Lesson Summary

Program Title: Introduction to Watersheds

Duration: 60 mins

Grade Level: Kindergarten

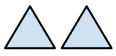
Abstract:

Rotating through four stations, or "centers," to fit the attention spans of early learners, each part of this lesson takes one step to develop an overall understanding of how water moves through the landscape, how watersheds are formed and impacted by the surrounding land, and how local rivers/watersheds connect farm and urban communities. Through interpreting aerial images and tracing the path of rivers on maps, students work to orient themselves and their school/neighborhood in relation to local water bodies. After experimenting with gravity's influence on their own bodies, students use a 3D model and record results in a bar graph to "follow the flow" of water pulled by gravity from high mountain tops down to low valleys. Illustrating their own homes, school, Oxbow farm, and other landmarks in the Snoqualmie and Skykomish River Watersheds, students explore the ways humans use land around rivers, and see the connections between the water flowing past the farm and through their city. Finally, students embody water droplets in a river movement dance and carry "pollutants" downstream, then discuss how we can keep our shared water resources clean.

Students Will Be Able To (SWBAT):

- Describe how water comes from upstream and flows downstream, pulled by gravity, through experiments with their own bodies and working with a model
- Identify the relationship between different size water bodies (streams, rivers, Puget Sound, Pacific Ocean) with smaller flowing into larger by tracing rivers on maps
- Explain the impact that human activity in cities and on farms has on surrounding water bodies and show how pollutants are carried downstream, through decorating a collaborative poster of their local watersheds and embodying a water droplet dancing down the river.

Materials/Preparation:

- Internet access and projector for watershed video introduction
- Two folders sturdy enough to make  shapes, optional tape (helpful for securing folders to table)
- At least two pompoms or other small balls (ideally not bouncy, for classroom management ease)
- Laminated bar graph recording sheet
- Water droplet dance "pollutant" cards
- Laminated map collection
- White-board markers and an eraser/paper towel
- Large sheet of butcher paper (approx. 6 ft.) per class with Snoqualmie, Skykomish, and Snohomish rivers traced on it. Title the map "Oxbow to Monroe" and include a compass rose.
- Coloring supplies for each student
- Books for teacher-led station (see recommendations below)

Program Title: Introduction to Watersheds

Duration: 1 hr

Grade level: Kindergarten

Theme(s): A watershed is an area of land where water flows to a common point. We all live in a watershed!

Goal(s): Students will be introduced to the concept of a watershed and learn how rivers and streams create connections between shared habitats. Students will identify areas of human impact within the watershed, both positive and negative.

Objective(s):

Students Will Be Able To:	**Educator verification method**
1. Describe that water is pulled by gravity from high to low elevation and that high points divide watersheds.	Students "test" gravity by jumping and trying to defy it. Students will make predictions about where the ball will roll and record results on bar graph with the folder gravity test.
2. Use a map to locate their school in relation to surrounding water bodies.	Students trace rivers on maps of different scale, including the rivers near the farm and school, following the rivers out into the Puget Sound and identifying places they know.
3. Identify the confluence of small streams into larger rivers and ultimately the ocean, specifically the confluence of the rivers in their own watershed- connecting Oxbow and Frank Wagner Elementary School, and eventually the Puget Sound.	Using a large sheet of butcher paper with only the Snoqualmie, Skykomish, and Snohomish rivers drawn out, students will add more details of their watershed on the large map, including wildlife habitat, human homes, cities, parks, schools, farms, etc.
4. Students will consider land use around the rivers, recognizing that watersheds are a place where people and other animals live. They will Identify sources of pollution and discuss how pollution travels downstream. They will also discuss ideas for pollution prevention and clean-up.	To engage in kinesthetic learning, students dance downstream as rain drops (some of which carry pollution) after discussion different pollutants from either farm or city. Students conclude with "cleaning up" the river, discussing how each pollutant can be cleaned up or prevented.

Teacher Background:

Become familiar with the bodies of water in your watershed, especially where the water originates and where it connects to bigger rivers.

Oxbow Farm & Conservation Center and Frank Wagner Elementary school in Monroe are in very different in terms of landscape, but they aren't so far away from each other. In fact, they are in the same watershed, meaning that the river flowing past the farm and the river flowing by the school connect, forming a larger river and going all the way out to the Puget Sound.

People live on land near the water and use the water for many different uses. It's a life-giving substance that's needed to grow food on farms and to survive in an urban area. The activities that people do on land can impact the water, causing pollution and harming the wildlife that lives in the river and the Puget Sound, and beyond to the Pacific Ocean. Luckily, there are many ways to help keep our watersheds healthy.

Resources:

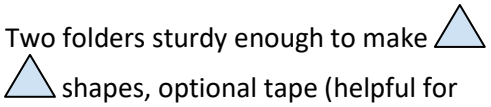
https://cfpub1.epa.gov/surf/state.cfm?statepostal=WA

https://gismaps.kingcounty.gov/iMap/

http://gis.snoco.org/maps/snoscape/viewer.htm

https://water.usgs.gov/wsc/map_index.html

Materials/Preparation:

- Internet access and projector for watershed videos
- Two folders sturdy enough to make  shapes, optional tape (helpful for securing folders to table)
- At least two pompoms or other small balls (ideally not bouncy, for classroom management ease)
- Laminated bar graph recording sheet (see below)
- Large sheet of butcher paper (approx. 6'x 3') per class with Snoqualmie, Skykomish, and Snohomish rivers traced on it. Title the map "Oxbow to Monroe" and include a compass rose.
- Coloring supplies for each student
- Laminated local river map collection
- Puzzle map placement board (pieces traced on it in correct orientation)
- Pre-made puzzle map pieces
- White-board markers and an eraser/paper towel
- Books for teacher-led station (see recommendations below)
- Water droplet dance "pollutant" cards

Introduction:

Introduce farmers. One very important thing that connects Oxbow Farm and Frank Wagner is our shared water! The squiggly Snoqualmie River flows past the farm, all the way up to Monroe where it meets up with the Skykomish River. The water from these two rivers mixes to become the big Snohomish River which travels out to the Puget Sound and eventually all the way out to the Pacific Ocean!

Today we are going to learn:

- How water moves from the tops of mountains all the way down to the oceans.
- That smaller bodies of water meet up and flow into larger bodies of water.

- The many ways we, as humans, are connected to the water and how we can help or hurt the water and all the other things that share that water with us.
- What a watershed is and which watershed(s) we are part of!

Play "What is a Watershed?" video:

English: https://www.youtube.com/watch?v=QOrVotzBNto

Spanish: https://www.youtube.com/watch?v=Rb0w8piQ4hI

Alternate "We all live in a watershed" music video (if there's enough time): https://www.youtube.com/watch?v=3ZP0B8PsuNU

Wow there are a lot of things that live in a watershed. What's a watershed again?

Define watershed slowly, using hand signs: "A watershed is an area of land where water flows to a common point."

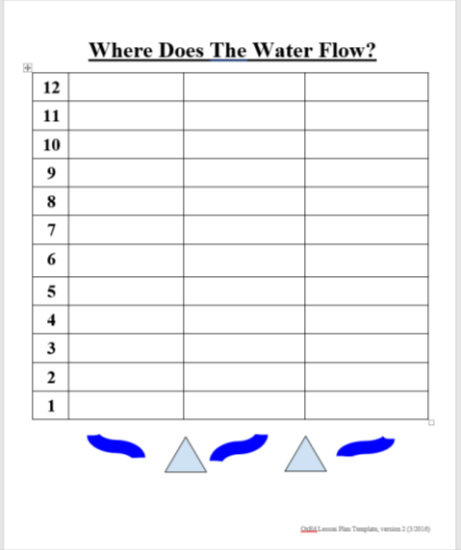
Introduce structure of the lesson: Explain to students that they'll be rotating through four centers or stations. Each one is hosted by one of your farmer educators or your very own teacher. Students will spend 10 minutes at each station and will then rotate to the next station when the timer sounds. Then they'll finish up with an activity as a whole group, starting at the carpet space.

Activities:

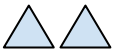
Center 1. Gravity pulls water downhill. High points like mountains and ridgelines divide the water that falls on top; these high points form the boundaries of watersheds.

Activity: Students "test" gravity's influence by trying to jump up to the ceiling, then discuss how gravity affects both our own bodies and water. Using two folders next to each other as a watershed model, students drop pom-poms (raindrops) on the ridgelines and record where the water "flows" in a bar graph. Discussion questions center around defining/ naming a watershed by the ultimate destination of water that falls in it (rivers, lakes, ocean) and how high points divide watersheds.

Students get ready to drop the water droplet (pompoms) from the tops of the mountains, then record which way the water flows, into the valley center or on the outside edges of the mountains.

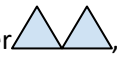


Materials:

- Two folders sturdy enough to make  shapes, optional tape (helpful for securing folders to table)
- At least two pompoms or other small balls (ideally not bouncy, for classroom management ease)
- Laminated bar graph recording sheet

Intro to activity 1: Hold up small ball and ask students to predict where it will go when it's dropped. Ask for reasoning to their claim. Some students might know the word "gravity." What is gravity? Explain that to help you learn, you'll play a game: us vs. gravity. In order to win, you need to jump up and reach the ceiling...and stay up! If your feet touch the floor, gravity won. You'll try for 10 seconds. Start jumping! Did anybody manage to stay up? Feel how gravity pulls your bodies back down to the ground. How do you think gravity effects water? Is there anything that can beat gravity? (Clouds, until they get too heavy and drop their rain! Or balloons, spaceships, etc.)

Activity: Using a folder and a small pom-pom ball as a model: stand folder spine-side-up (to form  shape). Define this model as a mountain and have students predict what will happen when a ball is dropped from the top/peak. Just as rain falling on a mountain will run downhill, the pompom will roll down as well, thanks to gravity. Can they predict which side it will roll down? What starts to form when enough of the pom-poms (rain or snow) fall to the sides of the mountains? Through guiding questions, students will conclude that this is how rivers and lakes are formed.

Using two folders next to each other  , model that the river in the "valley" between is fed by water flowing down both inner sides of the mountains, with two additional rivers forming on the outsides of the mountains. Introduce worksheets for graphing. Optional: Name the mountains after primary colors (i.e. Red Mountain & Blue Mountain) and name the valley in between after the secondary color formed when those colors mix (Purple Valley).

Have two students release balls from the tops of both mountains at the same time, aiming to release from the peak. Be sure students "float" the balls over the tops of mountains like clouds to avoid smashing the mountains. Practice counting down from 3 as a group to ensure approximately the same release time. Color a box on the recording sheet in the square associated with the river the balls rolled down into.

Inquiry Questions:

Counting: How many mountains are being represented here? How many sides does each mountain have? How many rain/snow balls fell in each valley? Where does most of the water go?

Analyzing: Where does the water go after falling on the top of the mountain? What forms when a lot of water flows to the same place?

Systems modeling: With two mountains next to each other, how many different places can water flow? How many rivers will form around the mountains? How many watersheds are formed by the two mountains?

Center 2. Watershed health includes the land as well as the water within an area; humans have many uses for land and water and share the watersheds where they live with many animals and plants.

Activity: Students illustrate features that are natural, human-made, urban, rural, plant, animal and human on a map of their watershed, showing the mixed use of the land and water and demonstrating that people have an impact on their watershed and that a watershed is a shared landscape.

Materials:

- Large butcher-paper map titled "Oxbow to Monroe," showing basic outline of Snoqualmie/Skykomish/Snohomish Rivers, labeled and including a compass rose.
- Markers and/or crayons for everyone
- [Further ideas: Pictures of features (well-known landmarks, riverside park views, Frank Wagner, Oxbow) to paste onto appropriate map locations.]

Note: The first group at this center will take the longest to facilitate because you'll be drawing certain baseline landmarks like Oxbow Farm and Frank Wagner School. Explain that the long squiggly line is the Snoqualmie River. Draw and label Oxbow. Point out the Skykomish River and the area of Monroe. Draw and label Frank Wagner (or have a student draw and label.) Repeat theme: A watershed is an area of land where water flows to a common point; emphasize the point where the Snoqualmie and Skykomish connect to form an even bigger river, the Snohomish River! You can use your fingers to demonstrate how two separate rivers come together to form an extra strong river.

Intro to Activity 2: Begin by telling students that this map already has a lot of information, but together you're going to fill it in with much more detail so that you can show what happens as the rivers move and what happens on the land around them.

Use the following guiding questions to help students come up with ideas for what to draw and label on the map:

> Guiding Questions: What else is in your shared watershed? Where is your house? Your school? Your city? How do you get from place to place? Where does your food come from? Where do you play? Are there any animals here? What kind of habitat can be found in a watershed? Whose habitat is it? Ask students to recall other maps they've seen and have them label what they're adding.

Allow students to draw and label additional items to the map but ask them to consider how it connects to water; does it use water or need water to live? How might it change the water—does it add something to the water or take something out?

Leave the map for the class to make any additions and to hang up in the classroom, perhaps throughout the school year as they learn about other watershed features and organisms that depend on clean water.

Digging deeper with more guiding questions: Pointing to the compass rose, ask students if they've ever seen that symbol before. What do these arrows tell you? Which direction are the rivers flowing? Orient the map in the classroom to align with actual cardinal directions. What can you find further (north/east/south/west) outside the map boundaries? Where does the Skykomish River flow after it leaves our map?

Center 3. We can find our place in the world and see connections to other places by reading maps. As water flows it meets up with more water to form larger streams, rivers, lakes, and eventually oceans; rivers create a downhill journey we can trace on a map.

Introduce laminated maps to students and ask them how people know where to go when they are traveling? Imagine that you are a bird and have a nest right here at the school. If you fly up, up, up, what will you see when you look down at your school and town below? What if you flew up even higher, what would you see? Students can have a discussion about maps being a "birds eye view" and why that is important.

Materials:

- Laminated map collection
- Puzzle map placement board (pieces traced on it in correct orientation)
- White-board markers and an eraser/paper towel

Step 1: Puzzle Piece Watershed: Pass out all puzzle pieces of laminated satellite maps of the Monroe area, Oxbow area and in-between. Together, using the maps, locate their school, signs of water, and other features; give students time to find things they recognize on the maps. Explain that these pictures show what a bird would see if it flew way up high into the sky.

Point out the shape of the pieces of the map, some students might have a wiggly edge on their puzzle pieces. These are all pictures of the land, taken from an airplane so things look very small. Invite students to look closer and ask what they see near the wiggly edge of their puzzle piece. (There is a river.) Ask what else they notice? Instruct students to find the place for their puzzle piece and start to notice the wiggly river that connects the pieces together. They can trace the river with their fingers. Point out the city of Monroe (where their school is located), then point out Oxbow. How do they look different? How do they look similar? (Talk about agricultural land vs. urban land.)

Remind students that since those water features are rivers and not lakes or oceans, we know that is not the end of the water's journey. Together, pretend you're birds that like to eat fish from the river and follow the river to see where it goes.

Invite students to trace the river with their fingers. Introduce it as the Snoqualmie River that travels by Oxbow. Ask students if they can find the city where your school is. Can they find the river that runs by their town? Introduce this as the Skykomish River. Tell students that now that you have put all these puzzle pieces together, you have created a map and you can follow the journey of the river between Oxbow and Frank Wagner.

Step 2: Show the connection: Point out the place on the map puzzle with the Monroe and Oxbow river convergence and describe how the squiggly Snoqualmie river comes all the way up the valley, winding and wiggling the whole way, past the city of Monroe. Point to the **confluence** on the map and ask the students if they can see the two rivers that come together, the one from the valley and the one by the city, combining into one river. **The river that runs past Oxbow and the river that runs past Monroe meet up with each other and connect, which means we are in the same watershed!** Remember a watershed is an area of land where water flows to a common point. To transition to the next step, ask students where the big Snohomish River goes from there now?

Step 3: Tracing the rivers: Explain to students that you're going to follow the rivers, first starting with the tiny streams, then going to the bigger rivers, then the even bigger rivers, all the way out to the ocean (or the Puget Sound, which is kind of like the ocean in Washington.) Using one of the maps to demonstrate, ask students what the natural features are that divide up watersheds on the map. These are the high points in the land, the areas where the small streams start to form, that are the edges of your watershed. What are those high points of land? (Mountains or hills!) Ask students if they have seen or visited the high mountains where the snow melts from. On some of the maps, the edges of the watershed (the mountains) are shown with a black line. Explain that together you're going to trace the tiny rivers (in blue on the maps) and see where they go. Demonstrate by starting at the ridgeline with the smallest river, tracing all the way until you reach the Puget Sound. Have students imagine there is a big rainstorm or snowstorm up in the mountains and gravity makes all that water travel downhill; according to the map, where does the water go?

Hand out all the watershed maps and markers, reiterate what they are doing, check for understanding by having students repeat back the steps: Starting at the tiny tip of a small stream in the mountains, trace where the water flows as it goes into bigger and bigger rivers, eventually out to the ocean.

Walk around putting dots on each student's map showing where Oxbow and Monroe are. Can they find where the nearby rivers go? Do they recognize any other places on the map?

Inquiry Questions:

Did anyone trace the squiggly river that goes by Oxbow Farm? Where do the rivers go? How do you know when the river has reached the end of its journey? Can anyone find a lake and the rivers that connect to it? Has anyone seen or visited the Puget Sound water that is near the ocean? How are these places similar? How are they different? Is the water salty or fresh? What different animals might you find in different parts of the maps?

Digging Deeper: Identify and label locations of Oxbow Farm, Frank Wagner, neighborhood landmarks, students' neighborhoods, favorite play spots/parks, etc. Where do the names of these rivers come from? Discuss First Nations in the area and why they might have settled and traveled along rivers. Are these people still here today? Read a book about local history and origins of river names. Observe how rivers are used as political boundaries, for example, the Columbia River separates Washington and Oregon, compared to the Washington and Canadian border which is not separated by a river.

Center 4: Free-read or tacher-led reading:

Materials:

- At least one river or watersheds themed book

Books from King County Library system:

Over in a River; Flowing Out to the Sea by Marianne Berkes. Top choice- includes counting and maps!

The River by Nik Pollard. Second choice- follows flow from mountains to streams, explores water usage

Follow the Water from Brook to Ocean by Arthur Dorros

River Song; with the Banana Slug String Band by Steve Van Zandt

Where Do Rivers Go, Mama? by Catherine L. Weyerhaeuser. A little advanced for the K level readers

Other books:

El agua: Arriba, abajo y en todos lados by Natalie M. Rosinsky (Spanish language)

Soy El Agua/ I Am Water by Jean Marzollo (Spanish & English versions available)

Conclusion: **Group Wrap Up Activity: 10 mins**

Our actions affect the health of all water downstream. You and me, the farm and the city, the human and the fishy, we are all connected by our shared water.

Materials:

- Pollution and river usage cards divided into Farm and City piles

Activity: Split class in half, with one half of students going to one side of the classroom as the Farm group with one instructor, and the other half on the City side with a second instructor. In these small groups, share and discuss ways that farms and cities both **use** and **impact** the water that flows through them (optional: record on T chart). Define **pollution** and, discuss sources and types of pollutants that might end up in water as it flows through either farmland or urban development.

As ideas come up in conversation, pass out water use and pollution ID cards to be carried by the "water droplets" (students) as they do a dance downstream. Flowing from their respective farm or city area, holding hands in a line following the instructor, each river chants its name ("Snoqualmie!" or "Skykomish!") After a few twists and turns around the classroom, eventually the two rivers converge, with water droplets holding hands, and the whole class chants the name of the new, bigger, river they form ("Snohomish!")

Discuss with students how different pollutants from the farm and city flowed downstream to

meet up in the same water body. Are there common pollutants? What are the differences between city and farm pollutants? How do those pollutants effect humans and animals? What can we do to keep our shared rivers clean? As students share suggestions (put trash in a garbage can, fix oil leaks, etc.) begin to "clean up" the river by collecting pollution cards from students until the pollution has been removed.

Digging deeper: Discuss the valuable nutrients and minerals that move downstream as sediment, bringing food to places like the Puget Sound. Animals who live in estuaries and shorelines depend on sediments brought in by rivers for food and habitat. Rivers are the reason the ocean is salty- all the minerals were once carried downhill from mountains! **Even further**: humans use this downstream flow power to float lumber and other important materials down the river without using additional power sources! Humans dam rivers to harness and make use of the massive gravity-driven energy of rivers in hydropower.

NGSS 3-Dimensions Connections:

Dimensions from Framework	What students are doing
Science and Engineering Practices (SEP) - Developing and Using Models - Analyzing and interpreting data -Engaging in argument from Evidence	- Students are guided through an activity where folders are used to model mountains. Puff balls (used to represent snow/raindrops) show how water moves from high places to low places on the land. - Students record information during the watershed model activity, filling in a bar graph with the number of times the water fell into each river, and make predictions about where the water will flow based on the first few rounds of data - Students draw and explain the human activities that take place in the watershed, and the impact these activities have on watershed health.
Disciplinary Core Ideas (DCI) - ESS3.C: Human Impacts on Earth Systems - ESS2.B: Plate Tectonics and Large-Scale Systems interactions (K level: maps can show where things are located & one can map the shapes and kinds of land and water in any area).	During the conclusion activity and the watershed drawing activity, students learn and explain the many ways humans and animals are using and impacting the water. Through the river flow dance activity, we will pick up pollutants along the way, then communicate ways to keep those pollutants out of the water. Students will explore maps through a puzzle and trace rivers on maps, finding the river convergence connecting Oxbow & Frank Wagner.
Crosscutting Concepts (CC) - Patterns	Students will test out gravity several times by jumping into the air. They will notice a pattern (gravity pulls things to the ground). Using this observed pattern, they will predict and carry out an investigation for which way a raindrop will travel. Students will learn that small streams flow into larger rivers.
Performance Expectation (P.E.) supported: **K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.***	

Five E Learning Model:

Engage: How does the lesson pique the learner's interest and allow them to express their existing thoughts and opinions on the subject?	Students are engaged kinesthetically when learning about gravity and pollution flowing downstream. They are invited to be creative when illustrating their maps and share ideas about how water is used and impacted.
Explore: How does the lesson allow students to interact with each other, and observe their surroundings. Does the lesson include problem solving or coming up with an answer to the question?	Students use aerial maps to piece together the river's journey from Oxbow Farm to Monroe. Students share during discussion some experiences they've had with rivers and illustrate their homes and other places they are familiar with in their watershed.
Explain/Elaborate: How does the lesson help students make a connection between new and former experiences. How does the lesson encourage students to record, reflect, and explain their new understanding to others?	The 4 centers build on each other so that by the last rotation students are familiar with concepts and able to jump into the activities. This in-class lesson relates to their field trip to Oxbow.
Evaluate: How will the students be encouraged to reevaluate their understanding of the phenomena and demonstrate what they have learned?	Students end the lesson by embodying a river and dancing together. Each center activity touches on concepts explored in previous centers while building a new piece to define watersheds.

Enrichment/Expansion:

My Hand as a Watershed

Activity: Each student traces one of their hands on a piece of paper. Label and color each finger as a unique river, label and color palm as a lake or ocean where all the rivers converge. Can draw mountains at the fingertips to reinforce the idea of water flowing down from the high points. Have students draw their **home** next to one river, a **farm** next to another one, their **school** adjacent to a third river, a **forest** around another and a **factory** by the fifth.

Questions: What part of your map is the highest ground? Which way is the water flowing? Draw arrows showing the direction of water flow. How might the water coming from each of these five rivers be different? How is the water changed, or impacted, by human activity around the river? Introduce the idea of pollutants and runoff from the different environments surrounding each river.

Next level: Identifying patterns: What other things, either found in nature or made by humans, have a similar pattern of small pieces meeting up to make larger pieces? (Examples include veins, tree branches, plumbing systems, etc.) How are these things similar to rivers in a watershed? How are they different?

Where Does The Water Flow?

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