



7th Grade Unit

“Impervious Surfaces and Pollutants in Local Waterways”

Materials and supplies to support this lesson: *

◆ Household Hazardous Waste Guides

Objective: In this unit, students will measure and calculate the amount of impervious surface at their own homes. Using the data they have collected, they will calculate the average percentage of impervious surfaces in residential areas. Students will also inventory materials and substances that might be used at home and will determine how these substances could impact local water quality. Students will also record activities that effect stormwater runoff and develop strategies to change practices that negatively affect stormwater quality.

Lesson 1: Calculate Impervious Surface Area at Home

In this lesson, students will study the amount of impervious surfaces where they live. Once the data is gathered, they will calculate the average percentage of impervious surfaces in residential areas. While students are gathering and calculating data, they can also keep a journal (see Lesson 3) of what they observe taking place on the impervious surfaces at home and in their neighborhood.

Materials

- Measuring tape (may have one at home they could use)
- *Calculate Impervious Surfaces at Home* Worksheet

Preparation

To prepare students for this activity, have them visualize their apartment complex, home lots or acreage.

Discuss with students what kind of structures or ground coverings are considered impervious surfaces. You may want to write a short list on the board for students to copy and take home: roofs, driveways, sidewalks, patios, buildings, etc.

* available for teachers from the City of Eugene. See end of unit to order.



Have students mark their rough sketches where they will need to take measurements.

Using these rough drafts, students go home and record actual measurements using tape measures.

Note: Students who live in rural areas on larger tracts of land may find measuring the dimensions of their property difficult. Have them ask their parents for the dimensions of their property. The response will probably be in acres. Have them convert the acreage into square feet: One acre=43,560 square feet or 4,047 square meters.

Sketch

Have students make a rough sketch on scratch paper of the shape of their property and the size and location of any buildings.

Scale Drawing

When students return to class with their rough drafts and measurements, distribute copies of graph paper to each student.

Using the graph paper, have students construct a scale drawing of their property, structures and other impervious surfaces using the measurements from their rough drafts. Students who live on property larger than one quarter to one half an acre will probably not need to include the whole property unless it is largely covered by structures or impervious surfaces.

Calculate

Make copies and distribute the *Calculate Impervious Surfaces at Home* worksheet to each student. Have the students calculate the square footage area of the structures and impervious surfaces (questions 1 and 2). It would be helpful to show them how to divide the areas into shapes that can be easily calculated. It is not necessary to be exact (questions 3 and 4).

Use the total square footage of impervious surfaces and divide it by the total property area (question 5). The result is the percentage of property that is covered with impervious surface.

Have the students average their individual impervious surface percentages together to calculate the average percentage of impervious surfaces for their class. Record on the worksheet (question 6).

Option: Divide the data into urban and rural properties and determine these average percentages separately (question 7).

Discuss

1. What effect does this amount of impervious surface and its subsequent untreated stormwater runoff have on local waterways?
2. How do human activities on these surfaces affect the quality of stormwater runoff? What effect can pets and livestock have on stormwater runoff?
3. What is the difference between the water quality of runoff in urban areas compared with rural areas?





Calculate Impervious Surfaces at Home Worksheet

Name: _____

Date: _____

1. Calculate the square footage area of the structures on the property where you live:
2. Calculate the square footage area of other impervious surfaces around your home or apartment:
3. Determine the total surface area of impervious surfaces:
4. What is the total property area (to a fence or street boundary) in feet?
5. Determine the percent of this property that is covered with impervious surfaces:
6. What is the class's average percentage of impervious surfaces found at residences?

Optional:

7. How many of the class's homes are in urban settings? How many are rural? How are these locations different in terms of stormwater?



Lesson 2: Effects of Stormwater Pollutants on Local Water Quality

In this lesson, students will inventory materials and substances that might be used on impervious surfaces in their homes. Materials could include cleaning solutions, paint, fertilizers and pesticides. This information will then be used to determine the effect these substances have on the stormwater surface runoff and the waterways into which the runoff discharges.

Materials

- *Household Hazardous Waste Inventory Worksheet*
- *Household Hazardous Waste Guide*

Procedure

Copy and distribute *Household Hazardous Waste Inventory Worksheet* to each student.

Discuss the process to have the students take their worksheets home and look in their garage, basement, workshop, closet, etc., for substances listed on the worksheet. They may want to check with their parents to be sure they don't overlook anything. Add any substances their family may use on impervious surfaces that do not appear on the list. Make sure they note the type and amount of each substance and where and how it is used.

Research

When students return with their completed worksheets, distribute the *Household Hazardous Waste Guide*. The guide provides information on the proper method of disposal for each substance as well as suggesting alternatives. Using their completed home inventories, have students research water quality effects of pollutants their family uses. Resources include the library and the internet.

Report

Have students write a report on the source of pollutants, their effects on water quality, and possible solutions/alternatives.

Project

Have each student make a poster, labels or brochure that contains the disposal information that his or her family needs. They may decide to make drawings, clip pictures from magazines, take photographs, etc.

Extension

Have students make a report describing how their family has changed behavior as a result of this project. Suggest they use photographs, artwork, samples, etc.

Lesson 3: Journal of Local Water Quality Impacts

In this lesson, students record activities they see take place on the impervious surfaces of their neighborhood on a journal sheet. They then discuss with the class what they observed and develop strategies to change practices that negatively affect stormwater quality.

Materials

- Journal Sheet
- Butcher paper hung on wall
- *Household Hazardous Waste Guide*

Observe

Students spend 15-30 minutes on 4-6 different occasions walking through their neighborhood and recording activities they observe that may affect local water quality. Examples could be litter being thrown in the gutter, someone washing a car, a parked car leaking oil or antifreeze, or any activity that could result in pollutants being washed down a storm drain. Record these observations on *Observe and Record Water Quality Impacts Worksheet*

Record

When students complete the *Observe and Record Water Quality Impacts* Worksheet, have the class generate a list of all the observations on a butcher paper banner hung on the classroom wall.

Discuss

Discuss the effect that individual activities and substances may have on surface water and stormwater runoff. How do they affect water quality? Refer to the *Household Hazardous Waste Guide*.

Have students choose 4-5 substances or activities they think have the most negative water quality impact. Have them use the criteria of frequency and/or extent of damage to make their decisions.

Lead a class discussion in alternatives to the hazardous substances or activities using the *Household Hazardous Waste Guide* as reference.

Act

Have students design and implement an education strategy to improve the water quality impacts in their neighborhood. Some possibilities might be developing posters, flyers or newsletters. Encourage students to contact their neighborhood leaders and place an article in the neighborhood newsletter. For neighborhood leaders, contact the City Neighborhoods Office at 541-682-5272.

Hold a "Fish-Friendly Car Wash" on a sunny Saturday to raise money for your school group and demonstrate how to protect Eugene's water quality at the same time. Students may write and design fact sheet to hand out to vehicle owners. See *Fish-Friendly Carwash* video for additional information.



SPLASH! classroom materials are online at happyivers.org

SPLASH! was developed by the City of Eugene Stormwater Management program to support education about water quality in our community. This program is funded by City of Eugene stormwater user fees.

* For more information, supplies for use with these lessons, the SPLASH! Songs CD, or a visit from Lily, contact jeffrey.j.flowers@ci.eugene.or.us or call 541-682-8482 (Eugene schools only)

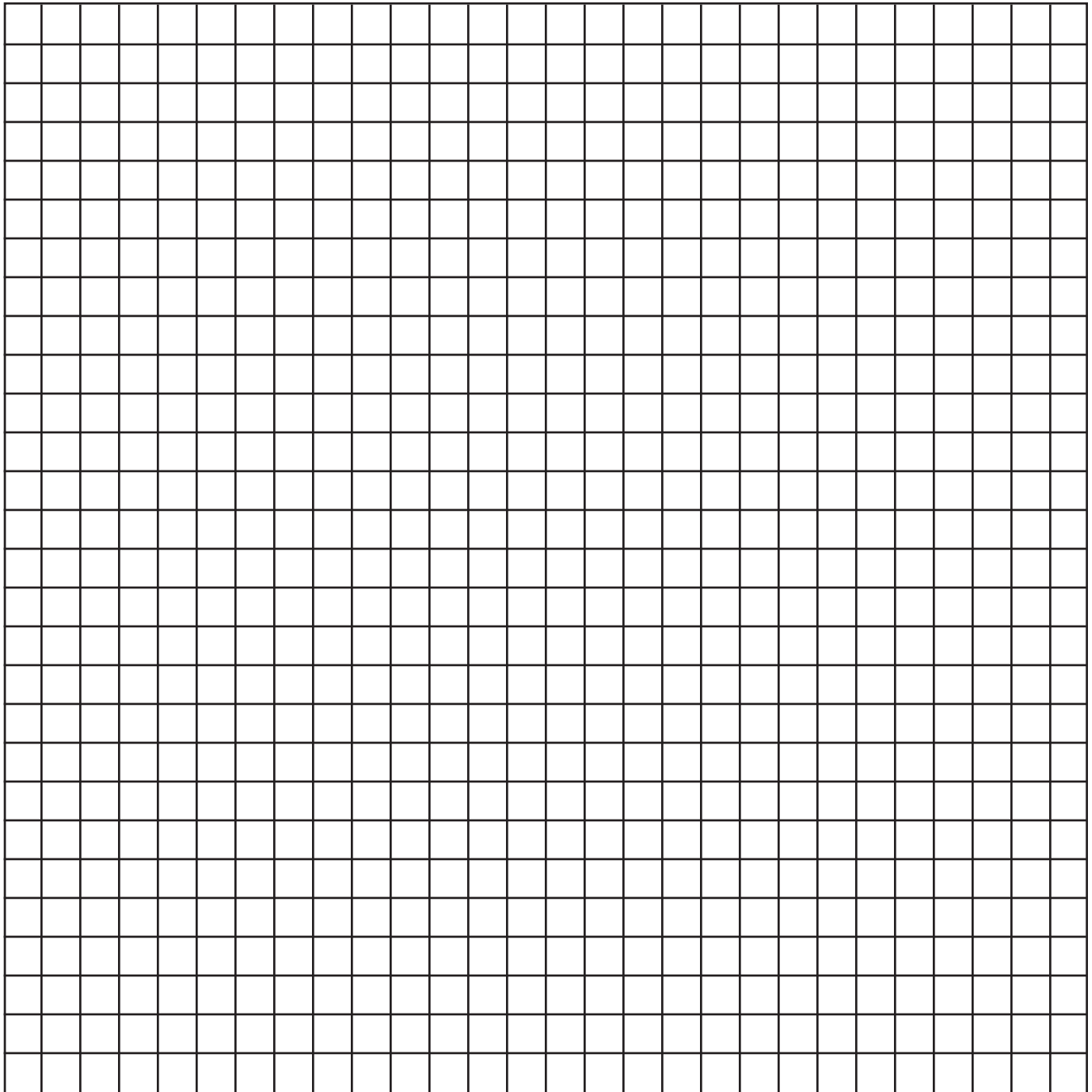




Graph Paper

Scale:
1 square= _____

Name: _____
Date: _____





Household Hazardous Waste Inventory Worksheet

Name: _____

Date: _____

Hazardous Substance	Product type/ Brand name	How much do you have?	Where/How is it used?	Where is is stored?
Antifreeze				
Transmission Fluid				
Brake Fluid				
Motor Oil				
Enamel or Oil Based Paint				
Latex/Water Based paint				
Rust Proof Coatings				
Paint Thinner or Turpentine				
Wood Preservatives				
Stain/Varnish				
Pesticide: Arsenics				
Pesticide: Botanicals				
Pesticide: Carbamates				
Pesticide: Chlorinated Hydrocarbons				
Pesticide: Roach/Ant				
Herbicides				
Pool/Spa Chemicals				



