

WHAT IS A WATERSHED?

LESSON3

GRADE LEVEL(s):

2nd, 3rd, and 4th grade

MAIN CONTENT AREA FOCUS:

Science, Social Studies

SKILLS:

Discussion, Critical Thinking

LESSON DURATION:

50 minutes

GROUP SIZE:

Small groups of three to four students

PROGRAM DEVELOPED BY

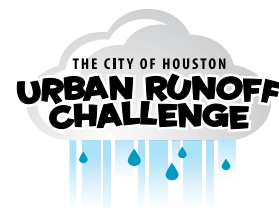
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LEARNING OBJECTIVES

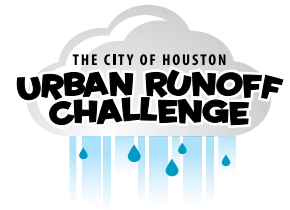
- THE STUDENTS WILL...**
- 1 Write a preliminary definition based on the word “Watershed.”
 - 2 Discuss the term “watershed” by establishing commonalities of their peers’ definition.
 - 3 Understand the term “watershed” by recreating the environment and redefining the term.
 - 4 Observe what happens when water and pollutants are introduced to the watershed by simulating a rain storm.

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TEKS OBJECTIVES

2ND, 3RD, 4TH GRADE:

§112.13. Science, Grade 2, (b) Knowledge and skills.

- (2) **Scientific investigation and reasoning.** The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations. The student is expected to: (A) ask questions about organisms, objects, and events during observations and investigations; (B) plan and conduct descriptive investigations such as how organisms grow; (D) record and organize data using pictures, numbers, and words; (E) communicate observations and justify explanations using student-generated data from simple descriptive investigations; and (F) compare results of investigations with what students and scientists know about the world.
- (3) **Scientific investigation and reasoning.** The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to: (A) identify and explain a problem in his/her own words and propose a task and solution for the problem such as lack of water in a habitat; (B) make predictions based on observable patterns
- (9) **Organisms and environments.** The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to: (A) identify the basic needs of plants and animals; (C) compare and give examples of the ways living organisms depend on each other and on their environments such as food chains within a garden, park, beach, lake, and wooded area.

§112.14. Science, Grade 3, (b) Knowledge and skills.

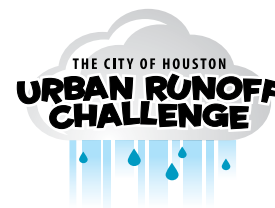
- (9) **Organisms and environments.** The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to: (A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem; (C) describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.
- (10) **Organisms and environments.** The student knows that organisms undergo similar life processes and have structures that help them survive within their environments. The student is expected to: (A) explore how structures and functions of plants and animals allow them to survive in a particular environment.

§112.15. Science, Grade 4, (b) Knowledge and skills.

- (1) **Scientific investigation and reasoning.** The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to: (B) make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic.
- (2) **Scientific investigation and reasoning.** The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to: (A) plan and implement descriptive investigations, including asking well-defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions. (F) communicate valid, oral, and written results supported by data.
- (3) **Scientific investigation and reasoning.** The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student.

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TEKS OBJECTIVES

2ND, 3RD, 4TH GRADE:

§113.6. Social Studies, Grade 4, (b) Knowledge and skills.

- (9) Geography. The student understands how people adapt to and modify their environment. The student is expected to: (A) describe ways people have adapted to and modified their environment in Texas, past and present, such as timber clearing, agricultural production, wetlands drainage, energy production, and construction of dams; (B) identify reasons why people have adapted to and modified their environment in Texas, past and present, such as the use of natural resources to meet basic needs, facilitate transportation, and enhance recreational activities; and (C) compare the positive and negative consequences of human modification of the environment in Texas, past and present, both governmental and private, such as economic development and the impact on habitats and wildlife as well as air and water quality.

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KEY VOCABULARY

IMPERVIOUS SURFACES Artificial structures such as pavements (roads, sidewalks, driveways and parking lots) that are covered by impervious materials such as asphalt, concrete, brick, and stone--and rooftops. Soils compacted by urban development are also highly impervious.

[HTTP://EN.WIKIPEDIA.ORG/WIKI/IMPERVIOUS_SURFACE](http://en.wikipedia.org/wiki/Impervious_Surface)

SURFACE RUNOFF Water flow that occurs when the soil is infiltrated to full capacity and excess water from rain, meltwater, or other sources flows over the land.

[HTTP://EN.WIKIPEDIA.ORG/WIKI/SURFACE_RUNOFF](http://en.wikipedia.org/wiki/Surface_Runoff)

STORM DRAIN (or storm sewer) Designed to drain excess rain and ground water from paved streets, parking lots, sidewalks, and roofs. Many storm drainage systems are designed to drain the storm water, untreated, into rivers or streams.

[HTTP://EN.WIKIPEDIA.ORG/WIKI/STORM_DRAIN](http://en.wikipedia.org/wiki/Storm_Drain)

STORM WATER Water that originates during precipitation events. Stormwater that does not soak into the ground becomes surface runoff, which either flows directly into surface waterways or is channeled into storm sewers, which eventually discharge to surface waters.

[HTTP://EN.WIKIPEDIA.ORG/WIKI/STORM_WATER](http://en.wikipedia.org/wiki/Storm_Water)

WATERSHED (Drainage Basin) An extent or an area of land where surface water from rain and melting snow or ice converges to a single point, usually the exit of the basin, where the waters join another waterbody, such as a river, lake, reservoir, estuary, wetland, sea, or ocean. Drainage basins drain into other drainage basins in a hierarchical pattern, with smaller sub-drainage basins combining into larger drainage basins.

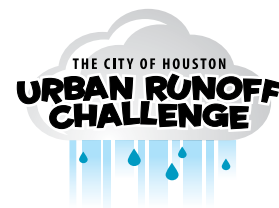
[HTTP://EN.WIKIPEDIA.ORG/WIKI/DRAINAGE_BASIN](http://en.wikipedia.org/wiki/Drainage_Basin)

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MATERIALS

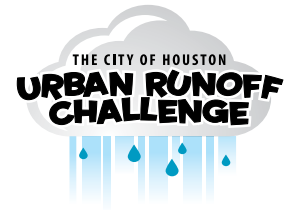
- Different colored index cards
- Pencils
- White printer paper (8.5" x 11")
- Large sheet of blue construction paper (at least 11" x 17")
or two sheets of blue construction paper taped together.
- Water-based markers (brown, orange, gray, red, green)
- Permanent markers (green and black)
- Clear tape
- Spray bottle filled with water (set to mist)
- Paper towels or dry cloth
- Index Card Observation Sheet. [\(PDF\)](#)
- Watershed Observation Sheet. [\(PDF\)](#)
- Watersheds Channels Reference Guide [\(PDF\)](#)

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LESSON PLAN

INQUIRY-BASED 5E INSTRUCTIONAL MODEL

ENGAGE

Initiates the learning task. The activity should make connections between past and present learning experiences, and anticipate activities and organize students' thinking toward the learning outcomes of current activities.

OBJECTIVE

Students will write a preliminary definition based on the word "Watershed."

MATERIALS:

- Colored index cards Pencils

Teaching Strategies: Create interest; Raise questions and problems; Elicits responses that uncover students' current knowledge about the concept/topic.

1. Pass out one colored index card to each student. Try to not give a neighboring student the same color index card.
2. Ask students to write the word "Watershed" at the first line of the index card. **TIP:** *Feel free to write the word on the board for students to copy.*
3. Ask students to write a definition for the word "Watershed" on the next few lines of the index card (without any instructor guidance or hints). Students will guess what the word means and write the definition on the index card.
TIP: *The definition should be anonymous. There is no need for students to write their own name on the card.*
4. Collect the completed colored index cards and place in a container.
5. Instruct students that you will randomly pick a few cards to read out loud. Remind students that the cards are anonymous and they should not identify themselves as the author of the card.
6. Proceed to mix up the cards. Randomly pick a few cards and read the definitions out loud to the class.
7. Facilitate class discussion on the definitions of the cards. Are there similarities between the definitions? What is different with each definition? Write observations on the board.



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LESSON PLAN

INQUIRY-BASED 5E INSTRUCTIONAL MODEL

EXPLORE

Provide students with a common base of experiences within which current concepts, processes, and skills are identified and developed.

OBJECTIVE

Objective: Students will discuss the term “watershed” by establishing commonalities of their peers’ definition.

Teaching Strategies: Encourages students to work together without direct instruction from the teacher; Observes and listens to students as they interact; Asks probing questions to redirect students’ investigations when necessary; Provides time for students to puzzle through problems.

MATERIALS:

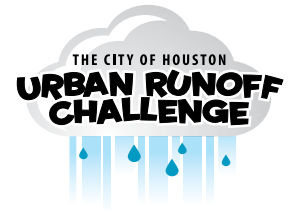
- Completed index card definition of “Watershed”
- Pencils
- Index Card Observation Sheet (PDF)

1. Place students into groups of three to four. Provide each group three to four completed “Watershed” definition index cards.
2. Ask groups to evaluate each definition and to record their notes on the Index Card Observation Sheet (.pdf) **TIP:** Instruct groups to write their definition in pencil. As the lesson proceeds, groups will work to revise the definition of “Watershed.”
3. Ask each group to read their new definition out loud to the class.
4. Facilitate class discussion on the group definitions of the cards. Are there similarities between the definitions? What is different with each definition? Write observations on the board and develop a draft of the definition.

Lesson: What is a Watershed?	
Student Names:	Date:
Index Card Observation Sheet	
Objective: Groups will collaborative redefine the word “Watershed.” Materials: Completed “Watershed” definitions that were written by their classmates and pencils. Directions: Groups will read the “Watershed” definitions, identify similarities and differences between each definition, and as a group redefine the word “Watershed.”	
Similarities	Differences
New Group Definition	

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LESSON PLAN

INQUIRY-BASED 5E INSTRUCTIONAL MODEL

EXPLAIN

Focus students' attention on a particular aspect of their engagement and exploration experiences, and provide opportunities to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to introduce a concept, process, or skill.

OBJECTIVE

Students will understand the term "watershed" by recreating the environment and redefining the term.

Teaching Strategies: Encourage students to explain concepts and definitions in their own words; Asks for justification (evidence) and clarification from students; Formally provides definitions, explanations, and new vocabulary; Uses student' previous experiences as the basis for explaining concepts.

MATERIALS

- Blue construction paper or two sheets of blue construction paper taped together;
- White sheet of printer paper; Permanent markers; Water-based markers;
- Clear tape
- Watershed Observation Sheet (PDF)

1. Pass out materials to each student.

2. Ask each student to crumple up their white sheet of paper and then open it up (do not flatten entirely). **TIP:** Notify students that they are about to create a watershed environment. Do not define the term at this time.



3. Instruct students to use a blue water-based marker and trace all the ridges of the paper. The ridges will represent streams, rivers, and lakes. Students should create a lake anywhere a flat surface appears.



4. Instruct students to use a black permanent marker to draw houses, cars, buildings, and roads. Using a green permanent marker, students should draw grass and trees. Put away all permanent markers upon completion. **TIP:** Ask students to draw civilization items on one side of the sheet. The other side should be mainly river and forests. Ask the class if they would like to redefine the term "watershed" at this moment. If so, edit the class definition based on student responses.



5. Instruct students to tape the four corners of the watershed to the blue construction paper. The blue construction paper represents a large body of water.

6. Ask students to use their prior knowledge and recall all the different types of pollution that can occur in a neighborhood or city. Write the list on the board.

7. Using water-based markers students should color in all the possible types of pollution that can occur on their watershed. Brown = pet waste; Orange = gas, grease, or oil waste; Gray or Red = trash; Green = fertilizer

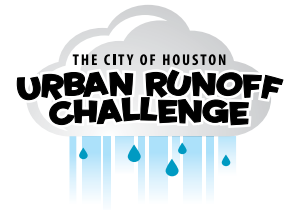
8. Pass out the "Watershed Observation Sheet" to each student. Read all three questions to the class. Ask students to keep in mind all three questions. **TIP:** Consider writing down their hypothesis on the board.

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LESSON PLAN

INQUIRY-BASED 5E INSTRUCTIONAL MODEL

ELABORATE

Challenge and extend students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills.

OBJECTIVE

Students will observe what happens when water and pollutants are introduced to the watershed by simulating a rain storm.

MATERIALS

- Spray bottle
- Paper towels or dry cloth
- Watershed Observation Sheet (PDF)

Teaching Strategies: Expects students to use vocabulary, definitions, and explanations provided previously in new context; Encourages students to apply the concepts and skills in new situations; Reminds and refers students of alternative explanations

1. Ask all students to clear their desk of all materials. Their watershed should be the only thing left on the desk.
2. Using a spray bottled (set on mist), simulate a rain storm. Ask students to spray water on their watershed and to observe what happens. Ensure to use enough water to start the process of it running down the paper.
3. Walk around the class. Ask students questions to facilitate their observations (such as: What is happening on the watershed? Why is that happening? Does that mean you could be drinking dirty water? Why is the water cleaner on one side but not the other side of the watershed? What can be done to prevent the water from being polluted? Etc...
4. After the rain storm, ask student to dry their desk using paper towel or a dry cloth.
5. Ask students to complete the "Watershed Observation Sheet." Encourage students to use vocabulary learned from previous lessons (such as: impervious surfaces, runoff, etc...)

Lesson: What is a Watershed? Date: _____

Student Name: _____

Watershed Observation Sheet

Objective: Each student will recreate a watershed environment, make observations, and produce a final definition of "watershed."

Materials: Each student will obtain the following: Blue construction paper; White sheet of paper; Water-based markers; Permanent markers; and Spray bottle set to mist.

Directions: After recreating a watershed environment, each student will answer the following questions to observe the outcome after a stormy rain shower hits the watershed.

Questions

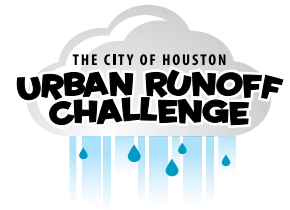
1. What will occur when rain falls on the watershed?

2. Why do you think the water flows in this way? What is a "Watershed"?

3. What can be done to keep pollutants from rivers, streams, and lakes?

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LESSON PLAN

INQUIRY-BASED 5E INSTRUCTIONAL MODEL

EVALUATE

Encourage students to assess their understanding and abilities and provide opportunities for teachers to evaluate student progress.

OBJECTIVE

Students will finalize the definition of “watershed.”

MATERIALS

- Pencils
- Tape
- Watersheds Channels Reference Guide(PDF)

VIDEO(S)

(YouTube)

Teaching Strategies: Observes students as they apply new concepts and skills; Assess student’s knowledge and/or skills; Allows students to assess their learning and groups process skills; Asks open-ended questions such as, What evidence do you have? What do you know about the problem? How would answer the question?

1. Ask the class how they have redefined the term “watershed.” Are there similarities between the definitions? With class involvement, develop a finalized definition of the term that is correct and write it on the board.



2. Using the index cards from earlier, ask students to write the final definition on the back of the index card. Students may notice how the original definition has changed over the course of the lesson. Ask students to tape the index card (with the new definition facing up) to their watershed.

3. Review the “Watersheds Channels Reference Guide.PDF” document with the class. Notify the class that we all live in a watershed. Illustrate to students how water from upstream watersheds affects downstream watersheds.

4. Ask the class: What can be done to keep pollutants flowing into other watersheds? What happens when trash is dumped in a watershed? Write answers on the board.

5. Play the following video: [USDA Watershed Learning Animation – For ASI Communications](#). Ask students to keep in mind today’s lesson and to see if their observations matches what the video demonstrates. Encourage student to correct their “Watershed Observation Sheet” as necessary.

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Many thanks to Kappa Delta Pi Zeta Omega Chapter, Keep Houston Beautiful, City of Houston Public Works, Populations Connection via Indiana University Purdue University Indianapolis, the Environmental Protection Agency, the U.S. Department of the Interior U.S. Geological Service, the Rain Garden Network, and <http://www.worldofrenewables.com/> for help with this lesson. 2012

