



Welcome to the Bellingham Water School home edition!

Use these worksheets, videos, and facts to learn about Bellingham's water systems. Each one of these 5 mini-lessons take about 30-minutes to one hour and should be completed in order. For any questions about Bellingham Water School, Bellingham's three water systems (stormwater, drinking water, and wastewater), or if you want to share about your learning experience, contact us at waterschool@cob.org

Fun Fact: As the City of Bellingham grows in population, more surfaces are turned from pervious to impervious; creating more stormwater. Rain barrels, green roofs, and pervious concrete are a few examples of how we can engineer ways to decrease stormwater flowing into our waterways from traditionally impervious surfaces.

Lesson 4: Impervious Surfaces and Stormwater

The third water system that the City of Bellingham manages is stormwater. Unlike the drinking water and wastewater systems in the City, stormwater is untreated, or unfiltered. As stormwater flows across hard surfaces (impervious surfaces), it picks up pollution that was on the land from every-day activities we do within the watershed such as driving.

Vocabulary:

- **Pervious:** a porous surface, such as a forest floor, that allows water to pass through the surface, soaking into the ground.
- **Impervious:** a hard surface, such as roadways and roofs, that does not allow water to pass through the surface; instead the water pools up or runs off.

Lesson Instructions:

1. Head outside to test surfaces to see if they are pervious or impervious by pouring water and observing. Fill out the top half of page 2 with your results. Use your results to shade in the picture on the bottom of page 2 identifying all of the impervious surfaces in this model neighborhood.
2. Measure an impervious surface and calculate stormwater. Complete page 3.
3. Watch [Lost and \(Puget\) Sound](https://youtu.be/o9hF2sQ5_9s) (https://youtu.be/o9hF2sQ5_9s) (30 min)

BELLINGHAM Water School

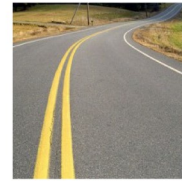
Step 1: Test surfaces outside to see if they are pervious (water soaks in) or impervious (water runs off). Pour 1 cup of water onto each surface slowly, observe for 30 seconds to see if the water is soaking in or running off.



loose gravel



bark mulch



pavement



leafy forest floor

Surfaces Tested

Pervious (water soaks in)	Impervious (water runs off)
1.	1.
2.	2.
3.	3.
4.	4.

A good way to remember pervious vs. impervious is: **P**ervious means it is **P**ossible for water to soak in, **IMP**ervious means it is **IMP**ossible for water to soak in.

Fun Fact: Stormwater enters the stormwater system of pipes that run under our city streets through stormdrains. The stormwater pipes take the stormwater to nearest body of water, without filtering any pollution the stormwater may have picked up.

Are human-made surfaces usually pervious or impervious? _____



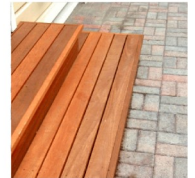
roof



lawn

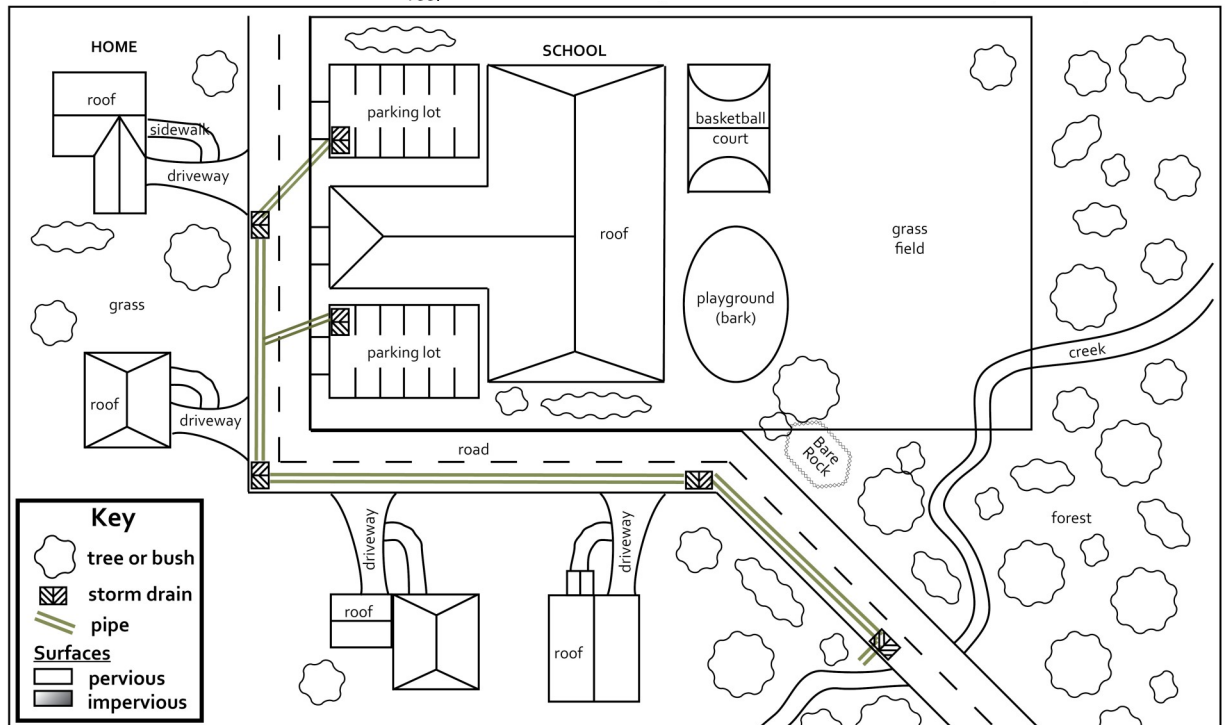


packed gravel



decking / pavers

Step 2: Use your pencil to shade in the impervious surfaces on the map. Add arrows to show the path stormwater, or the water that does not soak into the ground because the surface is impervious, will take to get to the creek.



As the City of Bellingham continues to grow, what do you think will happen to stormwater? _____



Let's measure how much stormwater comes from an impervious surface near your home!

Materials:

- Tape measure
- Pencil and paper
- Calculator

Fun Fact: *Bellingham gets 39 inches annually of precipitation (combination of rain, snow, hail). Take your tape measure and measure out 39 inches vertically. Imagine that much water covering the whole city! The City's stormwater system transports all this precipitation to creeks, lakes, and Bellingham Bay to help keep our City from flooding.*

Procedures:

1. Select a rectangular impervious surface to measure at or near your house; this could be your driveway, a parking spot, your sidewalk, or basketball court. With your tape measure, measure the length and width of your surface in feet and inches. Record here:

Length: _____ feet _____ inches

Width: _____ feet _____ inches

If your surface has bends or angles, you might want to break it down into smaller squares or rectangles and measure these separately.

2. Now that you know the length and width of your impervious surface, let's calculate surface area by multiplying length by width. We need to first convert the measurements into the same units—inches:

<p>Length (feet only):</p> <p style="text-align: right; margin-right: 20px;">X12 inches</p> <p>_____</p> <p>+ Remaining inches:</p> <p>_____</p> <p>Total length in inches:</p> <p style="margin-left: 40px;">Length in inches:</p> <p style="margin-left: 40px;">Width in inches: X</p> <p>_____</p> <p style="text-align: right; margin-right: 20px;">inches²</p>	<p>Width (feet only):</p> <p style="text-align: right; margin-right: 20px;">X12 inches</p> <p>_____</p> <p>+ Remaining inches:</p> <p>_____</p> <p>Total width in inches:</p>
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3. Imagine a heavy rain falling down from the sky. This heavy rain dropped 1 inch of water over the whole city, including the area you just measured, let's calculate the cubic inches of rain that fell on the area you measured because of the imaginary rainstorm.
4. Let's convert this imaginary rainfall in gallons so we can easily visualize how much stormwater is created from our impervious surface. Use the back of this paper if you need more space to calculate this multiplication.

Surface area in inches²:

X 1 inch of rain

inches³

Inches³ of rainfall:

X 0.004329

Gallons of stormwater:

Just imagine 39 times this many gallons every year of stormwater from just the one site you measured!

Example of Measuring Impervious Surface at My Home!

I am measuring the length and width of a parking space at my apartment using a tape measure.



Procedures:

- Select a rectangular impervious surface to measure at or near your house; this could be your driveway, a parking spot, your sidewalk, or basketball court. With your tape measure, measure the length and width of your surface in feet and inches. Record here:

Length: 16 feet 4 inches

Width: 9 feet 1 inches

- Now that you have length and width of your impervious surface, let's calculate surface area by multiplying length by width. We need to

first convert the measurements into same units—

meas- Length (feet only): 16
the inches: X12 inches
192
+ Remaining inches: 4
Total length in inches: 196

Width (feet only): 9
X12 inches
108
+ Remaining inches: 1
Total width in inches: 109

Length in inches: 196
Width in inches: X 109

21,364 inches²
Surface area in inches²: 21,364 in²
X 1 inch of rain
21,364 inches³

- Imagine a heavy rain falling down from the sky. This heavy rain dropped 1 inch of water over the whole city, including the area you just measured, lets calculate the cubic inches of rain that fell on the area you measured because of the imaginary rainstorm.

Inches³ of rainfall: 21,364 in³
X 0.004329
Gallons of stormwater: 92.48 gallons

- Let's convert this imaginary rainfall in gallons so we can easily visualize how much stormwater is created from our impervious surface. Use the back of this paper if you need more space to calculate this multiplication.

