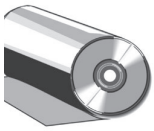
1. You enjoy your favorite beverage in an aluminum can.

2. You are a good "sort." You put the aluminum can into a bag or bin for recycling.

3. A recycling company takes the cans to a recycling plant. The aluminum is shredded and melted.



4. The molten aluminum is gradually hardened into ingot form.



5. The ingots are made into flat sheets that canning and bottling companies buy.

6. The aluminum sheets are made into new cans, and the cycle begins again.

Over and Over

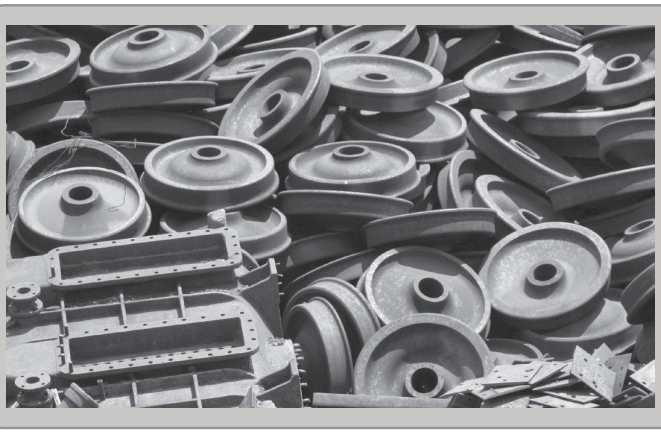
Aluminum can be recycled over and over again. It does not lose its quality, and recycling it saves money, energy, and natural resources every time. Today in the U.S. we only recycle 55% of our aluminum cans.

Steel Recycling

Steel is the most recycled metal. We recycle huge amounts of steel from cars, appliances, old buildings, and bridges. Today, all steel products are made with some recycled steel.

You can help at home by recycling steel cans. The cans with your soup, your dog's food, and Mom's coffee are made of steel. In fact, about 90 percent of all metal food containers are made of steel.

You have probably heard people call a steel can a tin can. Steel cans are sometimes called tin cans because the inside is coated with a thin layer of tin. Tin protects the food in the can.



Saving Energy by Recycling Steel

Americans use 100 million steel cans each day. During that time, 67 million cans are recycled.

For every ton of steel recycled, we save:

- 2,500 pounds of iron
- 1,400 pounds of coal
- 120 pounds of limestone
- Enough energy to power the city of Los Angeles for 8 years

The ABC's of Steel

Steel and aluminum are both mined from ores and are made in a similar way.

Steel recycling saves a lot of energy. It takes 75 percent less energy to make steel from recycled materials than it does from iron ore. That's why today's steel makers always use some steel scrap to make new steel products.

Magnet Power

Steel is the easiest material to separate from the rest of the trash. Steel is attracted to magnets. If you're not sure which cans are steel and which are aluminum, use a magnet to separate them. Steel will stick to the magnet; aluminum will not.

Recycling your used steel cans at home is easy, too. All you need to do is rinse the food from the cans and place the cans in a recycling bin. That's it.

Recycling Steel

Steel can recycling is like aluminum can recycling. Steel is melted in a furnace and then flattened into sheets.

Recycled steel cans can be made into new cars, girders for buildings, or new food cans. Like aluminum, steel can also be recycled again and again. It does not lose any of its strength or quality in the recycling process. It can be a never-ending process that continues to save energy and resources.