From the Mountains to the Estuary: From the Schoolyard to the Bay

Meaningful Watershed Experiences for Grade 6 Students

Created by:

Prince William County Public Schools
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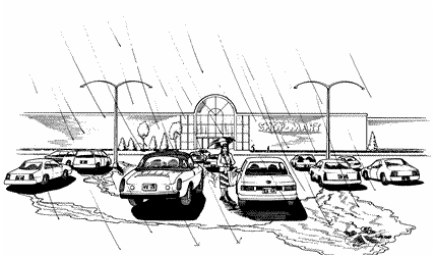
Math Integration

Calculating the Amount of Impervious Surface in your Schoolyard

Overview: Students will calculate the percentage of impervious surfaces in their schoolyard and investigate what effect it has on local water quality and the Chesapeake Bay.



Teacher Background:

Visit
http://www.chesapeakebay.net/imperviousurfaces.aspx?menuitem=14670

Materials Needed:

- Map of schoolyard[1]
- Measurements of various impervious surfaces in your schoolyard
- Measuring Wheel
- Calculator if desired

Setting the Stage:

As you just discovered in the last lesson, impervious surfaces like roads, sidewalks, driveways, parking lots and rooftops prevent rain water from penetrating into the ground. Schoolyard trails compacted by many kids walking over them are also highly impervious. When it rains, the stormwater washes over these surfaces, carrying sediment, liquids leaked from cars and trash into nearby storm sewers or streams. These pollutants are carried downstream affecting water quality in the local streams as well as the Potomac River and the Chesapeake Bay.

On warm days, when it rains, stormwater heats up as it flows over the warm parking lots and roads. This warm runoff travels into streams increasing the water temperature, which decreases the dissolved oxygen, making it difficult for aquatic life to survive. As more land is covered by impervious surfaces (e.g. stores, parking lots, roads, neighborhoods etc.), more polluted runoff enters our rivers, streams and the Bay. In the Chesapeake Bay Watershed, stormwater has become the fastest growing type of pollution.

Acquisition of Learning

1. Handout the student page, the school map and the measurements of impervious surfaces.

2. If your schoolyard has impervious surfaces not listed with measurements, you can send student groups outside with a measuring wheel to obtain length and width measurements.

Closure

As a class, discuss the calculations of impervious surfaces. Ask which surfaces were largest, smallest, most eroded etc..

Ask students how the impervious surfaces in our schoolyard affect water quality in local streams.

Tell students that in the Chesapeake Bay watershed impervious surfaces are replacing about 25,000 acres of forested or vegetated land each year. These surfaces include new strip malls, stores, parking lots, office buildings, roads, houses and sidewalks. In the year 2010, the watershed is estimated to have about 1.1 million acres of impervious surface. Ask students what ideas or projects could help slow down the conversion of forested or vegetated areas into impervious developed areas?

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[1] If you do not have a map of your schoolyard, type in the address of your school at www.maps.google.com

Student Page

Name(s):_____

1. To determine what percent of your schoolyard is impervious to rain water or snow melt, use the map and data provided to calculate the following: What is the total acreage of your school lot? _____(acres)

2. How many square feet in an acre?

   $\frac{5280^2 \text{ (number of square feet in one mile)}}{640 \text{ (number of acres in a mile)}}$ = _____ ft^2 in one acre

3. How many square feet in your school lot? _____

(We have to know the square footage of the school lot to figure out what percent of the lot is impervious to rain.)

4. To determine the percentage of impervious surface in your schoolyard, find on your map and data sheet, all of the impervious areas in your school yard. If you don't have a surface listed below at your schoolyard, leave that space blank. If you have identified other impervious surfaces in your schoolyard, add those into the blanks provided. You can find the area by measuring with the measuring wheel.

Impervious Surface	Area (ft^2)
Roof of main building (ft^2)	
Trailer roof (ft^2)	
Trailer roof (ft^2)	
Trailer roof (ft^2)	
Bus loop (ft^2)	
Parking lot 1 (ft^2)	
Parking lot 2 (ft^2)	
Tennis courts (ft^2)	
Sidewalk (ft^2)	
Front entrance walkway (ft^2)	
Cafeteria delivery parking area (ft^2)	
Basketball courts (ft^2)	
Track (ft^2)	
Shed roof (ft^2)	
Shed roof (ft^2)	
Eroded area 1 where water doesn't sink in (ft^2)	
Eroded area 2 where water doesn't sink in (ft^2)	
TOTAL Amount of Impervious Surface	
Square footage of your school's lot from question 5 above	
Divide: TOTAL Impervious Surface by Lot Size	
Percent Impervious Surface	
Percent Vegetated Areas	

Percent Impervious Surface in a Watershed Its impacts on Water Quality and Aquatic Species	
Unstressed	<1% impervious (>99% vegetated)
Lightly Stressed	1-5%
Stressed	5-10%
Impacted	10-25%

1. Using the table above, how would you classify the impacts our schoolyard will have on water quality and aquatic species in local streams?

   _____

2. List 5 different impervious surfaces you identified at your school.

   _____

   _____

3. Would you find more impervious surfaces in an urban or a rural area?

   _____

4. If you tested the run off water in local streams for pollutants (e.g. oil, antifreeze, fertilizer, trash, sediment etc…) during and just after a heavy rain storm, in what type of area or environment surrounding a stream, would you expect the water to be 'cleaner'? Explain your response.

   _____

   _____

5. During a rain storm, what happens to the oil, transmission fluid and antifreeze that leaks out of vehicles in your school parking lot?

   _____

   _____

6. What could you do in your schoolyard (anywhere on the lot) or neighborhood to decrease the amount of pollutants running off impervious surfaces into local streams?

   _____