Stormwater Runoff Journal

Your name: _____

TABLE OF CONTENTS

Lessons

NO DUMPING
DRAINS TO RIVER

My Notes

Source	What stormwater is	How stormwater gets polluted	What we can do to keep the water clean
Video 1:			
Article: Let's Visit Stormville			

My Notes

Source	What Stormwater is	How stormwater gets polluted	What we can do to keep the water clean
Illustration: The Culprits			

Your notes will not be scored. You may use them to answer questions and to write your essay.

Task: Stormwater Pollution

1. What is stormwater runoff? Be sure to name your source. **(Claim 4, Target 2)**

Task: Stormwater Pollution

2. What do you learn in the article about types of stormwater pollution that you don't learn in the diagram? **(Claim 4, Target 3)**

Task: Stormwater Pollution

3. Defend this statement using information from two of the sources. Be sure to name your sources. *"We can make a difference in keeping our water clean and healthy."* **(Claim 4, Target 4)**

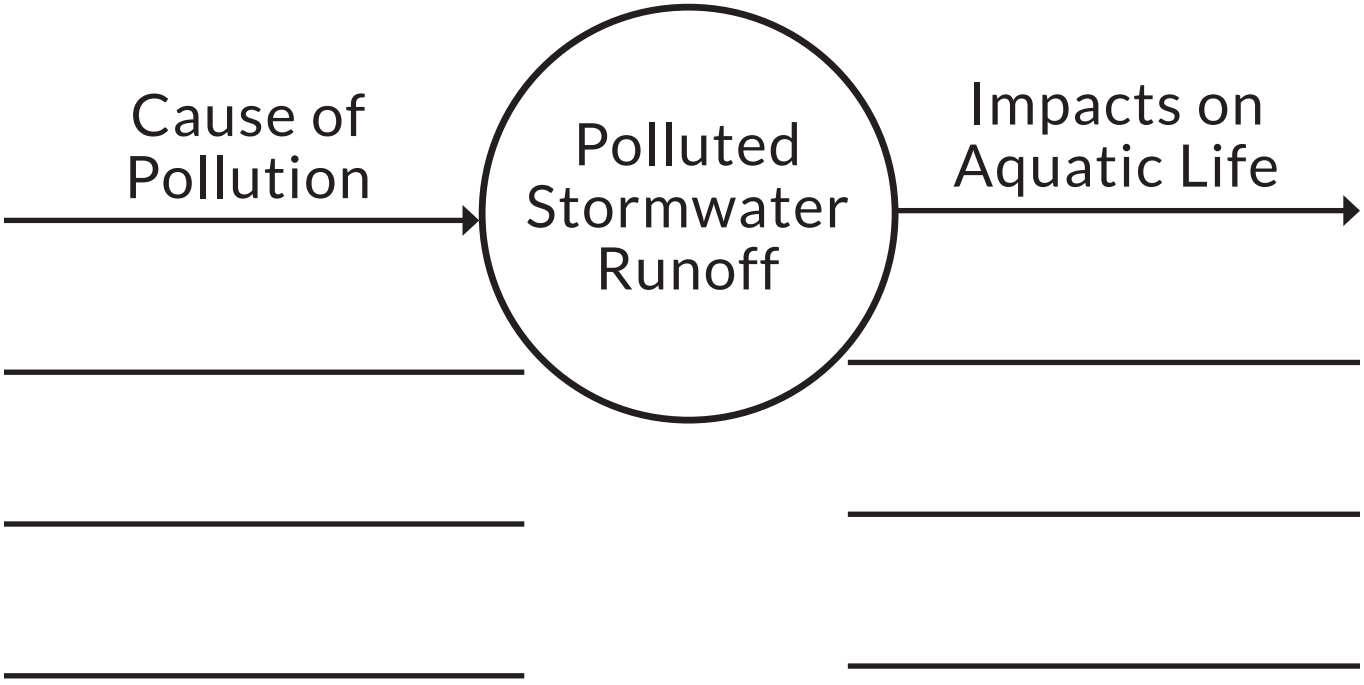
Task: Stormwater Pollution

ORGANIZING MY ESSAY

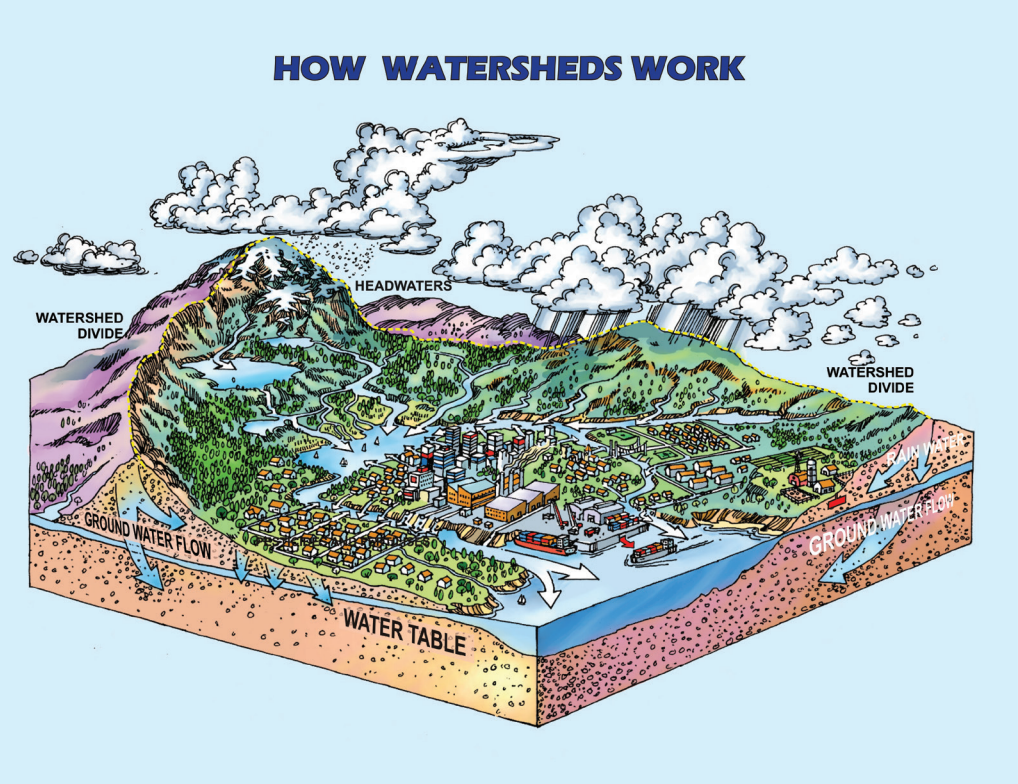
Introduction	
What stormwater is	
How stormwater gets polluted	
What can we do to keep stormwater clean: Idea #1	
What can we do to keep stormwater clean: Idea #2	
Conclusion	

Videos and Presenters

On the graphic organizer, explain one cause of stormwater pollution and the impact of this pollution on aquatic life.



Watershed Model



Define a watershed

Watershed Model Comparison

SIMILARITIES

DIFFERENCES

Watershed Model	Real Watershed

Watershed Model

1. How is the model like the watershed you live in? How is it different?

2. What about the watershed is not represented in the model?

3. What is the main purpose of the watershed model? What is the model trying to show?

4. How could you improve the model of the watershed?

Student Journal Page

Location or area ON THE SCHOOL SITE: _____

Draw and Label the Schoolyard System

What are the parts of the system?

Schoolyard System Water Questions

1. What are the parts of the local system?

2. List the places, from this spot, where you can SEE water.

3. What is the role of water in the schoolyard system?

4. Are there places where the water is moving? If yes, where is it traveling to? And why?

5. Is the water beneficial? If so, how?

Schoolyard System Water Questions, continued

6. Is the water harmful? If so, how?

7. Are humans impacting this schoolyard system? Identify evidence of how humans are impacting this schoolyard system?

8. Describe one interaction between living and non-living part of the system.

9. The schoolyard system is in a watershed. Identify inputs and outputs of water to the schoolyard system.

Water Inputs	Water Outputs

Student Journal Page

1. A **WATERSHED** is all the **LAND** (from the ridgetop down to the bottom of the valley) that surrounds and drains to a creek, river, lake or other water body. Watersheds can be covered by trees or they can be filled with urban things like schools, homes, & roads. Most watersheds are a combination of both.

2. **DATA GATHERED FROM THE FORESTED WATERSHED**

   Let's create a model watershed out of students and see how rain runs off the land in a forested watershed.

   In a forested watershed I observed:

   Total number of raindrops: _____
   (the number of students minus the forest, creek, wetland)

   Total number of raindrops that actually reached the creek: ☐

   Actual length of time for all the raindrops to reach the creek: ☐

3. **GATHERED FROM THE SUBURBAN WATERSHED**

   In a suburban watershed I observed:

   Total number of raindrops: _____

   Total number of raindrops that actually reached the creek: ☐

   Actual length of time for all the raindrops to reach the creek: ☐

4. DISPLAY THE DATA USING A HYDROGRAPH

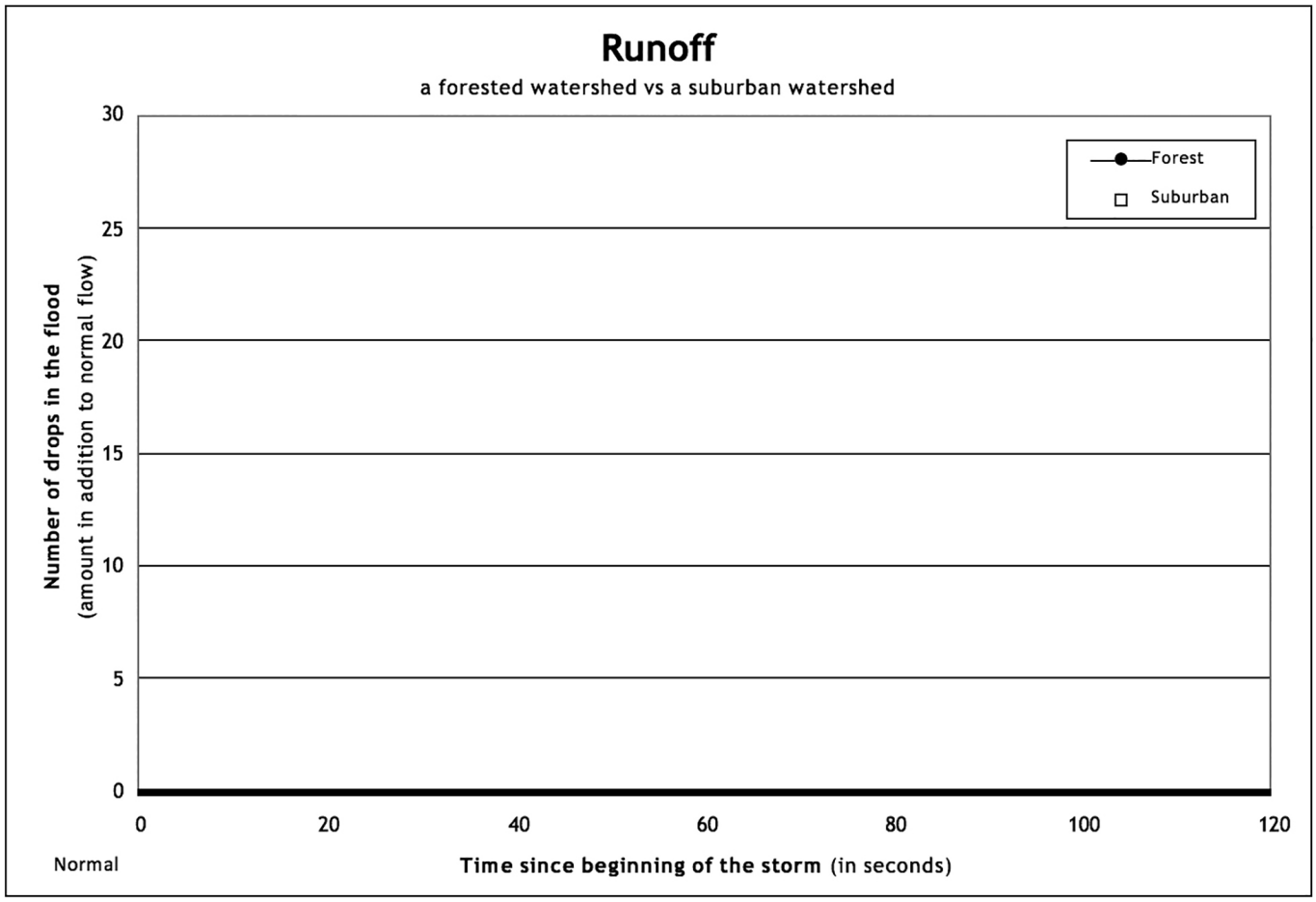
a. hydro = _____ graph = _____

b. Graph the data for the forested watershed:

- Find the point on the graph where the number of raindrops that reached the creek intersects with the number of seconds it took for those raindrops to reach the creek.
- Use a • symbol to show where this point is on the graph.
- Draw a **solid** line that curves from 0,0 point on the graph (the bottom left corner), to the • point, and then back down to the bottom of the graph. Your line should be in the shape of an upside"U."

c. Graph the data for the urbanized watershed:

- Find the point on the graph where the number of rain drops that reached the creek intersects with the number of seconds it took for those raindrops to reach the creek.
- Use a ☐ symbol to show where this point is on the graph.
- Draw a **dashed** line that curves from 0, 0 point on the graph (the bottom left corner), to the • point, and then back down to the bottom of the graph. Your line should be in the shape of an upside "U."



5. How does the graph communicate the difference in runoff between the forested land and the developed land?

6. What could an engineer design to have less water flow into creeks in an urban watershed?

7. What happens to pollutants in urban systems? What are ways to prevent pollution from entering wetlands and creeks?

Defining the Problem

1. Define the problem facing your community.

_____

_____

_____

_____

_____

2. List things we already know about pollution in stormwater runoff.

_____

_____

_____

_____

_____

3. List things we still need to find out about.

_____

_____

_____

_____

_____

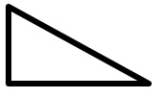
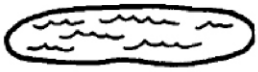
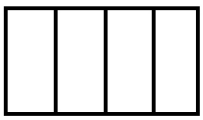
Research the Problem

LIST OF FEATURES (evidence)
and their impact on stormwater runoff on the schoolyard campus

Feature	Impact of Stormwater Runoff

Schoolyard Stormwater

LEGEND

	Pervious surface
	Impervious surface
	Erosion
	Deposition of materials leaves, soil, twigs
	A puddle or soggy area shows where water collects.
	Unnatural materials, such as litter, oil, dog poop, and chemicals.-Pollution
	Plants and mulch to slow water down
	Water Flowing Direction
	Storm Drain

Understand Stakeholders

Stormwater Runoff - STAKEHOLDER LIST

Stakeholder	Why they care

NOTES on the Stakeholder Visit

How are you connected to this school?
Why do you care about stormwater runoff in our community?
What are your top priorities for cleaning and reducing the polluted stormwater runoff in our community?
If you were to recommend an outreach project for us that would influence people's behavior choices what would it be? How could we measure whether people's behavior changed?
Is there a project to reduce stormwater runoff in the schoolyard that you would recommend? How would we measure the success of this project? What might be a challenge for this type of project?
Are there any concerns you have about changes to this site?

Possible Stormwater Solutions

Polluted stormwater runoff solution	Description of solution	How does this solution reduce pollution in stormwater runoff?	What resources do you need to complete this solution (time, money, materials, other people, etc.)?
Pollution Prevention: Informing people to influence behavior choices			
Schoolyard solution			
The solution my group researched			

Evaluating Possible Solutions Table

What is the solution?	Benefits – How will this solution prevent pollution in stormwater?	Drawbacks (high maintenance, high cost, difficult to install, needs school district OK, etc.)	What would the stakeholders (students, city, teachers, neighbors, etc.) like or not like about this project?	What is the cost and difficulty level of this project?	Can you *really* do this project? (circle one)
				Cost: Difficulty:	No Maybe Yes
				Cost: Difficulty:	No Maybe Yes
				Cost: Difficulty:	No Maybe Yes
				Cost: Difficulty:	No Maybe Yes

Pollution Prevention Outreach

TIP SHEET!

Stay positive.
Combatting pollution will take time and energy from everyone. Remember to be optimistic!

Be friendly.
No one is hurting the environment on purpose. Help others understand and find motivation to change.

Consider your audience.
Your message might need to change depending on who is listening.

Tell people why it's important.
Show how their actions impact themselves, their environment, and their communities.

Tell people what they can do.
Advise on how to improve, not on what is being done wrong.

Use visuals and models.
Seeing is believing - a picture is worth a thousand words. Help your audience visualize the problem.

Test your message.
What's working? What isn't? Be flexible and test your message with classmates, teachers, and family.

Stormwater Project Planning Worksheet

What Personal Behavior are you trying to change?

_____

_____

What might be the something keeping people from changing their behavior?

_____

_____

Who is your audience?

_____

What does your audience need to know, and how will you convince them to change?

_____

Who do you need to contact? (examples: for distribution of posters, arranging presentation, hosting website, etc.)

What tools and materials do you need? (pens, markers, paint, computer, etc.)

How will you know your project worked?

BASIC INFORMATION AND POSITION

(Solution description and behavior you are trying to change?)

REASONS

(What do they need to know and what's in it for them to change behavior?)

SUPPORT (Facts, examples, quotes...)

CONCLUSION

(Restate your position in a different way.)

Pollution Prevention Outreach

Sample of pledge card students could develop:

Make Your Mark
Personal Action Plan

Plant native trees, Shrubs and other Plants	Properly dispose of pet waste
Do not feed birds and ducks when visiting parks	Fix car oil leaks
Reduce lawn chemicals	Use natural fertilizer & limit synthetics in your yard
Wash car at carwash or on lawn	Install rain gardens
Clear storm drains	Do not put anything down storm drains

Pollution Prevention Outreach

Example of a Looking Back Survey

Project: _____ School: _____

Grade:_____ Teacher: _____

Read each sentence below and circle the ONE answer that best fits:	BEFORE PARTICIPATING in the stormwater project (THEN)	AFTER PARTICIPATING in the stormwater project (NOW)
1. I know that urban stormwater runoff is the major cause of pollution in our aquifers, rivers, lakes, and streams.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
2. I know about the main groups or people (the stakeholders) who care about the stormwater runoff.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
3. I can help solve the stormwater pollution problem through my everyday actions such as scooping my pet's waste, fixing car leaks, fertilizing with natural compost.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
4. I want to do something to help and protect the environment through solving the pollution stormwater runoff problems.	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree	1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

TURN OVER THIS PAGE

Pollution Prevention Outreach

1. List two ways stormwater runoff becomes polluted in your community.

_____

_____

_____

_____

_____

2. Describe two ways you can keep the stormwater clean.

_____

_____

_____

_____

_____

Thank You for filling out this survey!!

Planning Worksheet

1. What is the solution (include location in the schoolyard)? How will it help solve the stormwater problem?

2. What tools and materials do you need?

3. What are the major steps to this project?

Schoolyard Solutions

4. Who do you need to tell about your project before you begin?

5. Who might be able to help with the project? How would they help?

6. What could prevent the project from getting done (barriers)?

7. Does anything need to be done to make sure your project keeps working now and in the future? If so what needs to be done and who is going to do it?

8. How will you know if your project is successful?

Testing the Solution

Results of tests and/or surveys:

Explanation or Summary of Test Results:

How could this survey, model, test be improved?

Solution for Polluted Stormwater in My Community

Ideas on improving my solution:

More ideas after talking with my neighbor:

More ideas after hearing the class discussion:

Project Summary

Who are the team members that you worked with to complete this project?

What is the Problem that you worked to solve?

Why is this Problem important for your school and the surrounding community?

Who were the stakeholders or people that you worked with? What did they do?

What are two or three of the most important things that you learned about stormwater runoff and your schoolyard and community?

What did you learn about engineering by implementing this project? What skills did you use?

Glossary of Stormwater Terms

Aquifer: An area where water is stored under the ground, in the soil. When rain water soaks into the ground, it can fill an aquifer. This undergroundwater is called groundwater (see definition below). This water can then be withdrawn for human use through wells andsprings.

BMP: This stands for Best Management Practice. A Best Management Practice is a behavior or action that a person performs that protects the health of the environment.

Deposition: The process where sediment, soil, and rocks are moved and collect on another part of the landscape.

Detention pond: A small, man-made pond that collects the rain water that runs off of hard surfaces in developed areas, such as streets and buildings. The detention pond temporarily stores this rain water and releases it gradually back into the environment, usually over a few hours or days.

Dry Well: A drainage pit lined with loose stonework for the leaching of liquid wastes.

Erosion: The carrying away or displacement sediment, soil, rock, and other solids, usually by wind, water, or ice by down-slope movement in response to gravity or by living organisms. (OSPI)

Evaporation: The process where water becomes a gas (vapor) from a liquid.

Filtration: A process where water moves slowly through the soil, removing pollutants that are in the water.

Groundwater: the water found underground in the cracks and spaces in soil, sand and rock. Groundwater is found in aquifers. (groundwater.org)

Habitat: An ecological or environmental area that is inhabited by a particular species. It is the natural environment in which an organism lives or the physical environment that surrounds a species population. (OSPI)

Headwaters: The area where a creek, stream, or river begins - the source of that waterway.

Impervious surface: A type of land or ground covering that is hard and prevents rain water from soaking into the soil. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots, buildings, concrete or asphalt paving, gravel roads, and hard-packed dirt.

Infiltration: A process where water moves slowly through the soil.

Model: In science models are used to represent a system. They can be diagrams, physical replicas, mathematical representations, analogies, and computer simulations. (Next Generation Science Standards- Appendixes).

Native Plants: Plants that occur naturally in a certain region and are adapted to that climate.

Nonpoint source (NPS) pollution: A type of water pollution which occurs when rain runs off farmland, city streets, construction sites, suburban lawns, roofs, and driveways before entering the waterway. This is pollution that does not come from a single source, or point. Instead, this pollution comes from many different sources, and is collected as rain water runs over the surface of the land.

Optimize: Improving a design to make the design function better, cost less, be more efficient or other criteria. This involves trading off less important features for those that are more important. (Next Generation Science Standards- Appendixes)

Pervious Surface: A type of land surface that allows water to soak in.

Pollutant: A substance introduced into an environment that has undesired, harmful, or destructive effects on organisms and/or resources in the environment. (EPA)

Polluted stormwater runoff: The byproduct of stormwater runoff and the pollutants in the environment through which it runs. Pollution makes the stormwater unclean and harmful to the organisms in the waterway.

Retention: The process of collecting and holding storm water runoff.

Riparian: Describes the area of land directly next to river, lake or other body of water, such a shoreline or river bank.

Rain Garden: A garden with spongy soils and plants which is used to collect and filter stormwater.

Stakeholder: Individuals or groups with interests related to an issue or outcome.

Storm drain system: The system of gutters, pipes, streams, or ditches used to carry surface and storm water from surrounding lands to rivers, lakes, or the Puget Sound.

Stormwater: is precipitation (rain, snow, or hail) and ice melt. Stormwater can soak into the soil (infiltrate), be held on the surface and evaporate, or runoff and end up in nearby streams, rivers, or other water bodies.

Stormwater Engineer: A person who designs solutions for problems created by too much surface water runoff and pollution in stormwater.

Stormwater Runoff: Water from rain, or other precipitation, that is not absorbed into the ground. Instead, the water runs off the surface of roofs, streets and lawns and enters natural waterbodies, such as rivers, lakes and Puget Sound, either directly or through storm drains. Also see definition of runoff above.

Surface water: Water found about the land, including oceans, estuaries, lakes, rivers, streams, and ponds.

Surface Runoff: Water from rain, or other precipitation, that is not absorbed into the ground. Instead, the water runs off the surface of roofs, streets and lawns and enters natural waterbodies, such as rivers, lakes and Puget Sound, either directly or through storm drains.

Swale: A shallow, line-shaped depression in the ground, like a canal, that can collect water. Swales can be man-made and are usually less than 30 cm deep.

Transpiration: The process by which water evaporates from plant tissues.

Toxic: Poisonous or otherwise directly harmful to life.

Water Filter: A device to remove pollutants or unclean substances from water.

Watershed: The entire land area from which water drains into a particular surface water body.

Wetland: An area covered by shallow water most of the time, where vegetation grows that is adapted to the wet conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Pollution and Solutions

Sources of Pollution in Stormwater Runoff	Possible Solutions Mentioned

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