

Lesson 2: Evaluating Waste Streams

Grade Level:

6-8

Concepts Taught:

Conservation of resources, circle graphs

Activity Time(s):

20 minutes (lesson); 30 minutes (follow-up)

Essential Questions:

- What is municipal solid waste (MSW)?
- What is a waste stream?
- What can pie graphs tell us?
- What is the make up of the waste stream for Wake County, N.C.?

NC CORE/Essential Standards:

Grade 6: Math 6.RP.3.c; Science 6.E.2.4, 6.L.2.3; Soc Std 6.G.1.2, 6.G.1.3, 6.G.1.4, 6.G.2.1;

Grade 7: Math 7.NS.3, 7.G.1, 7.G.2, 7.G.4; Science 7.E.1.6; Soc Std 7.G.1.1, 7.G.1.3, 7.G.2.1

Grade 8: Science 8.P.2.1, 8.P.2.2, 8.E.1.4; Soc Std 8.G.1.2, 8.G.1.3



Objectives:

- Students will identify common components of a Municipal Solid Waste Stream.
- Students will predict proportions/percentages for each component of Wake County's MSW stream.
- Students will review and discuss composition of circle graphs.
- Students will extrapolate similarities and differences between the waste stream of Wake County and other geographic locations.
- Students will use provided data to create a circle graph.

Materials:

Sample of county waste stream graph (included) —make a transparency
Sample waste stream data for "Anytown, USA" (included)-make a transparency and student worksheet
Protractors for each student

Lesson:

1. Review concepts about landfills. Landfills are necessary. They are specially designed and operated to minimize effects on the environment. Students have many opportunities to reduce the amount of garbage taken to the landfill such as recycling at school.
2. Review the term Municipal Solid Waste (MSW). Explain that MSW makes up part of our waste stream, which is the waste material output of a community. Other parts of the waste stream can include agricultural waste, industrial waste, tires and batteries. Explain that during this lesson, students will focus only on the MSW part of the waste stream. MSW is made up of paper, plastics, metals, wood, food waste, glass, construction and demolition debris, and other materials that are sent to the landfill.
3. Show the pie graph without legend of the MSW waste stream for Wake County, NC. Ask students what materials they think make up each section of the waste stream.
4. Show the circle graph with legend and discuss why the waste stream is proportioned that way. Most of the waste stream is made up of containers and packaging because

Starve the Landfill

Most everything we purchase comes in some type of packaging.

5. Other items to discuss with students regarding the graph:

a. *What is the title of this circle graph?* (Waste Stream for Wake County) Notice that it describes the graph without using too many words, but gives enough detail so that the reader knows exactly what the graph is about.

b. *How do you think you make a portion of the circle graph to measure exactly 30%, like the paper portion on this graph?* First, you know that there are 360 degrees in a circle. We have to figure out how many degrees 30% of this circle would measure. Multiply 360 by 0.30 (or 30%). (Use calculators or pencil and paper.) This makes 108 degrees. If you were making a circle graph, you would use your protractor and the center of the circle to measure 108 degrees to show the paper portion of the circle.

c. *How many degrees would the food waste portion of the circle use?* Multiply 360 (because there are 360 degrees in a circle) by 0.10 (or 10%). You should get 36 degrees for the food waste portion of the circle graph.

d. *How many degrees should all of your portions add to total?* (360)

e. *What is a legend?* (It's the key that shows what each section of the circle graph stands for. This can be done using colors or patterns (such as dots, diagonal lines, etc.).

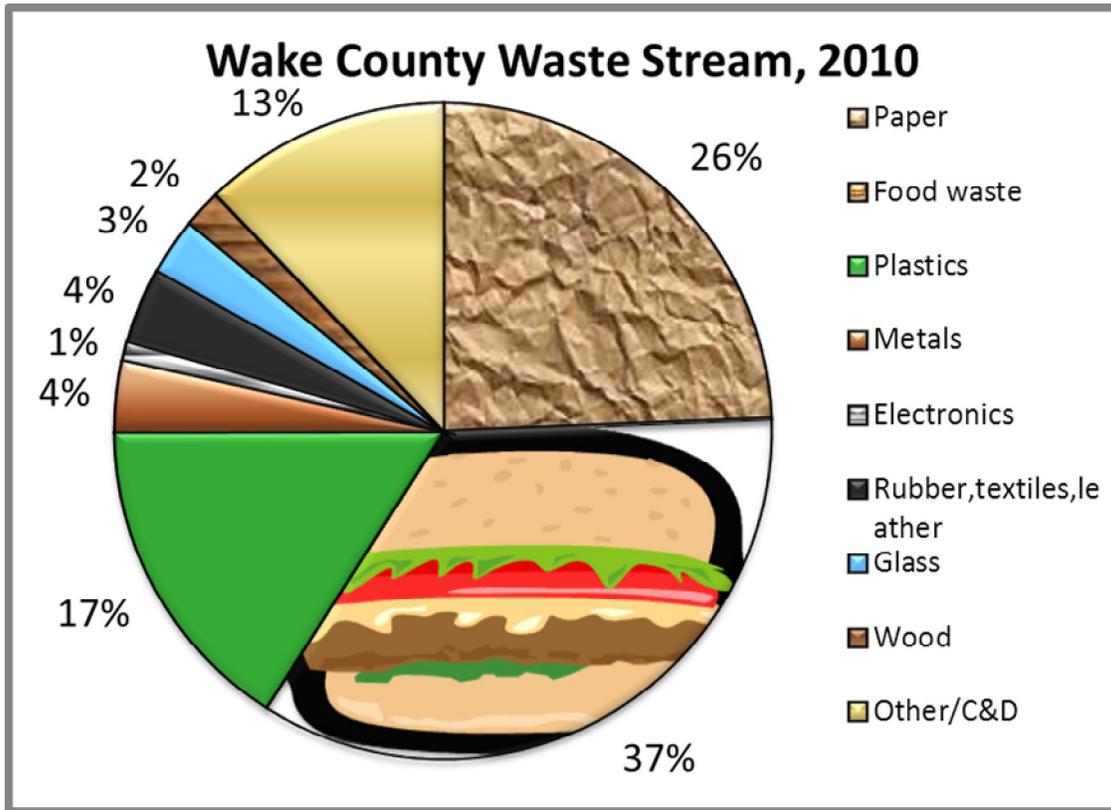
6. Ask if students think the graph of waste streams from other geographic locations will look similar or different to Wake County's waste stream. Other locations that do not have curbside recycling services may have an increased amount of plastic, paper, glass, and metal thrown away. Also, the construction and demolition debris section would probably be bigger in an area that has recently experienced a natural disaster or is rapidly growing and where many homes are being built.

7. Have students use the provided worksheet to create a circle graph showing the waste stream distribution for "Anytown, USA". Students must also include all the necessary parts of a circle graph including labels, title, and legend. A grading rubric is attached. Follow up this activity by discussing how the waste stream graph might look different if the waste were measured in weight instead of volume. [For example, items like Styrofoam® weigh less but take up more volume].

Extensions:

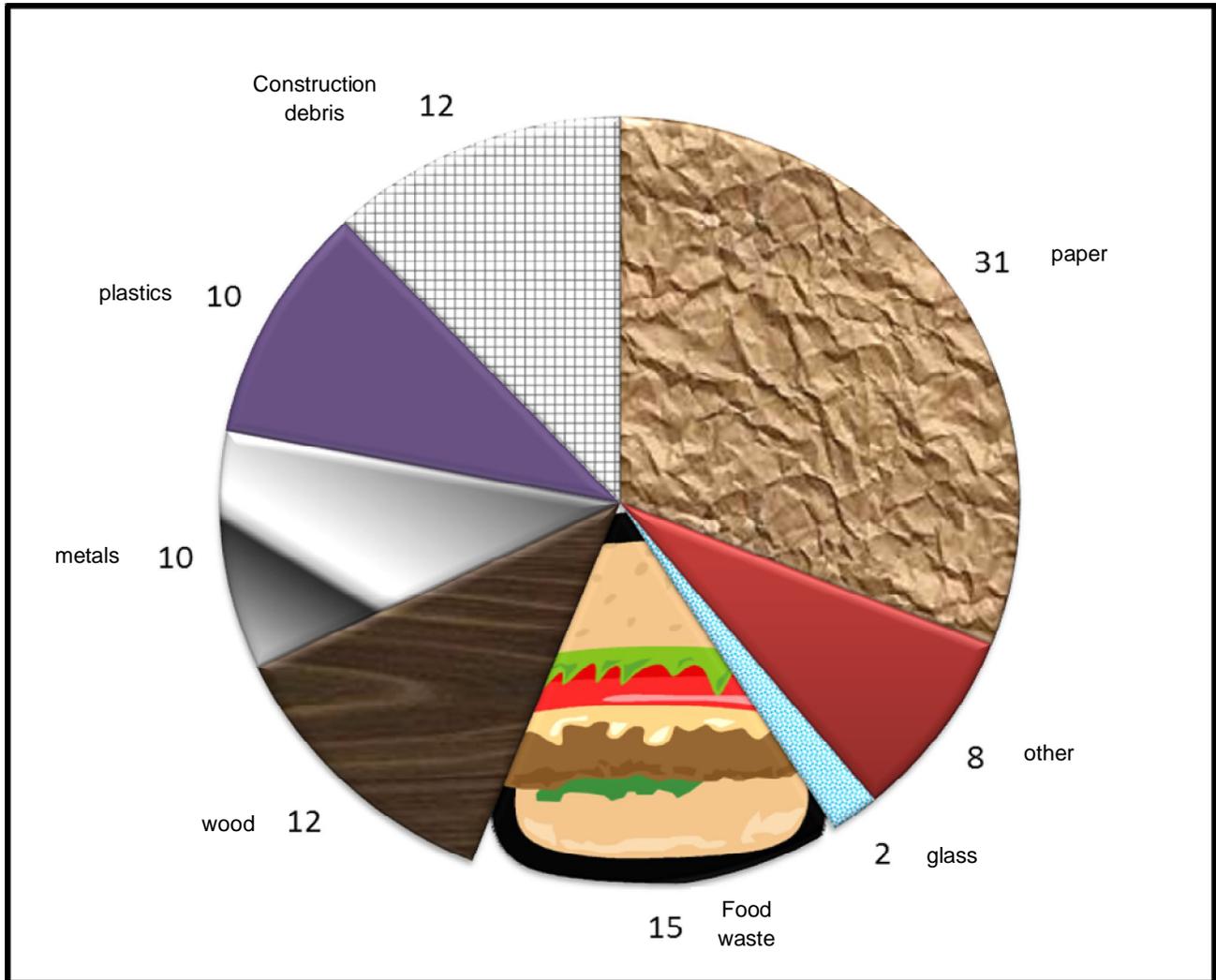
1. Trash Journals: Students record what type of materials they place in the trash can over the course of a day or a week and analyze how each individual's trash compares to the waste streams that were discussed in the lesson. Data collected can be organized in graph format (i.e., bar graph, circle graph).

2. Make an "Alternative Garbage Pizza" with students using the activity following this one.



Source: SCS Engineers; 2011 Wake County Solid Waste Composition Study

Waste Stream for Anytown, U.S.A.—Answer Key



Grading Rubric for Circle Graphs

CATEGORY	4	3	2	1
Neatness	The graph is readable, clean, neat and attractive. It is free of erasures and crossed-out words.	The graph is readable, neat and attractive. It may have one or two erasures, but they are not distracting.	The graph is readable and somewhat attractive.	The graph is not neat or attractive.
Sections	The graph contains the correct number of sections that are all correctly apportioned.	The graph contains the correct number of sections, but may not be drawn or calculated appropriately.	The graph is missing one or more sections. An attempt has been made to correctly apportion the categories.	The graph is missing two or more sections. There has been little or no attempt to correctly apportion the categories.
Title	The graph has been appropriately titled. The title is in the correct place.	The graph has been appropriately titled, but the title is not in the correct place.	The graph has an inappropriate title.	The graph has not been titled.
Labels	All sections of the pie graph are appropriately labeled.	The graph has one section that is not labeled.	The graph has two sections that are not labeled.	The graph has three or more sections that are not labeled.
Legend	The graph contains a legend that matches all sections of the graph.	The graph contains a legend that may be missing one section or does not match one section of the graph.	The graph contains a legend that may be missing two or more sections or does not match two or more sections of the graph.	The graph does not contain a legend.