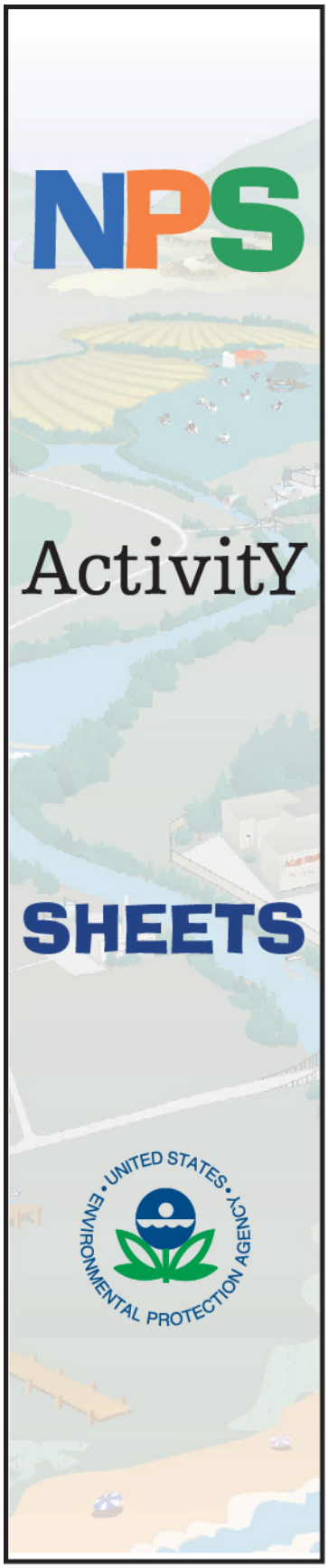


Activities to Accompany

Stop Pointless Personal Pollution

For Grades 6-8

Objectives:

This is a set of exercises based on some of the topics addressed in the accompanying article. They emphasize personal participation and creation of a program. In Exercise I, students are encouraged to take charge of their environment through an Adopt-A-Street program. Exercise 2 is a problem that uses math interpretation to lead students to think about a more water-conservative strategy for car washing. In particular, students are asked to work with fractions. The third exercise uses a case study to evoke thought and discussion among students about pet sources of bacteria in densely populated areas. The last exercise is a lab experiment that leads students into thinking about the effects of phosphates from household fertilizers and detergents on their waterways.

Exercises:

Exercise I. Create an Adopt-A-Street Program in Your 'Hood
Exercise II. A Suburban Bacterial Dilemma
Exercise III. Phosphates in Your Water

Time Required:

Individual exercises are designed to be approximately ½ hour to 45 minutes long.

Curricular Standards and Skills:

Natural Science:
- stream/pond ecology
- pollutants
- lab methods

Math:
- fractions
- percents

Language Arts:
- reading comprehension
- discussion/critical thinking
- writing

Civics:
- map reading/geography
- population density
- urban related challenges
- community service

Vocabulary:

acutely toxic
chronically toxic
impervious
integrated pest management
nitrogen and phosphorus
pesticides
storm drain
wastewater

Web sites:

EPA's Nonpont Source Pollution Prevention page
http://water.epa.gov/polwaste/nps/whatudo.cfm

Water Action Volunteers Storm Drain Stenciling
http://watermonitoring.uwex.edu/wav/stenciling

EPA's Combined Sewer Overflows page
http://cfpub1.epa.gov/npdes/home.cfm?program_id=5

Adopt-A-Street Program, City of Little Rock, Arkansas:
http://keeplittlerockbeautiful.com

Adopt-A-Street Program, Greensboro, North Carolina:
http://www.greensboro-nc.gov/index.aspx?page=469

Northern Virginia Regional Commission Bacteria Research page
http://www.novaregion.org/4MileRun/bacteria.htm

U.S. Census Bureau
http://www.census.gov

City of Seattle's page on Preventing Pet Waste Pollution
http://www.seattle.gov/util/environmentconservation/myhome/preventpollution/petwaste

Exercise I. Adopt-A-Street Program in Your 'Hood

Before You Get Started...

Visit EPA's Web site on combined sewer overflows at http://cfpub1.epa.gov/npdes/home.cfm?program_id=5

What is a CSO (combined sewer overflow)?

What is a wet weather discharge?

Why is it important not to throw trash and pollutants into a storm drain?

First, Few Good Examples

Everything that is washed down street gutters affects the health of the waterways around you. Storm drain stenciling is a good way to remind people not to throw used oil, trash, and other objects down the gutters. Adopt-A-Street is a similar program.

Many cities have Adopt-A-Street programs. Adopt-A-Street is a partnership between a city and its residents. Groups or individuals agree to adopt a mile or more of city streets and keep them clean. The city provides organizational help, cleanup supplies, free hauling, and street signs that identify the Adopt-A-Street sponsors. Little Rock, Arkansas and Greensboro, North Carolina are two good examples of cities that have successfully started Adopt-A-Street programs. You can see what these cities are doing by visiting the following Web sites:

Little Rock, Arkansas:
http://keeplittlerockbeautiful.com

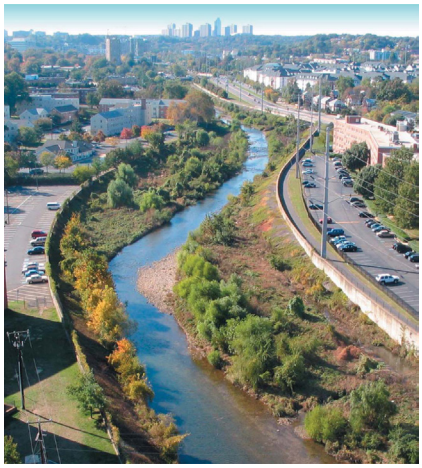
Greensboro, North Carolina:
http://www.greensboro-nc.gov/index.aspx?page=469

Now, Create Your Own

Activity 1:
Are you part of an Adopt-A-Street program? Investigate whether your city will provide support for an Adopt-A-Street program by calling the Department of Public Works.

Activity 2:
As a class, you can set up an Adopt-A-Street group for the stretch of road outside your school. You can also start an Adopt-A-Street program for your neighborhood or housing development.

Exercise II. A Suburban Bacterial Dilemma



The Four Mile Run watershed drains an urban suburb of Washington, DC.

On a map of the United States, locate Washington D.C. To the west of the city are suburbs in the state of Virginia. Four Mile Run stream runs through the suburbs. Four Mile Run drains a watershed made up of an urban area with closely packed houses, streets, and shopping centers. The watershed is less than 20 square miles, but almost 183,000 people live there (according to the U.S. Census of 2000).

Nearly 40 percent of the watershed is covered with impervious surfaces (surfaces that do not absorb water) such as buildings, parking lots, pavement, and roads.

Population Density
A way of measuring how closely people live together. It is measured in people per square mile.

Urban and suburban areas like the Four Mile Run watershed often face problems with pollution. Agencies that have been monitoring Four Mile Run have found that it contains high amounts of bacteria. It does not meet minimum state standards and therefore has been labeled "unsafe for fishing or swimming."

Pollution Challenges
A discussion of the many water quality issues facing Four Mile Run can be found in http://www.novaregion.org/DocumentCenter/Home/View/780.

Where do all the bacteria come from? As the Four Mile Run watershed mostly has houses, offices, malls and shops, it is easy to rule out industries and factories as the source of bacteria. Scientists discovered that along with some waste generated by animals such as raccoon, geese, and deer that survive in suburban areas, domestic pet waste is also a significant source. At approximately 800 per square mile they estimated that dogs contribute more than **5,000 pounds** of pet droppings every day in the 20 square mile watershed.

How do they know it's pet waste?
Scientists have been studying bacteria in the watershed's streams and ponds to identify the exact sources of bacteria. They are trying to find the sources by doing DNA fingerprinting studies. These studies show scientists what type of animal created the bacteria. The studies examine *Escherichia coli,* also known as *E. coli*. This strain of bacteria lives in the intestines of humans and warm-blooded animals, mammals, and many birds. Because each warm-blooded species has a unique DNA fingerprint, scientists can examine DNA from the *E. coli* and link it to the animal that produced it. Then they will know which animals are responsible for the bacteria in the waterways.

Calculating Population Density

Hint: To find the population density of an area, you divide the area's population by the area's size.

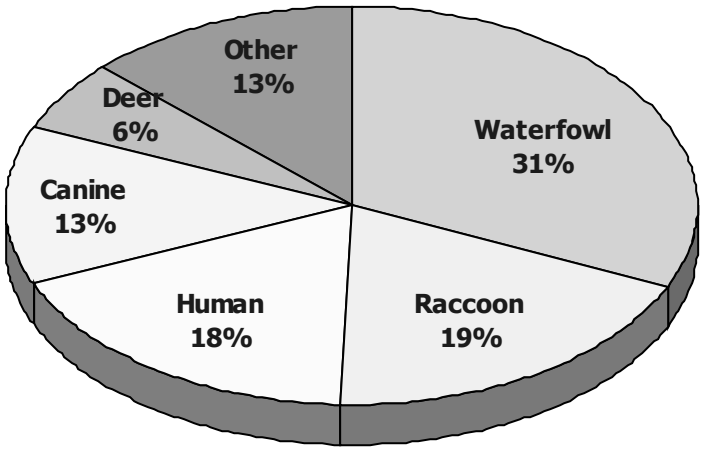
Population Density = population ÷ size

If the population of the Four Mile Run watershed is 160,000 and its size is 20 square miles. What is its population density?

What is the population density of your area? Get population figures at http://www.census.gov/population/www/censusdata/density.html

Reading a Pie Chart

Look at the pie chart below. What are the top 3 sources of bacteria in the Four Mile Run watershed?



Sources of Bacteria in the Four Mile Run Watershed.
Source: Northern Virginia Regional Commission, Don Waye, March 25, 2002

Using the Internet

There are many ways to reduce the amount of bacteria that enters streams and lakes. They are called best management practices. In the space provided, write a paragraph on the best management practices that could be used to reduce the amount of animal-related bacteria that enters waterways in urban and suburban areas.

Hint: Best management practices are described on the Internet. A page that talks about best management practices for bacteria is www.seattle.gov/util/environmentconservation/myhome/preventpollution/petwaste.

Group Activity

In a group of three, come up with a public planning strategy for reducing animal-related bacteria. For each part of your strategy, list the possible objections and roadblocks you might run into and the steps you would take to address them.

Public Planning Strategies

To reduce bacteria pollution, many cities have come up with a combination of best management practices they would like to use. This combination of ideas is known as a public planning strategy.

Exercise III. Phosphates in Your Water

Goals and Objectives

This experiment looks at how fertilizer runoff affects waterways. Students will:

- Examine the effects of detergents and fertilizers on aquatic life.
- Test for dissolved oxygen in water samples.
- Determine the relationship between pollutants and dissolved oxygen in water.
- Collect and interpret data.

Materials Needed

- Access to a nearby pond or stream
- Dissolved oxygen test kit
- 10 jars
- Trowel
- Water, plants (get some with roots), and mud from a pond
- Detergent containing phosphates
- Fertilizer in powder form
- Measuring spoons

Procedure

1. Label jars 1 through 10. Cover the bottom of each jar with mud and plants (roots and all). Fill each jar with pond water.
2. Place the appropriate amount of fertilizer or detergent in each jar using the amounts listed in the following chart.
3. Following test kit directions, measure the amount of dissolved oxygen in the pond water.
4. Put all the jars in a sunny location.
5. Make observations daily for 2 weeks.
6. Measure the amount of dissolved oxygen, according to the kit directions, on day 7 and day 14 of the experiment.
7. Discuss your observations.

Jars	Treatments	Dissolved Oxygen Day 1	Dissolved Oxygen Day 7	Dissolved Oxygen Day 14
1.	CONTROL			
2.	CONTROL			
3.	1/8 tsp detergent			
4.	1/4 tsp detergent			
5.	3/8 tsp detergent			
6.	1 tsp detergent			
7.	1/8 tsp fertilizer			
8.	1/4 tsp fertilizer			
9.	3/8 tsp fertilizer			
10.	1 tsp fertilizer			

Note: tsp = teaspoon

Analysis

At the end of the experiment, which jar had the most vigorously growing plants?

Which jar had the least dissolved oxygen?

Conclusions

What would happen in a stream that has an excess of phosphates, warm temperatures, and good sunlight?

How are phosphates in the water important?

Look around your home and school and list possible sources of phosphates that might be entering local streams.

Does your state have a phosphate detergent ban? What does it do? When was it implemented?