

## Lesson 10

# WHAT IS A WATERSHED?

### Lesson Focus

Students will learn how rain and runoff water moves through a watershed, picking up natural and human-caused pollutants and carrying them to larger bodies of water. This lesson should be taught after the biosphere, geosphere, hydrosphere, and atmosphere have been introduced to students.

### Lesson Objective

- Students will be able to define the term watershed.
- Students will be able to explain how water moves through a watershed.
- Students will be able to explain how litter moves with rainwater and runoff water through a watershed.
- Students will be able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in their watershed model.

Grade Level	Duration	Subject Area	Vocabulary
3-5	1 Hour, plus independent practice for the next day	Science	watershed, ridgeline, tributary, runoff, basin, geosphere, biosphere, hydrosphere, atmosphere

### Louisiana Student Standards for Science

#### 3-LS4-4

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

#### 5-ESS2-1

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

#### 5-ESS3-1

Generate and compare multiple solutions about ways individual communities can use science to protect the Earth's resources and environment.

### Materials List

#### Per Pair of Students

- 2 pieces of copy paper (8.5" x 11")
- 1 copy of **Activity Sheet #1**
- 1 copy of **Activity Sheet #2**
- 1 blue washable marker
- 1 teaspoon of "litter glitter"

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### Per Class

- 2-3 staplers
- 1 bottle of glitter (preferably biodegradable, available at Amazon)
- 1 spray bottle filled with water

### Activity Sheets

- Watershed Base
- Creating a Watershed Model
- Parts of a Watershed
- The Mississippi Watershed

### Advance Preparation

1. Make copies of **Activity Sheet #1** (1 for every 2 students).
2. Make copies of **Activity Sheet #2** (1 for every 2 students).
3. Make copies of **Activity Sheet #3** (1 for every student for the following day or assessment).
4. Make copies of **Activity Sheet #4** (1 for every student for the following day or assessment).
5. Gather materials.

### Background Information

No matter where you live, your home is situated in a watershed. A **watershed** is an area of land that drains rainfall and snowmelt from tributaries to lakes, rivers, and eventually outflow points like reservoirs, lakes, and oceans. All watersheds have a large river or main stem with smaller rivers or streams branching off from it. These smaller rivers or streams are called **tributaries**. A watershed includes all the land, mountains, groundwater, plants and animals, cities, farms, and people in its boundaries. **Ridgelines** are high areas of land that form the boundaries of watersheds. When precipitation falls in a watershed, it flows down from the ridgelines to lower bodies of water such as bayous, streams, and rivers and eventually to a drainage **basin**. A drainage basin is an area of land where all flowing surface water converges to a single point, such as a river mouth, or flows into another body of water, such as a lake or ocean. A watershed is an excellent example of how the atmosphere and hydrosphere (precipitation) interacts with the geosphere (the land) and biosphere (living things such as plants and animals).

The **biosphere** includes all living things on Earth. The **atmosphere** is the mixtures of gases, including water vapor surrounding the Earth. **Hydrosphere** is the total amount of water on our Earth. It includes water that is on the surface, underground, and in the air. The **geosphere** includes the rocks and minerals on Earth - from the molten rocks and heavy metals in the deep interior of the planet to the sand on beaches and peaks of mountains (Center for Science Education, 2024).

The hydrosphere interacts with the atmosphere through processes like evaporation and precipitation. Water evaporates from bodies of water and enters the atmosphere as water vapor. This water vapor can then condense to form clouds and eventually fall back to the watershed as precipitation and flows down the slope of the ridgelines (geosphere) into bodies of water such as a lake. Water in the lake (hydrosphere) seeps into

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the ground, becoming groundwater (geosphere), or evaporates into the air (atmosphere). Animals, including humans (biosphere) live, play, drink, and sometimes contaminate the water (hydrosphere) in a watershed.

The fourth-largest watershed in the world, the Mississippi River watershed, reaches from the Allegheny Mountains in the eastern United States all the way to the Rocky Mountains in the West, encompassing regions from 31 states and two Canadian provinces in its drainage area. The Mississippi River Watershed has many tributaries, each of which has its own watershed. The Mississippi River Watershed empties into the Gulf of Mexico, which flows to the Atlantic Ocean.

Even the water that you see dripping down a car window shield, pooling in a street, or in a litter-filled ditch flows to a wetland, a river, or an ocean. When rainwater hits impervious surfaces (surfaces that do not allow water to go through them) such as pavement, roofs, or vehicles, it can't soak into the ground, and instead must flow across the hard surface. This water is known as **runoff**. In the process, this runoff water picks up litter, soil, debris, or chemical contaminants carrying them to storm drains. Heavy precipitation events can lead to a decrease in water quality by washing litter and other pollutants into local waterways. Because of the interconnectivity of watersheds, what may seem like a small action in one area of the watershed can have a big impact on natural systems further down in the watershed, including the plants, animals, and people (NOAA, 2019). This is why it is important that we dispose of household chemicals properly and that we clean up litter on our streets and highways. "As water runs over and through the watershed, it picks up and carries contaminants, litter, and soil. (NOAA, 2019)." Learning about watersheds can help students develop understanding and appreciation for the relationship that we have with our environment and a desire to take care of it.

### References

- Keep Louisiana Beautiful. (2019). Rocksey's Toolbox, Lesson 4.
- National Ocean and Atmospheric Administration (NOAA). (2019). Watersheds, flooding, and pollution. Accessed at <https://www.noaa.gov/education/resource-collections/freshwater/watersheds-flooding-and-pollution>
- National Environmental Education Foundation (NEEF). (2024). Lesson 1: Watershed Basics. Accessed at <https://www.neefusa.org/water/lesson-1-watershed-basics>
- The Center for Science Education. (2024). How Climate Works. <https://scied.ucar.edu/learning-zone/how-climate-works/biosphere>

### Procedure

#### Engage – 5 Minutes

1. Watch, **A Plastic Ocean** trailer (2:03), <https://www.aplasticocean.movie>
2. Ask students: **Where did all this litter come from?** Acknowledge all answers. This movie and question aim to start your students thinking about Louisiana's litter problem and help them realize that much of the marine debris comes from litter thrown on the streets. As students learn about watersheds, they will understand how litter can be carried to the oceans by rainwater and wind. This question also gives you an idea of their prior knowledge about the litter problem in waterways and the oceans.

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### Explore - 30 Minutes

1. Distribute materials and explain to your students how they will work with a partner to create a watershed model by completing the steps on **Activity Sheet #2**. To make the watershed model students should use both sheets of paper to make the model sturdy enough to hold up, especially once water is sprayed on it.
2. Once students have completed their watershed models and have labeled their basins, they should raise their hands.
3. Sprinkle a teaspoon of "litter glitter" on their models and explain that it represents all the litter in a watershed.
4. Ask students:
  - **What do you think will happen to the water when it rains on your model?** *The rainwater will travel from the high ridgelines to the low places like lakes and oceans through a river and its tributaries.*
  - Have your students trace the paths that they think the water will travel. Explain that there may be multiple paths and watersheds in their model. The paths they trace should begin at ridgelines and end at their basins. The basins should be labeled with X's.
  - **What do you think will happen to the litter glitter when it rains?** *The water will carry the litter glitter to the lowest point.*
5. Spray their model with the water bottle five times, stopping after each spray for students to observe. The water sprayed on the model represents rainfall. Students should observe the water traveling from high points to low points carrying the litter glitter with it. They should also notice that the water, along with the litter, accumulates in the lowest spots or basins such as lakes and oceans.
6. Ask students: **What happened to the litter glitter when it rained?** *It was carried by the water to the lowest point.*
7. Ask students: **Can you give me examples from your watershed model that demonstrated interactions between the geosphere, atmosphere, hydrosphere, and biosphere?** *The hydrosphere interacts with the atmosphere through processes like evaporation and precipitation. In our model the rainwater coming from the atmosphere rained down on our mountain and its ridgelines (geosphere) and formed rivers and streams that flowed to the ocean (hydrosphere). Living things (biosphere) live in the rivers, lakes, and oceans and drink the water. The litter glitter represented the litter that people (biosphere) dropped on the land (geosphere) in the watershed. The rainwater (hydrosphere) carried it through the watershed and deposited it in the ocean (hydrosphere) and on the land (geosphere). The litter in the water and on the land is a hazard for all wildlife (biosphere).*

### Explain - 25 Minutes

1. Place students' watershed models on desks or on a table. Have students stand around the table or desks and observe the models.
2. Review water flow in watersheds by pointing to the blue path created by the rainwater. Point to the ridgelines and explain that they are the boundaries of a watershed.
3. Ask students: **What do we call this area?** *It is a watershed.* **What is a watershed?** *It is the area where all water drains from the highest point to the lowest point, which eventually is a lake or ocean.*
4. Have students use the ridgelines to find the watersheds in their models.
5. Have students point out where the water has been contaminated with the litter glitter.

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6. Ask students: **Where do you see the litter glitter in the water's path or oceans?** *Students should point to the various places the litter glitter has settled.*
7. **Remember the video? Where did all the litter in that ocean come from?** *Students should explain that litter is carried to the oceans by rainwater traveling through a watershed. They should give examples from their models.*
8. **Independent Practice for the next day.** Students can practice labeling the parts of a watershed with **Activity Sheet #3**. They should have access to a computer to look up answers. This activity sheet could also be used as an assessment after they have learned the parts of a watershed.
9. **Independent Practice for the next day.** Students can learn about the Mississippi Watershed with **Activity Sheet #4**. This activity sheet could also be used as an assessment after they have learned the parts of a watershed. **The Rivers of the Mississippi Watershed** animation can be accessed at <https://svs.gsfc.nasa.gov/4493>. This animation starts with the points furthest from the Gulf and reveals the streams and rivers as a steady progression towards the mouth of the Mississippi until all the major rivers are revealed.

### Expand (*Independent Practice for the next day*) – 20 Minutes (*Optional*)

1. Have your students visit the **Central Sierra Environmental Resource Center** site at the link listed below. At this site students will learn ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact in a watershed. They can reinforce their knowledge of watersheds with the watershed diagram, learn the steps and sequence of the water cycle, and learn how to keep a watershed clean by playing the Watershed Game. In the Watershed Game, many different people and corporations are polluting a watershed. Their task is to complete each scenario to clean up and protect the watershed.  
**Central Sierra Environmental Resource Center.** Accessed at <https://www.cserc.org/sierra-fun/games/watershed-game>.
2. Project a picture from one of the **Watershed Game** scenarios on a wall or board. If you can't project a picture, you could print a picture for each pair of students.
3. Ask students to give you examples of the geosphere, hydrosphere, atmosphere, and biosphere interacting in the scenario.
4. Have students use the **USGS Streamer Tool** to trace the Mississippi River from the Gulf of Mexico (its basin to its source) and to explore where different rivers start and end. Accessed at <https://water.usgs.gov/streamer/web>
5. Directions:
  - Read the directions and click on **Go to Map**
  - **Map tools** are in the upper-right corner
  - Move the **Zoom Slider** below the second line
  - Click on **Trace Upstream or Trace Downstream**
  - Click on a **river on the map**
  - The tracer will start tracing the river downstream or upstream
  - **Hover your cursor over the red dot** and details about the river will pop up, including the river name and its outlet waterbody

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### Take Action

1. Host a screening of the movie, **A Plastic Ocean**, one evening at your school or during school to educate your school community about the litter problem in the ocean. This would be a good school activity to do during Earth Day week. Invite parents and neighborhood members. Ask your school or parent teacher organization to pay for the screening of the movie as there is a fee associated with the screening. The application can be found on this site: <https://www.aplasticocean.movie>.
2. Discuss ways that we can keep litter out of bodies of water, including the oceans. Contact a local organization or neighborhood and ask them if you could have a Saturday Litter Pick up Day in the park, walking path, or natural area away from traffic in their neighborhood. Plan a Saturday Litter Pick up Day with parents and students.

### Evaluate

1. Completed Watershed Model, **Activity Sheets #3** and **#4**.
2. **Go to Quizlet** <https://quizlet.com>. There are prepared watershed study sets that your students can study. You can create a quizlet test from the study sets.
3. **Activity Sheets #3** and **#4** could also be used as an assessment after students have learned the parts of a watershed.

### Online Resources

Jacobs, F. (February 3, 2019). **The World's Watersheds Mapped in Gorgeous Detail. Strange Maps.**

<https://bigthink.com/strange-maps/gorgeous-river-watershed-maps>

*This article features colorful watershed maps of all the world's watersheds. Each shows the flow of tributary streams into main rivers and water courses into the sea or final destinations inland. The streams are shown in the Strahler Stream Order Classification, which uses width to indicate the hierarchy of streams. Watersheds (a.k.a. drainage basins or catchment areas) are grouped by color. Ages 8 years to Adult.*

North Texas Municipal Water District. **What is a Watershed?**

<https://www.youtube.com/watch?v=QoqgzJAF6LQ>

*Do you know what a watershed is? By protecting your watershed and the environment around it, you can help improve the quality of the water you drink. (1:09)*

SCVWD Valley Water. (2020). **Watershed Maps: A Hands-On Map-making Activity.**

Accessed at Watershed Maps: A Hands-On Map-making Activity ([youtube.com](https://www.youtube.com)).

*This Watershed Maps activity is similar to the one in this lesson. This video also gives information on taking care of watersheds and has good pictures of litter in waterways and clogged storm drains. Participants will learn about watersheds and see how taking care of our environment has an impact on the quantity and quality of our local water supply! (12:59).*

One Cool Earth. (no date). **Marine Debris Prevention Best Practices Manual. NOAA.**

[https://marinedebris.noaa.gov/sites/default/files/publications-files/OCE\\_Marine\\_Debris\\_Prevention\\_Best\\_Practices\\_Manual\\_2022.pdf](https://marinedebris.noaa.gov/sites/default/files/publications-files/OCE_Marine_Debris_Prevention_Best_Practices_Manual_2022.pdf)

*This is an informational resource to assist schools in preventing marine debris. Includes lessons and resources. Ages 5 years to Adult.*

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Project WET Water Education Today. (no date). <https://www.projectwet.org/>

**Project WET: Water Education Today** is dedicated to solving critical environmental challenges by teaching the world about water. They do this by providing hands-on, science-based water education resources to formal and non-formal educators around the world. This link will take you to their publications page where you can purchase and download their educational resources and books.

Niagara Peninsula Conservation Authority. (2018). **What is a Watershed?**

Accessed at <https://www.youtube.com/watch?v=9isAx64liSc>

This video asks you to think of a watershed as a bathtub. The video explains the parts and function of a watershed. (2.08).

Geography Realm. (2018). **Geography Facts: Mississippi Watershed.**

Accessed at <https://www.youtube.com/watch?v=tuxQ7Ghdmgg>

This video shows all the tributaries of the Mississippi River Watershed (MRW) and gives facts about the MRW. (2.80).

### Children's Books

Beck, G. (2022). **Watersheds: A Practical Handbook for Healthy Water.**

Firefly Books. ISBN 0228103231.

*The book explains ecological principles and environmental challenges, introduces North America's major biological regions, outlines the complexities of water and nutrient cycles, and explains the ecology of wetlands and waterways. This book also explains some of the major environmental issues facing North America, including air pollution, water pollution, invasive exotic species, and habitat loss and destruction. Ages 8 years to Adult*

Crowley, J. (2019). **Song of the River.**

Gecko Press. ISBN 177657253X

*Cam, a mountain boy, follows the river from its trickling source in the mountain snow all the way to the coast. The river leads him through forests, farms, and towns to the salty wind of the sea. Dramatic landscape illustrations evoke a North American landscape and are packed with details to explore the world of the river. Ages 5 - 8 years.*

Project WET Foundation. (1999). **Big Rivers.**

Project WET Foundation. ISBN 1-8886314-44-9

Available at <https://store.projectwet.org/products/big-rivers-download>

*Readers explore big rivers and watersheds in North America. They will meet famous river explorers, calculate a river's rate of flow, discover how unique the river environment is, and recognize the role of water managers. Ages 8 - 14 years.*

Project WET Foundation. (2008). **Watershed Protection.**

Project WET Foundation. ISBN 978-1-888631-29-6.

Available at <https://store.projectwet.org/products/watershed-protection-kids-activity-booklet>

*Through this colorful activity booklet, watersheds not only come to life, but kids will discover how to help protect the many types of life that live in each unique habitat. Filled with engaging activities, students will soak in every drop of information. Ages 8 - 14 years.*