

Lesson Title: We all live in a Watershed

Grade: 6-8

Days to Complete: 1-2

Common Core Standards		Objectives	21 st Century Learning
<input checked="" type="checkbox"/> SL1: Collaboration with partners <input checked="" type="checkbox"/> SL2: Integrate/evaluate information <input checked="" type="checkbox"/> SL4: Present findings/evidence <input checked="" type="checkbox"/> SL5/W6: Purposeful technology usage <input type="checkbox"/> SL6: Formal communications usage <input type="checkbox"/> W1: Produce evidence-based claims <input type="checkbox"/> W3: Creative Writing	<input type="checkbox"/> W4: Writes on task <input checked="" type="checkbox"/> W7: Conducts research <input checked="" type="checkbox"/> W9: Use evidence for analysis <input checked="" type="checkbox"/> W10: Continued notebook usage <input type="checkbox"/> L3: Applied reading comprehension <input checked="" type="checkbox"/> L4: Using context clues <input type="checkbox"/> L5: Understanding of figurative language <input checked="" type="checkbox"/> L6: Using Academic Language	<ul style="list-style-type: none"> • Understand what a watershed is and what watershed the school is located in. • Demonstrate basic observation and identification skills • Describe different examples of point source and nonpoint pollution • Associate particular pollutant sources from different land uses • Develop a plan to prevent pollutants from entering the watershed 	Communicating verbally <ul style="list-style-type: none"> • Converse one-on-one • Present to groups Working directly with people <ul style="list-style-type: none"> • Work in teams Gathering information <ul style="list-style-type: none"> • Keep and use records Asking and answering the right questions <ul style="list-style-type: none"> • Pay attention to detail • Apply knowledge Solving problems <ul style="list-style-type: none"> • Identify problems • Launch solutions

Materials

WeAllLiveInAWatershed PowerPoint
 Discover Your Watershed worksheet
 Access to dec.ny.gov (teacher use and preparation)
 Activity 1 – Discover your watershed
 (per class or group of 3-6 students)

- Projector screen with access to <https://streamstats.usgs.gov/ss/>.
- Pencils
- Discover your watershed worksheet

Activity 2 – Impervious vs Pervious surfaces (optional)

- Watering Can
- Location outside school with pavement, grass, and/or dirt

Activity 3 – Sources of Pollution

- PowerPoint
- Pencils
- Discover your watershed worksheet

Activity 3 – Protect Water Quality

- Pencils
- Discover your watershed worksheet

DIN
 Background/PPT
 Activity 1 – Discover Your Watershed
 Discussion

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Activity 2 – Impervious vs Pervious Surfaces

Discussion

Activity 3 – Sources of Pollution (using PPT)

Activity 4 – Action Plan

Close

Lesson Outline

Time(min)	Description of Learning Activity
10	<p>DIN (Do it Now)</p> <p>Students will respond to the following prompts in their science notebooks using complete sentences:</p> <p><i>(Day 1)</i></p> <ul style="list-style-type: none"> • Are there places in the world where there is less water? What are those places like? Describe the landscape, the climate, and the types of animals you would expect to find there. <p><i>(Day 2)</i></p> <ul style="list-style-type: none"> • What are three ways that you can help reduce pollution in your watershed? <p>Allow student volunteers to share their responses and highlight details that relate to the role of trees in the environment.</p>
	<p>Essential Question</p> <p>What is a watershed? What watershed do you live in? How do your actions affect the water quality in your watershed?</p>
	<p>Background</p> <p>A watershed is a land that water flows across or under on its way to a river, lake, stream or bay. Water travels over farm fields, forests, suburban lawns and city streets, or it seeps into the soil and travels as groundwater. Watersheds are separated from each other by high points, such as hills or slopes. Watersheds can be nested within one another. Picture a watershed, think of a small stream that flows into a river. The river then flows into a lake. All the land that surrounds the brook, river and lake are in one watershed, because all the water in the area flows into the lake. In addition, the lake and its watershed may be part of a larger river’s watershed. Water in the rivers eventually makes its way to the ocean.</p> <p>The focus of this lesson is to emphasize the we all live in a watershed and our actions can impact the water quality in the watershed. The water in your backyard drains over or under the ground to a small creek or pond and is a part of its watershed.</p> <p>Vocabulary terms used in this lesson include</p> <p><i>Watershed:</i> The land area that channels rainfall and snowmelt to creeks, streams, and rivers and eventually to outflow points such as reservoirs, bays, and the ocean.</p>

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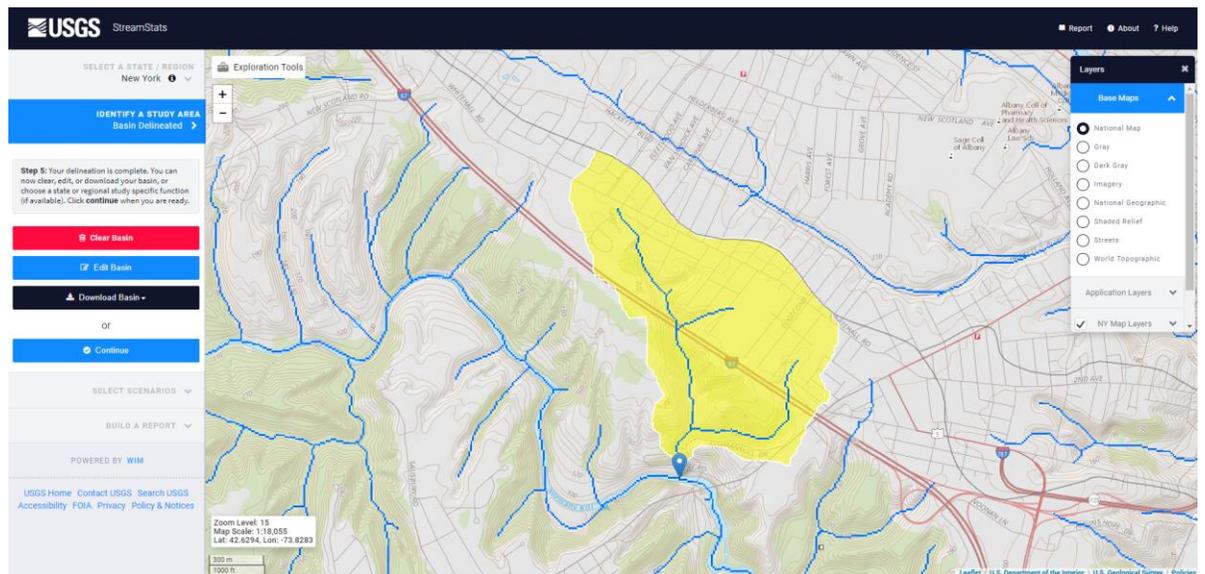
	<p><i>Pollutant:</i> a material that is harmful to the environment</p> <p><i>Nonpoint Source:</i> A combination of pollutants from a large area rather than from a specific identifiable source. e.g. construction site, farm, or parking lot</p> <p><i>Point Source:</i> A source of pollution that comes from a specific identifiable source. e.g. A discharge pipe from a factory.</p> <p><i>Pervious:</i> A surface that allows water to absorb into the soil e.g. grass, forest, gravel, permeable pavers</p> <p><i>Impervious:</i> A solid surface that does not absorb water, forcing it to run off e.g. roads and rooftops</p> <p><i>Runoff:</i> Water from rain or snow that flows over the surface of the ground into streams</p>
35	<p>Procedure</p> <p>Discuss how what a watershed is by asking students “what does <i>shed</i> mean?” Many students will define “shed” as a building used to store things. Indicate that <i>shed</i> has other meanings such as taking off a coat, or a dog shedding fur, or a snake shedding its skin. Encourage students to think of shed as also meaning “run off a surface” or “to get rid of”. Connect the idea of water shedding off the land and into the water as <i>runoff</i>.</p> <p>Discuss the difference between a pervious surface (grass) and impervious surface (sidewalk, roof top, paved road). Consider what can be carried by runoff into streams, rivers, and lakes and how they are carried to the water. Prepare students to evaluate the potential impact of pollution in runoff on water quality in their watershed.</p> <p>Review the water cycle and how water moves through the environment. Ask students to brainstorm and consider what pollutants there are in the watershed that can enter the stream through runoff. Some examples may include dirt and soil (sediment); fertilizer and manure (nutrients); oil, grease, or gas (toxic contaminants); pet waste and animal waste (pathogens); or plastic cups and bags (trash). Explain to students that these are just a few of many examples of pollutants in our watershed. Ask students to consider how to prevent these pollutants from getting into waterbodies (fences, grass or forest buffers along the waterway, picking up trash and bagging pet waste). Hand out the Discover Your Watershed worksheet and have the students follow along by filling it out.</p> <p>Activity 1 – What watershed are we in?</p> <p>Start out broad, ask students to predict the largest body of water that all the streams and rivers go to.</p> <ol style="list-style-type: none">1. If the school grounds have a stream, take the class outside or to a window and view the nearest stream. If the school ground does not have a stream and a projector is available, bring the students

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<https://streamstats.usgs.gov/ss/> . Enter in the address to the school and select New York as the State Study Area. Click on a blue stream near the school to see the watershed for that segment. You can click on Base Maps under Layers and select imagery to see orthoimagery on the map.



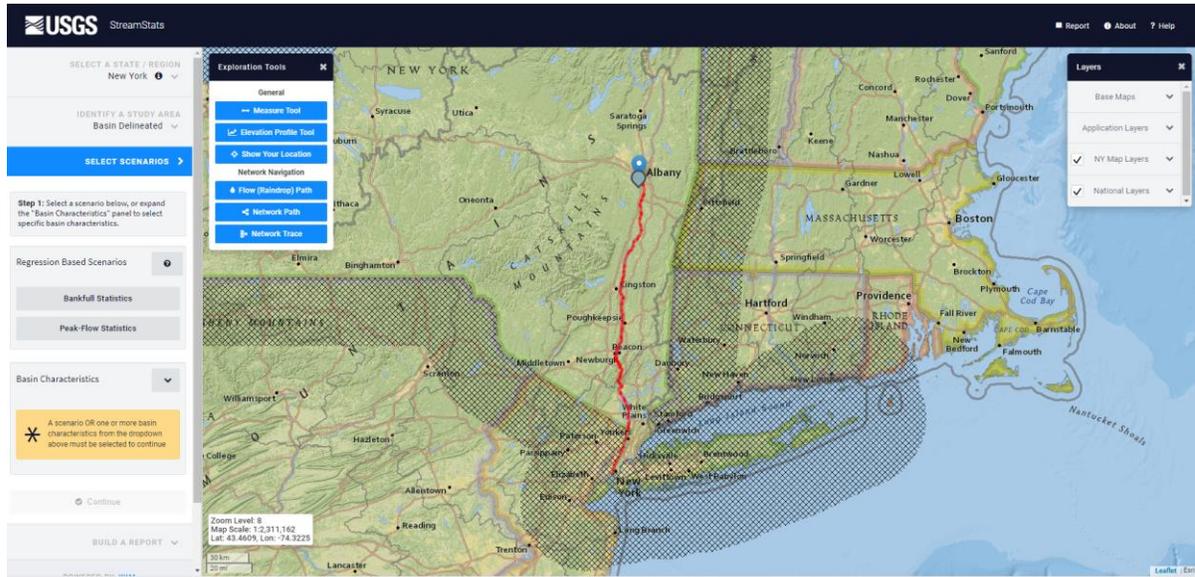
2. Have students point out areas in their watershed where pollution could come from. Examples include residential houses, gas stations, farms, factories, construction site or parking lots.



3. Have students point out examples of pervious and non-pervious surfaces. A pervious surface is an area that soaks up water like a sponge, areas that have grass or forest are pervious. Impervious areas include building roofs, parking lots and roads. If a rain drop were to fall on that part of the land would it be absorbed into the ground or runoff across the surface.
4. Discuss with students about where they think the water in the watershed continues. Does it go to a larger river or lake? Does that river eventually reach the ocean? Select the exploration tool in the top

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left corner of the map. Click Flow (Raindrop) Path, us Pourpoint and click Go. A red line will appear on the map showing flow from your watershed to the nearest ocean. Try repeating the exercise in another part of the state or country. In the south-west corner of New York in Allegany County, the waters drains through the Mississippi River and into the Gulf of Mexico.



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Activity 2 – Impervious or Pervious Surface?

As a raindrop hits the ground it is either absorbed into the ground or moves across the surface becoming runoff. Runoff can occur on fields of grass as sheet flow during heavy storms. Water is 'sticky' and picks up pollutants as it runs across the environment. Runoff will pick up nutrients, sediment, pathogens, trash, and toxins and deliver them to the nearest waterbody. What determines weather or not runoff will occur?

If possible, take the students outside of the classroom with a watering can and have the students experiment pouring the same amount of water on different surfaces outside, such as soil, grass, and concrete. Have the students observe what happens to the water depending on the surface it is poured onto. Grass and planted areas should soak up the water with very little runoff. An area with gravel may capture some of the runoff compared to a solid concrete or asphalt surface.

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Activity 3 – Sources of Pollution

We saw on StreamStats what types of areas were within our watershed. What pollutants are found in a watershed and where do they come from? Discuss the difference between nonpoint source pollution and point source pollution. A point source pollutant comes from a specific identifiable source such as a discharge pipe, that you can point to. A non-point source pollutant can come from a combination of pollutants from a large area rather than from a specific identifiable source. Non-point source pollution can be prevented by being environmentally conscious of your watershed. Use the PowerPoint to go through examples of nonpoint and point source pollution and review what possible pollutants are pictured in each slide.

1. There are four broad groups that pollutants can be categorized in:
 - a. Trash – often referred to as “floatables” when seen floating in the water, can include plastic debris, shopping carts, tires etc.
 - b. Pathogens/Microbiological – Bacteria, Viruses, Protozoa can occur naturally or as a result of improper treatment of water. Can cause undrinkable water for animals and humans.
 - c. Nutrients & sediment – A result of overfertilization, runoff from farming, improper disposal of containers, or wastewater treatment.
 - d. Toxics and hazardous chemicals – Human made, enter waterbodies as a result of improper disposal, run-off, leachate and acid rain.
2. Other categories can include heat pollution from industrial run-off and medical pollution from improper disposal of medicines/drugs in water systems.
3. Trash, pathogens and toxic chemical make sense but why are sediment and nutrients harmful if they are naturally occurring?
 - a. Too much sediment in the stream can be harmful for fish and aquatic life. If fish can not see their food or their mate they have a harder time feeding and reproducing. In some occasions the sediment can block their gills and cause the fish to leave the area for clearer water. If sediment fills in the bottom of the stream it can reduce habitat for macroinvertebrates that live in the small crevices in-between rocks and gravel.
 - b. Having too much nutrients in the stream can be harmful as well. When there is an increase in nutrients it can cause green, cloudy, stinky water associated with *eutrophication*. Eutrophication is a process that occurs when an increase in nutrients (nitrogen and phosphorus) create rapid plant and algae growth, clogging waterways and creating blooms. The increase plant and algae life cause a depletion of oxygen by preventing sunlight from

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	<p>reaching other plants, decomposition of the plants by bacteria can cause further depletion of oxygen and the ecosystem can collapse.</p>
30	<p>Activity 4 –Protect Water Quality</p> <p>What can people do to protect and promote water quality in your watershed? This activity encourages students to develop an action plan in small groups to help water quality on the school grounds or community. After reviewing the PowerPoint of practices that can be put in place to reduce watershed pollution:</p> <ol style="list-style-type: none">1. Using the table created in the Discover Your Watershed worksheet, chart out the pollution threats that were identified on the school grounds or community. Be sure to include a column for possible solutions. Other columns consider <i>what type of pollutant category?</i> and <i>what are common solutions for preventing this pollution from getting into the waterways?</i>2. As a class or in small groups, review the possible pollutants types found in the watershed and the methods of preventing pollution from getting in the watershed.3. Summarize with students by asking them to reflect and share the main ideas of preventing runoff pollution. Students should address the following questions as they present<ul style="list-style-type: none">• What would be the impact of their action?• How would it benefit water quality?• How would it benefit their community?
15	<p>Discussion</p> <p>Follow each activity with a summary discussion, making sure to stress the key point students should have understood from each.</p>
	<p>Check for Understanding</p> <p>Use a process of continuous questioning during background and activities to monitor student level of understanding. Some good questions to ask include:</p> <p>How does water move through the environment?</p> <p>What threats do watersheds face?</p> <p>How does impervious surfaces and pervious surfaces affect runoff?</p>

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	<p>What can people do to protect and promote water quality in their community?</p> <p>Why are sediment and nutrients considered a pollutant?</p> <p>How do tree and grass buffers reduce pollutants?</p>
	<p>Close</p> <p>Introduce the poster contest to students.</p>
	<p>Modifications for emerging and advanced learners</p> <p>Emerging Learners: Activity Two: Use sponges to demonstrate the difference between pervious and impervious surfaces. Activity Four: Have the students create signs they could put up around the community to protect water quality in their watershed.</p> <p>Advanced Learners: Activity Four: students can draw or use a map of their school grounds or community to design where they would install best management practices e.g. (add fences or buffers; place garbage cans or pet waste signs) Have students create a plan that includes defining a goal, generating a list of actions, preparing a timeline, allocating resources, and identifying possible problems.</p>