



Grade 3

Rain Gardens

Stormwater Curriculum



TAHOMA SCHOOL DISTRICT
Maple Valley, Washington



Rain Gardens

Stormwater Curriculum – Grade 3

Introduction

The number one cause of pollution in the Puget Sound is from stormwater runoff. Stormwater runoff carries in it pollutants from a number of sources. The most common pollutants come from pet waste, lawn care products, and car products such as oil and grease. The purpose of this five lesson unit is to educate grade three students that they can make a difference by decreasing stormwater pollution on their school grounds and in their own neighborhoods. Students learn about stormwater and how it carries pollutants to our surface water such as lakes, streams and the Puget Sound. They explore concepts of filtration, pervious and impervious surfaces, and water flow on their school campuses.

At the heart of the unit is the use of the school's demonstration rain garden as a teaching station. Students learn how water can be cleaned naturally by infiltrating soil that is specially constructed to slowly filter stormwater runoff. The students study the components of the rain garden, including the use of native plants that have adapted well to our climate. The layers of soil, combined with the roots of the plants, create a natural filtration system for storm water runoff.

This unit is best taught following the first three lessons in the STC Land and Water unit. Students will draw upon their background regarding the water cycle and the concept of erosion. The first three lessons in this stormwater unit focus on the natural cleaning process that soil can provide in removing pollutants from the water. In addition, students learn how to be "Drain Rangers" to minimize pollution from pet waste, car washing on impervious surfaces, and the excessive use of lawn care products.

The last two lessons focus on mapping the school grounds to determine where pollution might take place because of stormwater flow. The first hike is on a fair weather day. The students observe the schoolyard, predict where the water will flow in a rainstorm, and then check out their predictions on a raining day hike. Students suggest improvements to the school grounds to minimize pollution from stormwater runoff.

Throughout the unit, students practice a variety of thinking skills including observing, inferring, and predicting. They use the Habits of Mind of Questioning and Problem Posing, Striving for Accuracy and Precision, and Gathering Data through the Senses. They are scientists when they experiment with filtration and engineers when they map the school yard, proposing solutions to the storm water pollution problems. Finally, the students are community contributors when they make choices for the environment that preserve and protect our water for future generations. Enjoy the hands on activities that characterize this unit! Reinforce with our students that they are empowered, and they can take actions that do make a difference for the health of our environment.

Stormwater Lesson Overview

Lesson	Activities	Concepts/Skills	Habits of Mind	Resources
What is a Rain Garden and How Does it Work?	Watch video Discuss storm water pollution Visit campus rain garden, observe, and generate questions “Read” rain garden placemat to understand how a rain garden works Watch rain garden video Complete family letter	Storm Water Pollution Storm Water Run off Rain Gardens Filtration Observing	Questioning and Problem Posing	Storm Water Video Rain Garden Video Rain Garden Placemats Pre-Assessment Rain Garden Vocabulary Dictionaries Lesson Vocabulary
What Causes Storm water Pollution?	Entry task: How are salmon and rain gardens connected? Discuss cooper and its impact on salmon Explore Drain Ranger website to learn about the causes of pollution Exit Slips	Hazards to Salmon Causes of Storm pollution Action Steps students can take Cause and Effect	Applying Past Knowledge to New Situations	Netbooks for website access The Culprits Poster A break pad
How Do Rain Gardens Filter Water and Make It Clean?	Review unit vocabulary Create a water filter Filter dirty water Review pollutants to our surface water runoff	Filtration; Infiltration Observing	Striving for Accuracy and Precision	Rain Garden Dictionaries Lab supplies as listed

Lesson	Activities	Concepts/Skills	Habits of Mind	Resources
Where Does Water Go? Fair Weather Hike	Share Riddle Review Water Cycle Teach Pervious and Impervious Surfaces Review Culprits Poster Conduct Fair Weather Hike, including making predictions Exit Slips	Pervious and Impervious Surfaces Water Cycle (Review) Observing Predicting Inferring Cause and Effect Comparing/Contrasting	Striving for Accuracy and Precision Gathering Data Through the Senses	Watershed Map School Yard Maps Water Cycle Poster Culprits Poster Supplies for Fair Weather Hike “Where Does Water Go?” Teacher background information
Where Does Water Go? Rainy Day Hike	Share Rainy Day Hike Protocol Conduct Rainy Day Hike, updating maps and checking predictions Conduct class discussion using questions provided Discuss ways to improve water flow on the campus Assign Exit Slips Conduct Post-Assessment, Rain Garden Curriculum	Storm water Runoff Improving Campus water flow (Run Off) Observing Predicting Inferring Cause and Effect Comparing/Contrasting	Striving for Accuracy and Precision Gathering Data Through the Senses	Rainy Day Hike Materials Digital Cameras for optional enrichment activities Post-Assessment, Rain Garden Curriculum



Rain Gardens Grade 3 Stormwater Curriculum

Lesson Title: What is a Rain Garden and How Does it Work?

Implementation Time: Two 45 minute lessons

Materials:

- Rain Garden Placemats
- Videos: *What is Stormwater Runoff?* and *Make a Rain Garden*
- Pre-Assessment questions
- Sketching materials (optional)
- Family letter template
- Rain Garden Dictionary template
- Lesson Vocabulary
- The Culprits poster

☒ **Content Knowledge:**

Rain Garden
Water Filter
Filtration
Native Plants
Stormwater Runoff
Pollutants

☒ **Content Skill(s):**

Using Information to Demonstrate Understanding

☒ **Thinking Skill(s):**

Observing

☒ **Habit(s) of Mind:**

Questioning and Problem Posing

Learning Target:

I can explain what a rain garden is and how it works to keep our water clean.

Assessment:

Review student letters for accuracy of information including the meaning of the vocabulary words

Common Core ELA Standards:

RI #1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI #4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

RI #7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

RI #8: Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

Teaching Points:

Teacher Note: Prior to this lesson, have students respond to the six survey questions regarding stormwater on line if possible for easy aggregation and display of the data. The six questions are provided as a resource with this lesson.

Lesson Vocabulary:

- Rain Garden
- Water Filter
- Filtration
- Water Pollutant
- Native Plants
- Stormwater Runoff
- Pollutants

Continued on next page...



Stormwater Curriculum

What is a Rain Garden and How Does it Work, page 2

Teaching Points:

1. Ask students: What happens to water when it rains? Show the students a short video that illustrates how water from rainstorms finds its way to our streams and ocean: *What is Stormwater Runoff?* This is called **stormwater runoff**. Show that the water runs off of our roofs, over our lawns and streets and finds its way to storm drains. Show that the storm drain water ends up in our Puget Sound. Use the illustration provided to depict how the stormwater travels. (Consider acting out what happens when it rains and the various places that the stormwater goes.)
2. Ask students: What do you think happens to the water when it runs across our yards, roads and parking lots? The **stormwater runoff** picks up fertilizers, pesticides, animal waste, oil and other pollutants. Define **pollutants**: anything that makes our water unclean. All of these **pollutants** go down the storm drain and into our rivers and ocean with stormwater runoff. Use the Culprits poster to visually illustrate this process.
3. Share that there are many ways we can keep this water clean for our salmon. One of these ways is to construct **rain gardens**.
4. Share today's learning target: *"I can explain what a rain garden is and how it works to keep our water clean."*
5. Take students outside to view the campus rain garden. Instruct students to use their skills of observation to study the rain garden. What do they see? (plants, soil, a depression in the ground, connection to a drain of some sort) You may want the students to sketch the rain garden, showing the shape, the plants, and the location to another building on the campus.
6. Invite students to use their Habit of Mind of Questioning and Problem Posing. What questions can they generate about the rain garden? (What kinds of plants were used? Why is the rain garden located where it is? Why is the rain garden dug into the ground and below ground level? How is the rain garden connected to stormwater? How does the rain garden filter the water to help to keep it clean?)
7. Share that a rain garden is a natural way to collect and **filter** stormwater. The rain garden is built low into the ground and acts like a sink for extra water during a storm. As the water moves through the soil, it is cleaned by a process called **filtration**. Microbes in the soil break down the **pollutants**. The soil acts as a filter for the pollutants.
8. Remind students about **pollutants**. Pollutants are substances that make our water dirty and unsafe. When the stormwater is cleaned by the rain garden, the pollutants are broken down and become part of nature again rather than entering our streams where the salmon and other marine life live.
9. Ask students to tell their partner what a **rain garden** is: "A natural way to collect and clean stormwater." Check student responses. Review definition as needed. Remind students that our learning goal today is to be able to explain what a rain garden is and how it works.

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Stormwater Curriculum

What is a Rain Garden and How Does it Work, page 3

Teaching Points:

10. Discuss the questions the students raised. Talk about the location of the rain garden. Show that the rain garden is in a low spot and/or near a downspout so that it can collect more water (infiltration). Talk about the plants in the rain garden. These are **native plants** that will do well in our climate. The plant roots help the rain to soak in slowly.

Teacher Note: If you choose to divide the lesson over a two day period, you may want to break here.

11. Return to the classroom. Share the rain garden placemats. Invite students to partner up and tell each other how a rain garden works by using the illustrations on the placemat (Anatomy of a Rain Garden). Check for understanding by listening to what the students are sharing. Conduct a think aloud as a way for you to model how the illustrations tell the story of how a rain garden works.
12. Revisit one or more of the questions the students raised and instruct students to locate the answers to the questions on the placemat, reinforcing what you discussed when visiting the campus rain garden.
13. Show the rain garden video: *Make a Rain Garden!* What new ideas are introduced? What is reinforced?
14. Revisit the learning target. Tell the students that their job is to help their families understand what a rain garden is and how it works. They should complete the letters to their families and use the following words in their letters: rain garden, stormwater runoff, native plants, filter or filtration and pollutants. Use the template provided or create your own.

Teacher Note: Create Rain Garden Vocabulary Dictionaries with the students and include the vocabulary from this and future lessons. A dictionary template is provided. Also, post the vocabulary words in the classroom so that you can revisit their meaning throughout the unit.

Assessment:

1. Formally check for understanding by reviewing each letter. Note where students may have misconceptions so that you can address these in the lessons that follow.
2. Be sure to check the students' understanding of the key vocabulary. Post these words in your classroom to revisit during other lessons.



Rain Garden Curriculum Grade 3

Pre-Assessment

True or False:

1. Rain gardens can clean up bad pollution like car oil, grease, and lawn chemicals from getting into our streams.
2. Native plants and plenty of good soil mixed with mulch, help rain to soak in. (Infiltration)
3. Copper flakes from the brake-pads we use in cars and trucks are a big problem for salmon.
4. It's best to wash your car near a gutter so that the soapy water goes down the storm drain.
5. Dog poop on lawns and sidewalks makes storm water dirty and unsafe.
6. We don't have to worry about pollutants because they will wash away down our storm drains.



Lesson Vocabulary

Lesson Vocabulary

Rain Garden: A natural way to collect and filter storm water.

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

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

Water Pollutant: Anything that makes our water unclean.

Native Plants: Plants that grow easily and occur naturally in our climate.

Stormwater Runoff: Rainwater that runs off our roofs, streets, and lawns; finds its way to storm drains and then enters our rivers, lakes and ocean.



Rain Garden Vocabulary



Name: _____

Teacher: _____

New Word: _____

Prediction:

Sketch:

Definition:

My Sentence:

New Word: _____

Prediction:

Sketch:

Definition:

My Sentence:



Letter Home:

What is a Rain Garden and how does it work?

Dear Family: Today we learned about Rain Gardens. They are

We learned that rain gardens are important because

Here are some words I learned and what they mean:

Pollutant:

Stormwater Runoff:

Native Plants:

Filter/Filtration:



Here's my sketch of our campus rain garden:

[illegible]

A 3D cutaway diagram showing a wastewater treatment plant (WWTP) effluent pipe discharging into a waterbody. The effluent is shown as a green stream entering the waterbody. A person is shown standing on the bank, and a lawnmower is shown on the grass. The waterbody is labeled 'waterbody'.

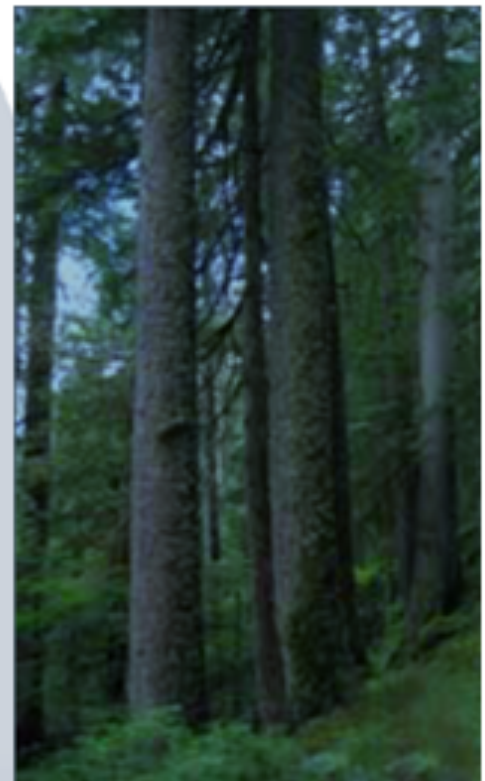
INTRODUCTION TO RAIN GARDENS

NATIVE SOILS AND FORESTS

of Western Washington store, filter, and slowly release cool, clean water to streams, wetlands, and the largest estuary on the west coast—Puget Sound. The rich diversity of life in marine and fresh water, as well as on land, depends on clean water to thrive.

As the region grows, native forests and soils are replaced with roads, rooftops and other hard surfaces.

When it rains or snows, more water flows from these surfaces than undisturbed areas, carrying oil, fertilizers, pesticides, sediment and other pollutants downstream. In fact, much of the pollution in streams, wetlands, and Puget Sound now comes from stormwater (water flowing off developed areas). The added volume of water and associated contaminants from developed land are damaging water resources and harming aquatic life in Western Washington.



What is a rain garden?

A rain garden acts like a native forest by collecting, absorbing, and filtering stormwater runoff from roof tops, driveways, patios, and other areas that don't allow water to soak in. Rain gardens are simply shallow depressions that

- ♦ Can be shaped and sized to fit your yard.
- ♦ Are constructed with soil mixes that allow water to soak in rapidly and support healthy plant growth.
- ♦ Can be landscaped with a variety of plants to fit the surroundings.



Photo by Seattle Public Utilities

Rain gardens provide multiple benefits, including:

Reduce flooding on neighboring property, overflow in sewers, and erosion in streams by absorbing water from impervious surfaces.

Filter oil and grease from driveways, pesticides and fertilizers from lawns, and other pollutants before they reach the storm drain and eventually streams, wetlands, lakes and marine waters.

Increase the amount of water that soaks into the ground to recharge local ground water.

Provide habitat for beneficial insects and birds.



ANATOMY OF A RAIN GARDEN

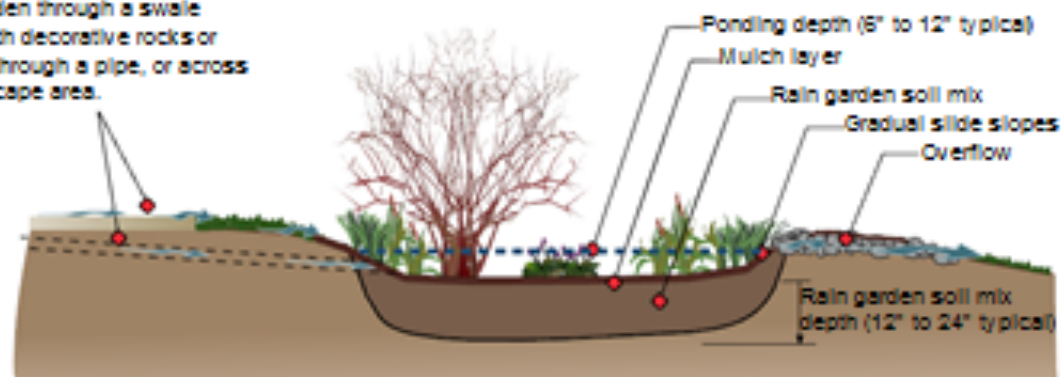


Newly planted Seattle rain garden.

Photo by Seattle Public Utilities

Water flowing off impervious surfaces (for example a roof or driveway) can be delivered to the rain garden through a swale lined with decorative rocks or plants, through a pipe, or across a landscape area.

Selected native plants or hardy cultivars



When properly designed and constructed, rain gardens drain rapidly with surface water present for only 1–2 days. Mosquitos take a minimum of about 4 days (many types of mosquitos take several days longer) to become adults after eggs are deposited in water.

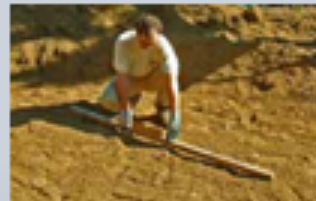
4 STEPS TO BUILDING A RAIN GARDEN

1 LOCATE



- ◆ Identify areas draining to the rain garden.
- ◆ Identify the best location for the rain garden.
- ◆ Test the soil.

2 DESIGN & BUILD



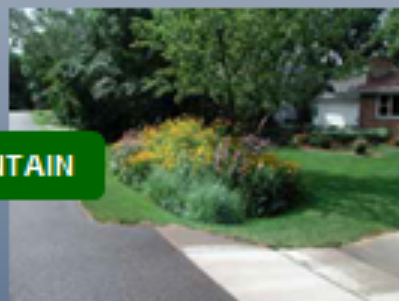
- ◆ Determine the size and shape of the rain garden.
- ◆ Excavate soil (18–30 inches typical).
- ◆ Level bottom of rain garden (do not compact).
- ◆ Mix compost with soil.
- ◆ Place soil mix and leave at least 6 inches below edge of rain garden for ponding.
- ◆ Level surface of soil.
- ◆ Create an entry for water (swale, pipe or landscape area) into rain garden.
- ◆ Provide a rock-lined overflow.

3 PLANT



- ◆ Use a variety of small trees, shrubs, herbs, or grasses.
- ◆ Select plants that enhance the area and have appropriate water needs (native plants and hardy cultivars are preferred).
- ◆ Cover exposed soil with 2–3 inches of mulch.
- ◆ Water to establish plants.

4 MAINTAIN



- ◆ Mulch as needed to prevent erosion and weeds.
- ◆ Keep inlet and outlet clear of debris and well protected with rock.
- ◆ Do not fertilize or use pesticides.
- ◆ Water as needed.



Rain Gardens Grade 3 Stormwater Curriculum

Lesson Title: What Causes Stormwater Pollution?

Implementation Time: 45 minutes

Materials:

- Entry Tickets
- Drain Ranger website
- Computers
- *Puget Sound Starts Here* video
- The Culprits poster
- Automobile break pad (older one made with copper)
- Graphic Organizer for closure assessment

☒ **Content Knowledge:**
Hazards to Salmon
Causes of Stormwater Pollution
Action Steps Students Can Take

☒ **Content Skill(s):**
Cause and Effect

☒ **Thinking Skill(s):**
Cause and Effect

☒ **Habit(s) of Mind:**
Applying Past Knowledge to New Situations

Learning Target:

I can explain one or more causes of Stormwater Pollution and take action to preserve clean water for our salmon.

Assessment:

Ask students to explain one or more causes of stormwater pollution and the effect that this pollution has on our salmon and other sea life. Use the graphic organizer provided. Then ask the student to share one way that they can be Drain Rangers and take action to protect our salmon resource.

Common Core ELA Standards:

- RI #3: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence and cause/effect.
- RI #4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.
- RI #5: Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.
- RI #7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
- W #7: Conduct short research projects that build knowledge about a topic.
- W #8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Teaching Points:

Lesson Vocabulary:

- Stormwater Pollution
1. Ask students to reflect on what they have learned about rain gardens and also what they have learned about the needs of salmon. (Applying on Past Knowledge) Ask them to respond to the following: How are salmon and rain gardens connected? Have students record their responses on entry slips for you to review. Select responses to share. Look for the following:
 - Rain gardens collect and filter stormwater, and salmon need clean water to survive.

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Stormwater Curriculum

What Causes Stormwater Pollution?, page 2

Teaching Points:

- Rain gardens clean pollutants in the water such as oil, dog poop, and lawn chemicals. Salmon need clean water to survive.
- Salmon need clean water, and rain gardens keep water clean.
- Salmon live in our ocean and our rivers. They will die if their water is too dirty to survive.

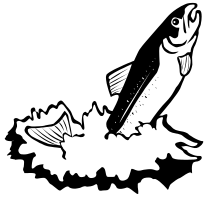
Students should see some connection between clean water and the needs of salmon for survival. Share that our learning target today is to learn some of the causes of **stormwater pollution** and how the students can take action to preserve clean water for our salmon.

2. Many pollutants are a problem for salmon. Share that salmon are particularly at risk because of one pollutant. This pollutant is copper. Ask students what they know about copper. Show them a penny to illustrate what copper looks like.
3. Tell students that copper affects the salmon's ability to smell. Ask: Why is this a threat to salmon? Remind students about the life cycle of the salmon and the salmon's sensitive sense of smell. This sense of smell is what allows them to return year after year to the same stream for spawning. When salmon can't smell, they become confused, aren't able to lay their eggs and they die.
4. Show the break pad to the students. Point out the tiny pieces of copper. As the break pad is worn, the copper pieces end up on our roadways. Storm water washes the copper into our lakes, streams, and the Puget Sound. Tell students that a law was passed banning the future use of copper in break pads. Point out that we can make rules to protect our environment.
5. Share what it means to be a "Drain Ranger". Use the *Puget Sound Starts Here* website, asking students to list all of the causes of stormwater pollution that they can after exploring the website. Reinforce the actions that the children can take to protect the water that goes into our rivers, lakes and Puget Sound. Students should identify the three most common polluters of stormwater. These include:
 - Some lawn and garden products
 - Dog poop
 - Soap from car washing

Assessment:

As a check for understanding, ask students to explain one or more causes of stormwater pollution and the effect that this pollution has on our salmon and other sea life. Use the graphic organizer provided. Then ask the student to share one way that they can be Drain Rangers and take action to protect our salmon resource.

Extension: If the students were to create a new rule regarding stormwater pollution, what might that rule be? What evidence would they provide to support the need for the rule?

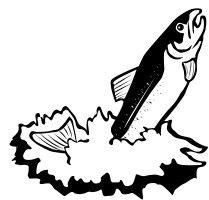


Entry Ticket



How are salmon and rain gardens connected?

My thoughts:



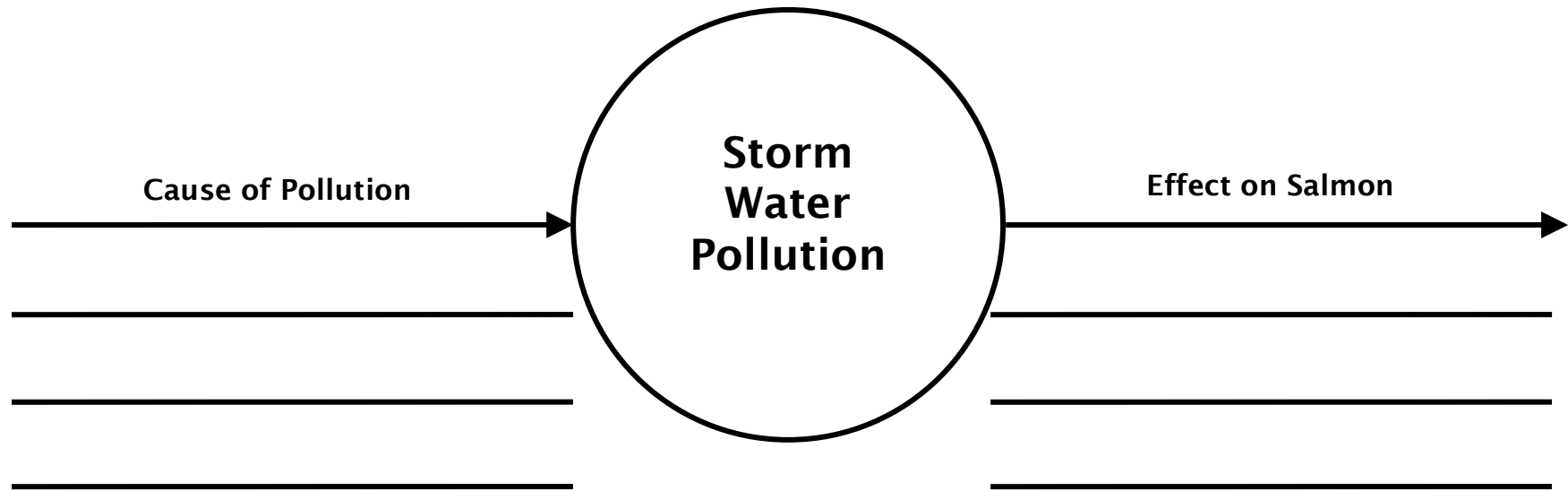
Entry Ticket



How are salmon and rain gardens connected?

My thoughts:

On the graphic organizer, explain one cause of stormwater pollution and the effect of this pollution on salmon and other marine life.



I can be a Drain Ranger by _____

Name: _____

Date: _____

The CULPRITS

When it rains, water that is not absorbed into the ground, intercepted by vegetation, or evaporated flows into surface waters such as rivers, canals and coastal waters. This flow is called runoff. As the runoff flows over the roads and land, it picks up pollutants.

Roads are a source of pollution. Oils, grease, construction dirt, trash & cigarette butts wash off roads when it rains.



Excess fertilizers wash off lawns & gardens when it rains & flow into surface water.



Surface water can be polluted through groundwater.



Things put into stormdrains and on the street can end up in our rivers, canals, & coastal waters





Rain Gardens

Grade 3 Stormwater Curriculum

Lesson Title: How Do Rain Gardens Filter Water and Make it Clean?

Implementation Time: 30–45 minutes

Materials:

- Rain Garden Dictionaries
- 4 clear plastic cups per group
- 3 cups gravel
- 1 paper towel sheet per group
- Push pins
- 1 large bucket of water
- 2 cups soil

☒ **Content Knowledge:**

Water Treatment
Filtration, Infiltration

☒ **Content Skill(s):**

Observing

☒ **Thinking Skill(s):**

Observing

☒ **Habit(s) of Mind:**

Striving for Accuracy and Precision

Learning Target:

I can explain how nature filters water to make it clean by using illustrations and words.

Assessment:

Ask the students to create a labeled illustration of how stormwater is filtered by a rain garden. Then tell them to explain the process of filtration in their own words. Collect the students' work for accuracy and any misconceptions that may need to be clarified in future lessons.

Common Core ELA Standards:

- RI #3: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence and cause/effect.
- RI #4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.
- RI #7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Teaching Points:

Lesson Vocabulary:

- Infiltration
- Filtration

1. Ask students to recall what a rain garden is and how it works. Review the definition of a rain garden as a natural way to collect and filter stormwater. Review what we mean by “stormwater” and by “filter.” Refer to the cognitive content dictionaries that the students are keeping. Share that today’s learning goal is for students to be able to explain how the filtering system in nature works using both illustrations and words.
2. Tell students that they will create water filters today to model how water is cleaned when it goes into the ground of a rain garden rather than directly to our rivers and streams.

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Stormwater Curriculum

How Do Rain Gardens Filter Water and Make it Clean?, page 2

Procedure:

3. Model how to make a water filter by using clear plastic cups, clean sand and gravel and soil. In the bottom of one of the cups poke holes. Lay a circle of paper towel in the bottom of the cup. Add 1 inch of gravel and 1 inch of sand. This is the filter. Explain that this is like the mulch, soil and plant roots that were used to construct the inside of the rain garden. The mulch is the first filter for the water entering the rain garden. Then the water soaks through the soil and in between the plant roots. The water infiltrates this soil, absorbing pollutants in the process. Instruct the students to make their filters.
4. Use another cup as the reservoir and fit the first cup inside. Mix the water and the dirt in one cup. In our model, the dirt represents pollutants like oil, dog poop, and lawn chemicals. Dirt can also be a problem because it can smother salmon eggs. Pour the dirty water back and forth between the two remaining cups to mix it and to talk about pollutants.
5. Next, pour the water slowly through the filter. Watch the clarity of the water as it comes out of the filter and into the cup. The filter is catching particles of dirt and cleaning the water. Pour the "cleaned" water through the filter several times to see the effect on removing pollutants. Direct students to follow this same procedure (steps 4 and 5) with their filters.
6. Ask students to talk in their groups about how the water was cleaned. Discuss how the rain garden acts as a filter for pollutants that are in stormwater, pollutants like oil, dog poop, and lawn chemicals. Revisit the learning target and listen as the students discuss in their groups how nature acts as a filter for cleaning stormwater.

Assessment:

As a formal check for understanding, ask the students to create a labeled illustration of how stormwater is filtered by a rain garden. Remind them that they should strive for accuracy and precision as they make their labeled drawing, just like a scientist would do in explaining how nature works. Then tell them to explain the process of filtration in their own words. Collect the students' work for accuracy and any misconceptions that may need to be clarified in future lessons.



Rain Gardens

Grade 3 Stormwater Curriculum

Lesson Title: Where Does Water Go? Fair Weather Hike

Implementation Time: 45–60 minutes

Materials:

- Watershed Map and PowerPoint
- Map Legend (enough for partner sharing)
- Water Cycle poster
- The Culprits poster
- *Where Does Water Go?* background information
- School Grounds Water Flow Map (enough for partner sharing)
- Water Cycle Boogie
- Clipboards, pencils, crayons/colored pencils
- Rain Garden Dictionaries

☒ **Content Knowledge:**

Water Flow
Pervious and Impervious Surfaces
Water Cycle (Review)
Pollutants (Review)
Infiltration (Review)

☒ **Content Skill(s):**

Mapping Skills

☒ **Thinking Skill(s):**

Observing, Predicting, Inferring,
Cause and Effect,
Comparing/Contrasting

☒ **Habit(s) of Mind:**

Striving for Accuracy and Precision
Gathering Data through the Senses

Learning Target:

I can predict the water flow on our school ground with evidence to support my prediction.

Assessment:

Exit Slips:

- What is your prediction regarding where the water will flow on one part of the school ground? What is your evidence?
- Why is it important for people to know how water flows after a rain storm?

Common Core ELA Standards:

RI #3: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence and cause/effect.

RI #4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

RI #7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Teaching Points:

Teacher Note: Prior to the start of this lesson, walk the school grounds on both a dry day and a wet day so that you can see how and where the water flows during a rainstorm. Select an area of the school yard for the mapping or consider dividing the class into teams to map a variety of areas, using parent volunteers to support the students.

(This lesson and the Rainy Day lesson may be linked to Land & Water following Lesson #4 and taught with lessons 1–3 of the stormwater curriculum.)

Lesson Vocabulary:

- Pervious Surfaces
- Impervious Surfaces

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Stormwater Curriculum

Where Does Water Go? Fair Weather Hike, page 2

Teaching Points:

1. Challenge the students with the following riddle:

Plants and soil slow me down,
But I pass on through.
I may be stored in a lake,
But I will be released;
I'm just passing through!
Who am I?

Answer: Water

2. Share with students that today they will walk the school campus, looking for the way stormwater from rainstorms "passes on through." The learning target today is: "I can predict the water flow on our school campus with evidence to support my prediction."
3. Show the students the poster of the water cycle and review this important concept with the children. Water evaporates into the atmosphere, condenses to form clouds, and returns to the earth as rain or precipitation. The rain falls back onto the earth and lands on various surfaces, some natural like forests and lakes (**pervious**) and some man made like parking lots and road ways. (**impervious**) You may want to use the Water Cycle Boogie as a way to review the water cycle and the vocabulary of Evaporation, Condensation, Precipitation, Infiltration and Groundwater.
4. Elaborate on the difference between a **pervious** surface – one where water can seep through, and an **impervious** surface – a hard, solid surface that does not allow the water to slowly seep into the ground.

Teacher Note: Instruct students to add pervious and impervious to their Rain Garden Dictionaries.

5. Review with the students why it is important to see where the water goes after a rain storm. Review the Culprits Poster that shows how surface water can be polluted if it crosses surfaces like a parking lot (impervious surface) or cleaned if it falls onto natural vegetation (pervious surface) like that in a forest. The goal is to identify ways for stormwater to be cleaned rather than carrying pollutants into our rivers, lakes and the Puget Sound. Remind students that rain gardens are important ways to capture and clean stormwater.

Teacher Note: You may want to read aloud the background information page or copy for a Shared Reading activity to build more background knowledge.

6. Tell the students that today, they will walk the school campus and make predictions regarding where water might flow after a rainstorm. They will look for evidence of water flow as they make careful observations. The Habits of Mind they will be applying include *Gathering Data through the Senses* and *Striving for Accuracy and Precision*. They will construct a map of the school ground, using symbols to show possible water flow, including vegetation, where pollutants might be carried off, and where natural materials can help to slow the water and filter the pollutants. (See symbol list.)

Continued on next page...



Stormwater Curriculum

Where Does Water Go? Fair Weather Hike, page 2

Teaching Points:

7. Use the map of the local watershed to show where the school is located on Google Maps. (an example PowerPoint is provided) Ask: What do you think will happen as water flows over the school campus? What evidence will we look for to determine water flow? What is the connection between water on the school campus and the water in the lakes, rivers and Puget Sound?
8. Tell the students that today's hike is fair weather! They will conduct their observations, make their predictions, and create their maps as they work to meet the first part of their learning target: I can predict the water flow on our school campus. Then on the next rainy day, they will observe again, this time to verify their predictions and to reflect on what actually happens in a rainstorm. Finally, they will make recommendations for how to improve where the water goes on the school campus.
9. Take the students outdoors to the preselected area of the school campus. Follow the Fair-Weather Hike protocol. Upon return to the classroom students may add color to their maps and share their predictions regarding the flow of water. Post the student maps so that the class can view the predictions and reference these after the rainy day hike.

Fair Weather Hike Protocol

1. Divide the class into partners. Each pair should have a copy of a map of the school campus, a map legend, a clipboard, and a pencil.
2. Instruct students to create a map using the symbols on the map legend. They should record only what they see in their assigned area including slope, erosion, natural material, puddles, etc.
3. After students have mapped their assigned area, they should draw arrows showing their prediction of where the water will flow during a rain storm. They should also mark an X for any place they predict could be a possible site for pollution. (Where there might be standing water, impervious surfaces, or erosion.)
4. Provide the exit slips for the students so that you check for understanding regarding the learning target: *I can predict the water flow on my school grounds with evidence to support my prediction.*

Assessment:

Fair Weather Mapping:

Invite the students to reflect on what they learned about their school campus and where they think the water will flow. Use the exit slip provided to check for understanding. Questions include:

- What is your prediction regarding where the water will flow on one part of the school ground? What is your evidence?
- Why is it important for people to know how water flows after a rainstorm?

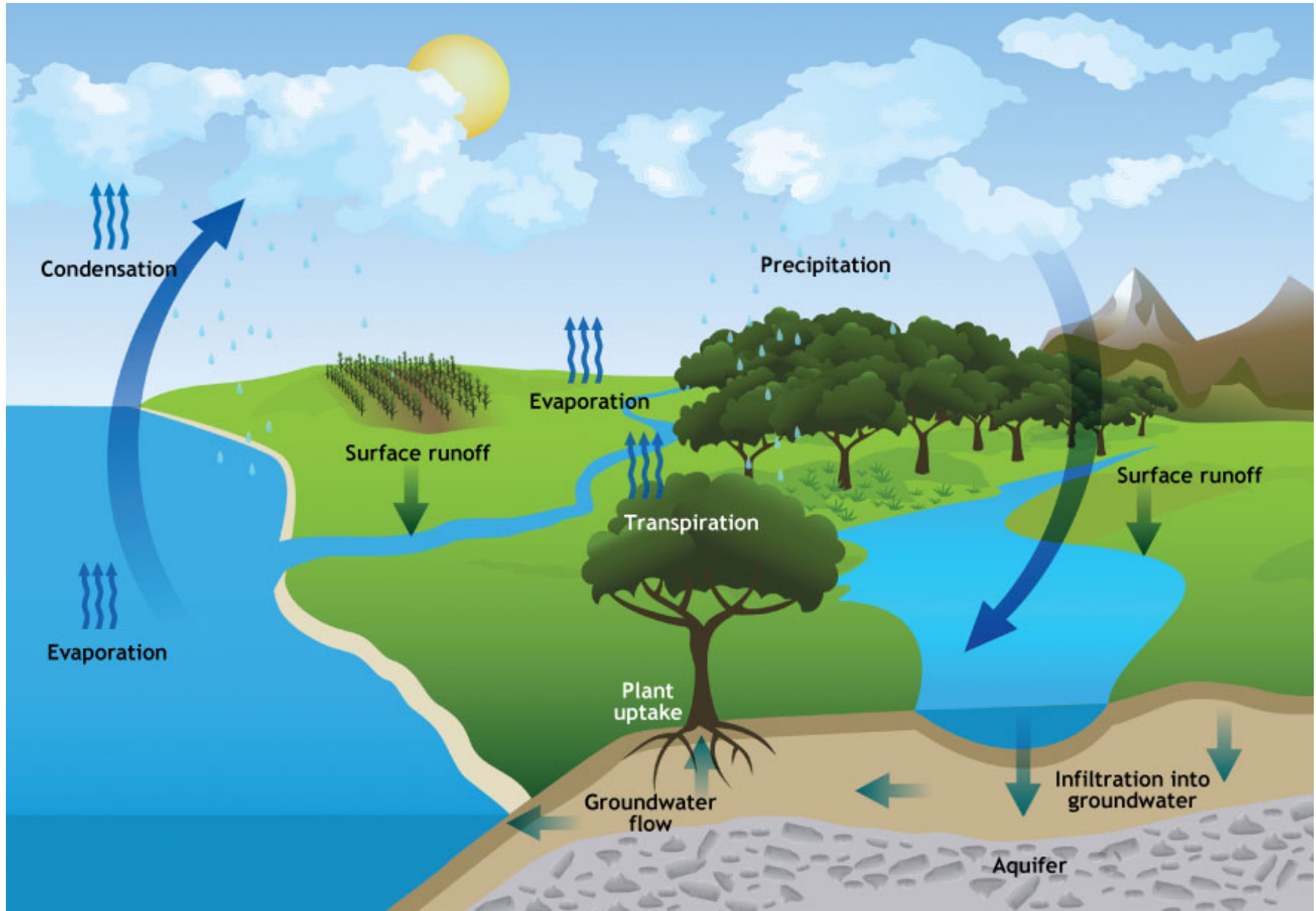
Illustration of a yellow sports car driving on a road towards a green area labeled "To Waterbody".

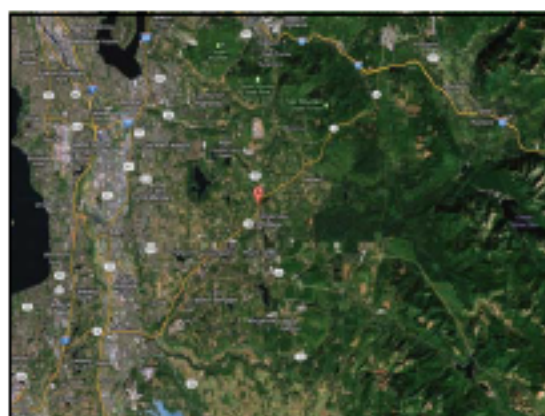
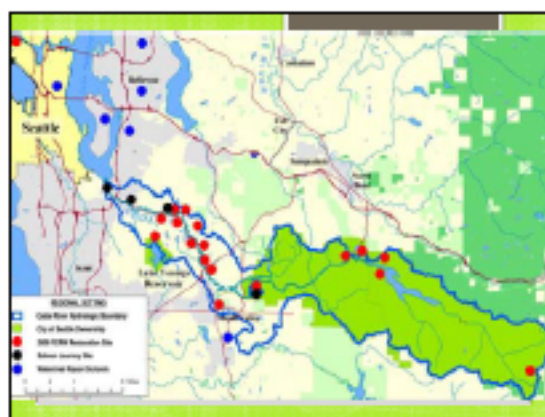
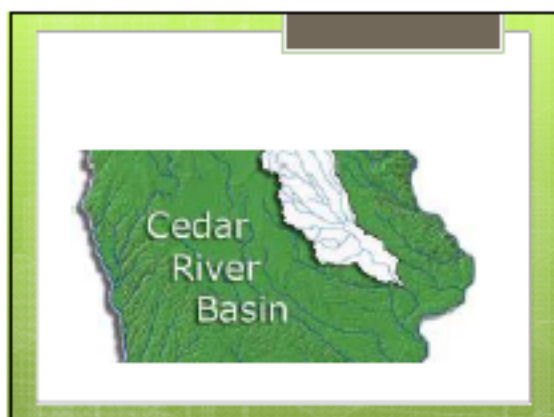
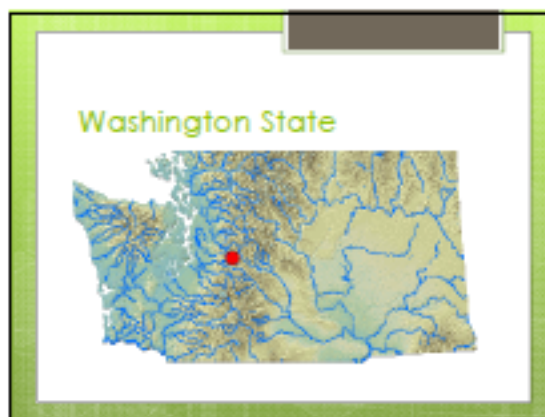
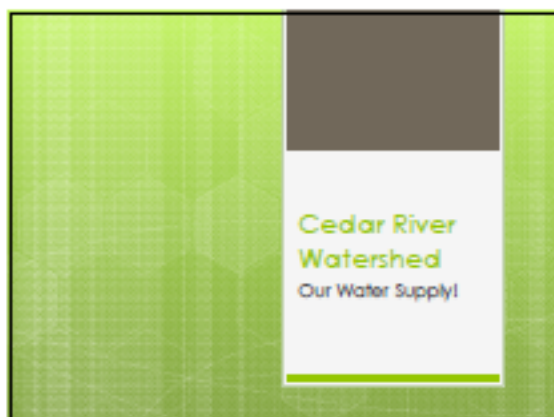


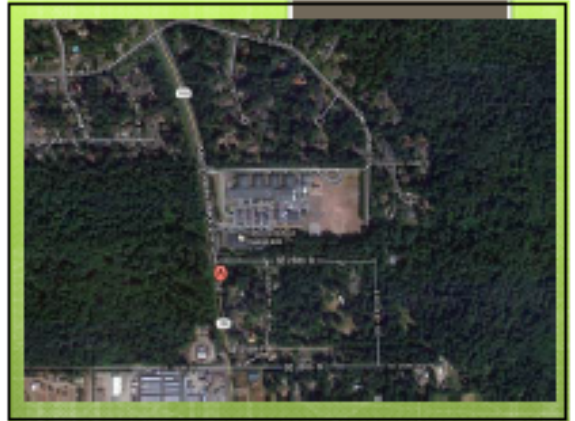
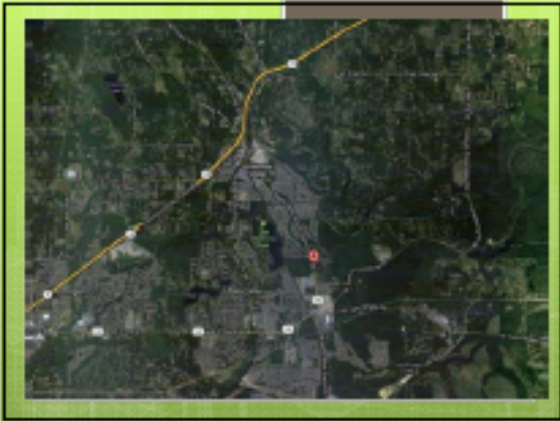
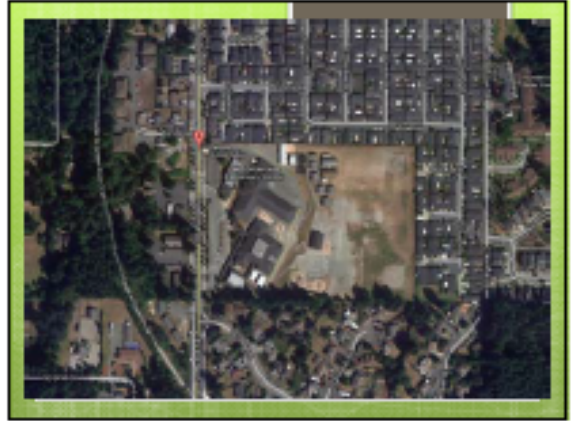
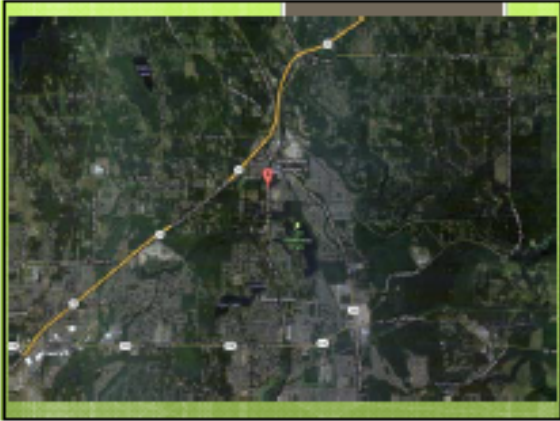
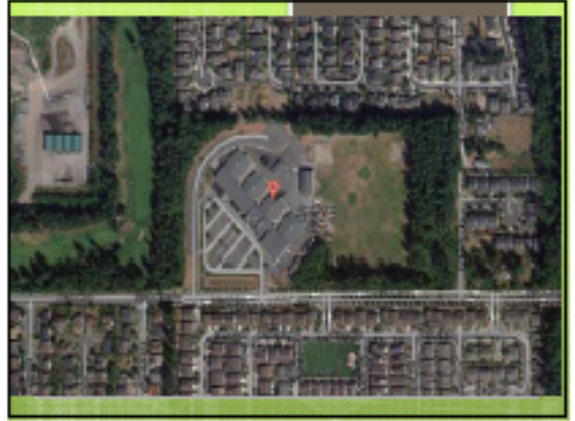
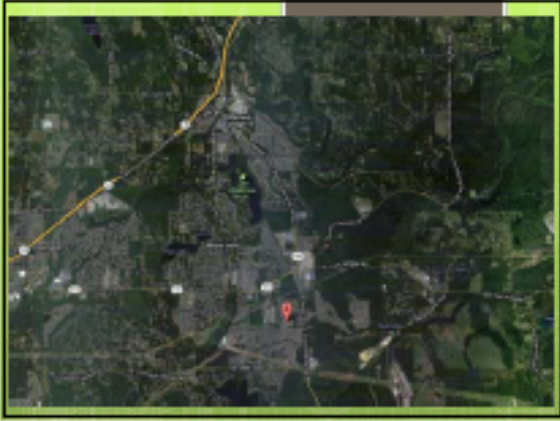
Excess fertilizer off lawns & gardens runs off into water. It rains & flows water.

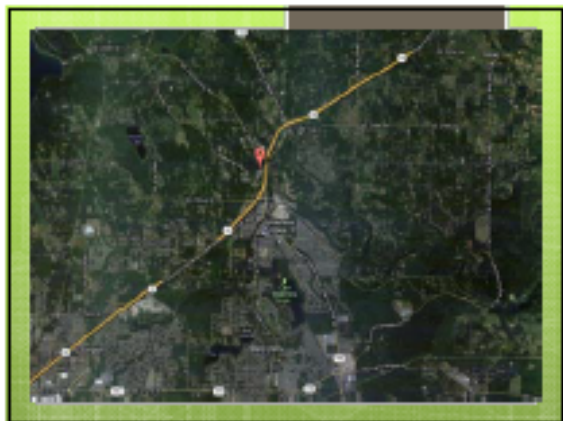
coastal waters

To Waterbody







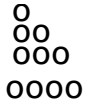




School Grounds Water Flow Map Legend



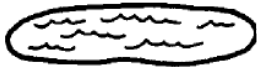
Slope



Erosion



A leaf indicates natural materials, such as leaves, soil, and twigs.



A puddle or soggy area shows where water collects.



A crumpled ball of paper indicates unnatural materials, such as litter, oil, and chemicals.



Flowers and shrubs



Trees



Grassy lawn



Drains



Pipe



Pervious surface



Impervious surface



Water Flowing Direction



Possible location of pollution

Fair Weather Hike Exit Slip

What is your prediction regarding where the water will flow on one part of the school ground? What is your evidence?

Why is it important for people to know how water flows after a rain storm?

Fair Weather Hike Exit Slip

What is your prediction regarding where the water will flow on one part of the school ground? What is your evidence?

Why is it important for people to know how water flows after a rain storm?



Where Does Water Go? Mapping Our School Grounds Background Information

Puddles, streams, and lakes all have something in common. They collect water that has drained from watersheds. Watersheds are like funnels; they are drainage basins where surface water runs off and drains into a common collection site. Watersheds are separated from each other by landforms (ridge lines or maintain divides). Water falling on each side of the divide drains into different watersheds and collection sites.

Surface runoff flows over a school's grounds on its way to the collection site (e.g., a river); therefore, schoolyards are part of a watershed. (Puddles are the collection sites of mini-watersheds: land surrounding puddles are the mini-drainage basins that empty into the puddle.) When the puddles overflow or the soil becomes saturated, water is released.

Often, materials carried by water to the school grounds (e.g., litter, twigs, leaves, oil) are left behind. Surface water living the school grounds may carry materials to the collection site of the watershed. These materials include soil, leaves, and twigs: litter; oil and gasoline from parking lots; and fertilizer from lawns.

As water flows from the school grounds, it combines with runoff from other land areas within the drainage basin. Materials from these other places are added to the water. While some substances decompose, settle out, or are filtered by soil, other matter continues to travel long distances downstream. Organic materials carried by the water nourish aquatic life. Some substances are toxic, however, and can endanger organisms consuming or living in the water. (Some lawncare products, soapy water from car washing on impervious surfaces, or dog poop.)

Contaminants whose entry point into the watershed is difficult to locate are classified as nonpoint source pollutants. Along with residential area, agricultural fields, and paved parking lots, school grounds can contribute nonpoint source pollutants. The schoolyard, an impervious surface, contributes source pollution when the source of the pollutant can be traced back to a specific location on the school grounds (e.g., sewer, ditch, pipe).





Rain Gardens

Grade 3 Stormwater Curriculum

Lesson Title: Where Does Water Go? Rainy Day Hike

Implementation Time: 45–60 minutes each

Materials:

- School Grounds Water Flow Map from Fair Weather Hike
- 2-Point Brief Writing Rubric
- 3–5 clipboards
- Pencils
- Crayons/colored pencils
- Digital camera
- Unit Post-Assessment

☒ **Content Knowledge:**

Water Flow
Water Cycle (Review)
Water Filtration (Review)
Pervious and Impervious Surfaces (Review)
Pollutants (Review)

☒ **Content Skill(s):**

Mapping Skills

☒ **Thinking Skill(s):**

Observing, Predicting, Inferring, Cause and Effect, Comparing/Contrasting

☒ **Habit(s) of Mind:**

Striving for Accuracy and Precision
Gathering Data through the Senses

Learning Target:

I can describe the water flow on our school campus and suggest improvements to reduce stormwater pollution.

Assessment:

Assign the Information Writing prompt:

Describe the water flow on our school campus and explain one way to improve the flow, reducing stormwater pollution.

Common Core ELA Standards:

RI #3: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence and cause/effect.

RI #4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

RI #5: Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

RI #6: Distinguish their own point of view from that of the author of a text.

RI #7: Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

W #2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

b. Develop the topic with facts, definitions, and details

W #8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Teaching Points:

Teacher Note: Prior to the start of this lesson, walk the school grounds on a wet day so that you can see how and where the water flows during a rainstorm. Select an area of the school yard for the mapping or consider dividing the class into teams to map a variety of areas, using parent volunteers to support the students.

Lesson Vocabulary:

- Pervious Surfaces
- Impervious Surfaces
- Stormwater Runoff
- Stormwater Pollution
- Water Filter
- Filtration
- Pollutants

Continued on next page...



Storm Water Curriculum

Where Does the Water Go? Rainy Day Hike, page 2

Teaching Points:

1. Share today's learning target with the students: *I can describe the water flow on our school campus and suggest improvements to reduce stormwater pollution.* Point out that today's learning target is much like the previous target on our fair-weather hike day; however, today, students will see if their predictions are correct based on what they actually observe on the school campus. They will also make recommendations for how to reduce stormwater pollution by improving water flow.
2. Follow the Rainy Day Hike Protocol. Students will review their predictions, visit the same location(s), and record what they see when the rains come. They will consider ways to improve the school campus grounds so that stormwater is filtered and cleaned when it enters our rivers, lakes, and Puget Sound.

Rainy Day Hike Protocol:

1. Hand out the Fair Weather maps to the students. They will visit the same location on the Rainy Day Hike as on the Fair Weather Hike.
2. Instruct students to review their predictions for water flow and spots they marked for possible points of pollution such as standing water, erosion, or water traveling over impervious surfaces. Today they will see if their predictions are correct based on observations on the same area of the campus.
3. Return to the observation site. Students should make improvements to their maps by noting puddles and evidence of erosion.
4. Students should check their predictions for water flow for possible points of pollution. Tell students to use a different color pencil to show the actual water flow. Mark where there was evidence of possible pollution: standing water, impervious surfaces, erosion.
5. Instruct students to check their predictions. Were they accurate?

Rainy Day Hike Wrap-up/Discussion:

1. Ask students to reflect:
 - a. Were your predictions of water flow correct? How were your predictions of water flow different from the water flow you observed (evidence) on the rainy day?
 - b. Was there any evidence that you found today that surprised you?
 - c. Describe where water went during the rainfall. Where did you see the greatest absorption of the water? Where was there standing water? What water ran over impervious surfaces? Did this water have a way to be cleaned by soil and plants?
 - d. How have humans affected the flow of water over the school grounds?
 - e. What are some of your recommendations to manage water flow in order to decrease stormwater pollution on the school campus?
2. Tell the students that their recommendations for managing water flow will be shared with the grade 5 students. These students will evaluate the suggestions and choose one to implement. The goal is to improve water quality after rainstorms so that the water entering our streams, lakes and Puget Sound is cleaned naturally of pollutants.
3. Assign the informational writing prompt as a check for understanding regarding the learning target: *I can describe the water flow on our school campus and identify a way to improve water flow, reducing stormwater pollution.*

Assessment:

Assign the Information Writing prompt: *Describe the water flow on our school campus and explain one way to improve the flow, reducing stormwater pollution.*

Score using the Brief Writing Rubric from Smarter Balanced Assessments.

Conduct Post-Assessment and compare to Pre-Assessment. Celebrate student learning!

Rainy Day Hike Exit Slip

Was your prediction accurate? Why or why not?



Where was the water absorbed on the school ground?

Where is one place where the water was not absorbed?

What's one improvement that we could make on the school ground so that the water is filtered before entering our lakes, rivers, and Sound?



Rain Garden Curriculum Grade 3

Post-Test

True or False:

1. Rain gardens can clean up bad pollution like car oil, grease, and lawn chemicals from getting into our streams.
2. Native plants and plenty of good soil mixed with mulch, help rain to soak in.
3. Copper flakes from the brake-pads we use in cars and trucks are a big problem for salmon.
4. It's best to wash your car near a gutter so that the soapy water goes down the storm drain.
5. Dog poop on lawns and sidewalks makes storm water dirty and unsafe.
6. We don't have to worry about pollutants because they will wash away down our storm drains.

Extensions Using Digital Cameras



Students can take pictures of their school grounds during both the fair weather and the rainy day school yard walks to document evidence of water flow on the school grounds. Then can then use these photographs to any of the following:

1. **Individual or partner work:** Create Venn diagrams with the photographs and have the students compare and contrast the fair weather and the rainy day conditions.
2. **Hallway Display:** Create a larger version of the school yard map. Students can then attach photographs and write captions explaining the evidence of water flow seen in the photographs.
3. **Assessment:** Students use photographs to document their knowledge of water flow, human impact, and erosion.
4. **Home/School Connection:** Students can document erosions by taking digital pictures or erosion in their own community/neighborhoods.



Additional Extensions:

1. Students can identify different types of water flow and evidence of erosion in magazines.
2. Students can map their own backyards or neighborhoods using the same key as the *School Grounds Water Flow Map*.
3. Students can pick up litter on their school campuses.
4. Teachers can share the following read-alouds:
 - a. *Follow the Water from Brook to Ocean* by Arthur Dorrow
 - b. *Where the River Begins* by Thomas Locker
5. Teachers can actually get dye from the local water utility to determine how /where water flows.



2-Point Brief Writing Rubric – Grades 3–11

Sample Generic 2-point (Grades 3-11) Brief Writing Rubric	
2	<p>The response:</p> <ul style="list-style-type: none">• demonstrates sufficient focus on the topic and includes some supporting details• has an adequate organizational pattern, and conveys a sense of wholeness and completeness, although some lapses occur• provides adequate transitions in an attempt to connect ideas• uses adequate language and appropriate word choices for intended audience and purpose• includes sentences, or phrases where appropriate, that are somewhat varied in length and structure
1	<p>The response:</p> <ul style="list-style-type: none">• demonstrates little or no focus and few supporting details which may be inconsistent or interfere with the meaning of the text• has little evidence of an organizational pattern or any sense of wholeness and completeness• provides transitions which are poorly utilized, or fails to provide transitions• has a limited or inappropriate vocabulary for the intended audience and purpose• has little or no variety in sentence length and structure
0	<p>A response gets no credit if it provides no evidence of the ability to (fill in with key language from the intended target) and includes no relevant information from the text.</p>

