



POWER OF WATER

Teacher Author: Stef Paramoure, Oak Run Middle School

Grades: Intermediate (6-8)

Subject: Environmental science or geography

Duration: Four 50-minute class periods

Unit Purpose: The purpose of this unit is to connect topography and watersheds together through lab activities, journaling, and modeling in a way that students can better understand the boundaries and topography of watersheds, forces of change within watersheds, and human impact within the watershed.

Unit Description: In this unit, students will learn about watersheds, including what a watershed is, how topography affects watersheds, and identify local and national watersheds. On the first day of the unit, students begin their journals for watersheds, watch a podcast on weathering, and complete a demonstration showing how topography affects watersheds, highlighting erosion and deposition. On the second day, students learn about natural forces of changes within watersheds, such as erosion or glaciation. On day three, a guest speaker uses a model of a watershed to teach students about human impact on watersheds. On the final day of the lesson, students will use the Tapestry of Time and Terrain and lab activities to summarize their learning about topography and watersheds, erosion and deposition within watersheds, and human impact on watershed. By the end of the unit, students will have an understanding of watersheds and topography, and be able to identify the boundaries of watersheds, water flow within a watershed, and forces that shape the Earth, such as erosion and deposition.

Unit Vocabulary: Watersheds, Uplift, Erosion Deposition, Glaciation, Delta, Point Source Pollution, Non-Point Source Pollution,

LEARNING OBJECTIVES

The student will define watersheds.

The student will explain the affect of topography on watersheds and be able to map the boundaries and flow of water within a watershed.

The student will identify and evaluate the forces of change within a watershed, including weathering, erosion, and deposition.

The student will describe the impact of humans on watersheds and be able to identify consequences of pollution within a watershed.

Materials:

Tapestry of Time and Terrain

Butcher paper

Spray bottles

Powdered drink mix

Plastic cups

Glue

Mini-Stream Beds (LabAids)

Note cards

Tape

Blue Food Coloring

Pipettes

Crayons (dark colors and red)

Mini-Watershed Models (LabAids)

Optional: Mineral block with drip set-up

National Standards

National Science Standards:

Strand 4: Earth and Space Science

Strand 6: Science in Personal and Social Perspectives

National Environmental Education Standards:

Strand 1: Questioning, Analysis and Interpretation (A, E, F, G)

Strand 2.1: The Earth as a Physical System

Strand 2.4: Environment and Society

Strand 3.1: Analyzing and Investigating Environmental Issues

National Geography Standards:

Standard 1: How to Use Maps and Other Geographic Representations, Tools, and Technologies to Acquire, Process, and Report Information From a Spatial Perspective.

Standard 4: The Physical and Human Characteristics of Places.

Standard 7: The Physical Processes That Shape the Patterns of Earth's Surface.

Standard 14: How Human Actions Modify the Physical Environment.

Texas Essential Knowledge and Skills (TEKS):

Note: Current the standard is grade 6 (6.14.B) but changing to 8.9.C and 7.8.C with new TEKS.

6.6.C Science concepts. The student knows that there is a relationship between force and motion. The student is expected to: (C) identify forces that shape features of the Earth including uplifting, movement of water, and volcanic activity.

6.14.B Science concepts. The student knows the structures and functions of Earth systems. The student is expected to: (B) identify relationships between groundwater and surface water in a watershed.

8.14.C Science concepts. The student knows that natural events and human activities can alter Earth systems. The student is expected to: (C) describe how human activities have modified soil, water, and air quality.

Teacher Masters:

Watershed Challenge Questions

Science in the Real World Podcasts

("Weathering" and "Glaciation")

Student Masters:

Weathering and Watershed Foldable

Mini-stream Tables: Erosion and Deposition in Action

Post Lab Questions

Modeling and Investigating Watersheds

Wall Wisher Activity

Advanced Preparation:

1. Gather all materials for classroom demonstrations and student labs. If this is the first time to complete this lesson, practice the demonstrations and labs. While some of the labs can be modified using other materials, this lesson uses LabAids Mini-stream Beds and Watershed Models (Kits 442 and 437). These can be ordered at: www.lab-aids.com
2. Make copies of student handouts.
3. Download or order Tapestry of Time and Terrain at <http://tapestry.usgs.gov/>
4. Download "Weathering" podcast from Science in the Real World Series (on iTunes or at <http://thetrc.org/web/podcastindex.html>).

Assessment Instructions:

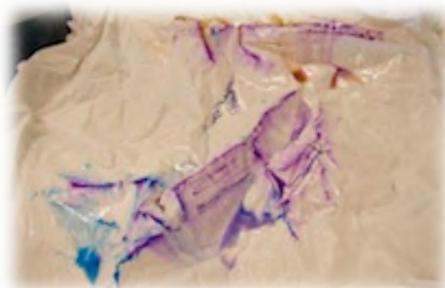
Formative Assessment: The teacher can assess student learning during class discussions, student labs, and journaling to understand student conceptions and misconceptions of watersheds.

Summative Assessment: The Modeling and Investigating Watershed lab and the Watershed Foldable can be used to determine what students learned about watersheds over the course of the lesson.

Lesson Procedure

Day One: Introducing Watersheds

1. **Watershed Focus Activity** (5 minutes). Students will glue the **Weathering and Watershed Foldable** into their journals and take time to complete the entry on watersheds:
 - **Watershed Journal Entry** (pre-activity): Students will write and answer the question: *I think a watershed is...* Reassure students that don't have to know the correct answer to this prompt because they are going to learn about watersheds over the next couple of days.
2. **View Tapestry of Time and Terrain Map** (5-10 minutes). Connect prior learning of the dynamic nature of planet Earth. Students should have basic understanding of Plate Tectonics and the Rock Cycle. Introduce the USGS map, Tapestry of Time and Terrain. Use either the website at <http://tapestry.usgs.gov/> or printed maps obtained from the Geological Society (see references for information). Using this map, point out local geologic features from the map that shows "new" and "old" geological formations and river basins (Possible questions: What patterns do you notice? What information do the different colors convey?). *Note: Ms. Paramoure invited a guest speaker, a geologist, to talk about the map to students. Teachers can do this too.*
3. **Journaling** (15 minutes). Review weathering vocabulary activity using foldable in Journals. The foldable will be created with the definition provided and students putting the definition in their own words and drawing a diagram (Review the following Weathering and Watershed foldable expectations with students: First, students will be expected to review the definition and put the definition in their own words and draw a picture that showcases their understanding of the word. Emphasize that each word will be explain in more detail or connected to a hands-on activity so that the foldable is expected to be completed by the end of the unit).
4. **Viewing** (5-10 minutes). Introduce the viewing of the podcast episode "Weathering" by having students think-pair-share what the term weathering means to them. Next ask students to focus on "Physical Weathering" and "Chemical Weathering" as they watch the podcast. View of podcast episode "Weathering" to provide real world examples of how the Earth has been shaped by weathering. After podcast, ask student to think-pair-share their new definitions for weathering to see how their definitions have changed. *Emphasize the concept that with chemical weathering, a new substance is formed. In physical weathering, the same substance remains, but the size will change.*
5. **Class demonstration: Watershed** (10 minutes). Return to Watershed Journal Entry and ask students to share their thoughts about watersheds. Hands-on experience to give students concrete exposure to weathering, erosion, and deposition, as well as a chance to view the basic mechanics of a watershed.
 - Students crumple Butcher paper into a ball and then create two uplifted areas in the paper. Use regular water-based markers to color the uplifted boundaries (peaks and ridges in the crumpled paper). Distribute sediments along the colored peaks and ridges



(jell-o), and then allow the rain (spray bottle) to “shape the Earth.” Students should notice the sediment (jell-o) run off the watershed (crumpled paper), and should point out different watersheds on their crumpled paper. As the teacher moves around the room “raining” on the different watersheds, elicit student observations about water flow, boundaries, movement of sediment (jell-o) in an effort to support student personal understanding of watersheds.

- Now have the students reflect on this demonstration using their journals. *Journal entry: I better understand what a watershed is now because:*
6. **Closing** (5 minutes): Ask students what do they expect to see on their “landscapes” (the crumpled paper) if we allowed all water to evaporate. Set-up one example in the back of the room using freezer paper to prevent the water from soaking through. Follow the same steps used in the crumpled paper watershed. Place this model under a heat lamp. Ask students to make a prediction about what they will see on the freezer paper watershed tomorrow.
 7. **Optional: Class demonstration: Mineral Block** (5 minutes). Mineral Block Journal Entry: Show students to brick size mineral blocks that have been prepared by teacher. Ask them to decide which block had rainwater (tap water) drip on the block and which block had acid rain (weak vinegar solution) drip on the block and record in their journals. Set up two new blocks in the back of the room and start the rain and acid rain drip. Student will make observations over the next few days and record in their journals.

Day Two: Connecting Watersheds and Forces of Change

1. **Watershed Journal Entry** (5-10 minutes). If possible, play a short video clip of the watershed activity from yesterday to point out specific features of the watershed. This allows students to “experience” the activity a second time with guided instruction to verify students notice how the topography (shape) of the land is what determines the path the water will take to the lowest point. Point out how the water-based markers slowly bleed into the lowest areas and micro-watersheds are parts of macro-watersheds.

Then, ask students make observations of the evaporated freezer paper watershed model from Day One. Discuss in table groups if their predictions were support or not supported. Also give students time to review their definition

Note from the Teacher

Students can misperceive the concept of “watershed” as being about water only. Be sure to catch this misperception and clearly tell students that watersheds are land areas that drain water, and the direction and flow of water is dependent upon the topography of the land.

Labs can be modified using other materials, like cardstock and colored water, but consider ordering lab kits that are designed to facilitate learning about watersheds to ensure a successful lab. These can be used year after year and come with all the materials that are needed to model watersheds, erosion, and deposition.



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- of watersheds in their journal and sketch a picture or visual representation of watersheds.
- Erosion and Deposition within Watersheds** (30 minutes).
 - Give students the **Mini-Stream Beds: Erosion and Deposition in Action** and the **Post Lab Questions** handouts.
 - First, review with students the vocabulary “weathering,” “erosion,” and “deposition.” Ask students: What is the difference between weathering, erosion, and deposition? *Weathering is the breaking down of rock and erosion is the transportation of the rock. Deposition is the depositing of the sediment.* Show podcast on glaciation.
 - Introduce expectations for the lab and connect the vocabulary to the Tapestry of Time and Terrain map (with an emphasis on “delta”). Point out the “Mississippi Baker” or “MIMAL”-nicknames for the Mississippi River path (which traverses Minnesota, Iowa, Missouri, Arkansas, and Louisiana on the western side of the river to the delta). Walk students through lab steps first so they are prepared for the lab activity.
 - In groups, students get hands-on experience using the mini-stream beds lab activity from LabAids. Students will witness how water can weather, erode, and deposit sediments. This lab reinforces the real world creation of deltas. Students will sketch erosion and deposition from the mini-stream bed during the lab. Connect this learning to the Bird’s Foot Delta (Mississippi Delta) clearly indicated on the Tapestry of Time and Terrain.
 - Human Impact** (5 minutes): Introduce the topic of human impact to get students thinking about tomorrow’s focus activity. Why is one of the Bird’s foot “toes” longer than the other? How can people damage watersheds? Is watershed protection an important issue?

Day Three: Guest speaker on Watershed and Water Quality

- Journaling Activity** (10 minutes).
 - Ask students to write a short note to their principal that explains what they are learning in their classroom. Encourage them to use their vocabulary words from the last couple of days.
 - Once their letters are complete, ask them to write down how humans impact their local watersheds. Give them time to write down several ideas.
- Guest Speaker** (30 minutes). The guest speaker for this lesson is from a local river authority.
 - Explain expectations to students for the game and for the guest speaker’s activities.
 - Introduce the guest speaker. Introduce the local water sources for the town (includes rivers, aquifers, springs, lakes, and other sources of water). This talk can be highlight by using a watershed map from the river authority. The guest speaker should explain how water flows through a watershed, where local drinking water comes from, and point-source and non-point source pollution (*point source pollution comes from a known source while non-point source pollution*). Briefly mention to students the environmental laws that protect water sources.
 - Using a **Watershed Model**. A small watershed model can demonstrate to students ways in which different land use and human activities affect the local watershed. The model can demonstrate agricultural run-off, run-off from residential areas, roads, and hillsides, and pollution from human development and industries.
 - Watershed Challenge Game**. During the watershed model demonstration, students work in teams to answer questions about the local watershed, based upon what they have learned over the last few days. To do this, assign students to six teams. One team

member sits in the “hot seat” around the demonstration table while supporting team members stand behind the “hot seat” to listen. Periodically throughout the demonstration, break students into teams, give the teams a **Watershed Challenge Question**, and have them write their answers on a small white board. Teams earn points for correct answers throughout the demonstration. This keeps students actively listening and participating during the guest speaker’s demonstration.

- **Closing** (5 minutes). Now that students have learned about point source and non-point source pollution, ask students to predict what activities affect water quality in their local area. They can either write these into their journal or talk about them in a class discussion.

Day Four: Topography and Watersheds

1. **Journal Activity** (5-10 minutes). Ask students to return the Weathering and Watersheds Foldable and give the terms definitions “in their own words” and sketches of the terms (based on what they have learned through the week. While students are working on their journal entries, ask questions like “What have you learned about watersheds?” and “What have you learned about the movement of water and weathering this week?” “What is glaciation?” Give time for students to reflect on the vocabulary. *Be sure to address this common misconception: Many students will think the watershed is just water, but watersheds are actually land areas in which water drains to larger bodies of water. Emphasize the land area.*
2. **Locations in the Watershed** (5 minutes). If possible, project local maps (either from online mapping software or downloaded maps) or aerial images of key features along the local watershed. Ask students to identify local businesses, development, parks, and water bodies. Ask: “What is the affect of _____ (i.e. development) on the local watershed?” *Answers will vary, but encourage students to use the vocabulary they have learned over the last couple of days (weathering, erosion, deposition).*
3. **Watersheds and Topography Lab** (30 minutes). Using the LabAids Watershed Models, students will connect what they have learned about topography and watersheds by drawing watershed boundaries and flow of water from high elevations to lower elevations. Students need to connect the land features to water sources.
 - Give students **Modeling and Investigating Watersheds**. This handout walks students through their local watershed so labels on the handout represent local features. Modify this as necessary for your local watershed.
 - Clearly explain lab expectations to students and model using a pipette releasing “water” into the watershed. Model making predictions about water flow and determining watershed boundaries.
 - Give students time to follow lab instructions and make predictions about water flow based on elevation and topography. Students will make predictions, test predictions, and then correct their drawings on the lab handout. The teacher should circulate among the lab tables to support student learning. Ask questions like “What land features influence where the water flows?” (*Answer: areas of higher elevations such as uplifts and ridges; these determine watershed boundaries*) or “What land features divide watersheds?” and “Why?” (*Answer: Ridges or uplifts divide watersheds and influence the direction water flows because water flows from higher elevation to lower elevation*) or “What force is causing water to flow?” (*Answer: Gravity*).
- **Closing** (5 minutes). On the Modeling and Investigating Watersheds lab, ask students to share their answers to Questions 11 and 12 (about human impact on watersheds).

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- Question 11: A gasoline tanker truck reeked on Deer Ridge during a heavy rain storm. Make a dot with the water-based marker to represent the gasoline. Gently release 2 pipettes of water over the gas spill and observe the water flow path. What part of the watershed was impacted the most from the gasoline spill? Support your answer!
 - Question 12: A mining company has discovered a coal bed (a large layer of coal) at the top of Lake Hill. Your town wants to determine the impact of a mining operation on the water quality of Oak Run River and Canyon Lake. Use your water-based marker to represent the sediment that would be created and the coal that would be exposed during the mining operation to determine the impact on both Oak Run River and Canyon Lake.

Extension Activity:

Using the website www.wallwisher.com, ask students to create a word wall about watersheds as a class. See the **Wall Wisher Activity** handout for instructions. Note: The teacher should create a specific URL for each class period, such as [teachernamewatershedperiod1](http://www.wallwisher.com/wall/paramourewatershed), [teachernamewatershedperiod2](http://www.wallwisher.com/wall/paramourewatershed), etc. See <http://www.wallwisher.com/wall/paramourewatershed>

References and Resources:

LabAids: www.lab-aids.com (watershed lab kits)

Science in the Real World: <http://thetrc.org/web/podcastindex.html> (video podcasts)

Enviroscapes: www.enviroscapes.com (for watershed models)

Tapestry of Time and Terrain: <http://tapestry.usgs.gov/> (geology map)

Surf Your Watershed: <http://cfpub.epa.gov/surf/locate/index.cfm>

National Conservation Resource Service; Education: <http://www.nrcs.usda.gov/feature/education/>

Environmental Protection Agency; Water: <http://www.epa.gov/water/education.html>

Texas Water Development Board; Education: <http://www.twdb.state.tx.us/kids/index.htm>

National Water Program: <http://www.usawaterquality.org/>

U.S. Geological Survey; Water Education: <http://water.usgs.gov/education.html>

Project WET: <http://www.projectwet.org/> and www.watereducation.org

Water Science for Schools: <http://ga.water.usgs.gov/edu/>

Weathering and Watersheds Foldable
(Side One)

In my own words:		Weathering
In my own words:		Watershed
In my own words:		Erosion
In my own words:		Deposition
In my own words:		Uplift
In my own words:		Glaciation

Weathering and Watersheds Foldable

(Side Two)

Weathering: The chemical and physical processes that break down rock and other substances at the Earth's surface.	What it can look like:	
Watershed is the area of land where all of the water, when it rains, drains off to a low point, such as a creek, river, or lake.	What it can look like:	
Erosion: The movement of rock particles and sediments, by wind, water, ice, or gravity.	What it can look like:	
Deposition: The process by which sediment settles out of the water or wind that is carrying it and is deposited in a new area.	What it can look like:	
Uplift: Vertical or upwards movement of the Earth's surface.	What it can look like:	
Glaciation: The build up and movement of a glacier that shapes the land.	What it can look like:	

Mini-Streams Tables: Erosion and Deposition in Action

Background: Weathering is the process that breaks down rock as the surface of the Earth. Agents of weathering include: _____, _____, _____, _____, _____. Water plays a major role in creating the landforms found on Earth's surface. Moving water can remove and transport (also known as _____) pieces of rock, or _____ from their original location. These eroded sediments are pushed by the force of moving water, sometimes for many miles and sometimes only a few millimeters. The force of _____ is what moves sediments from areas of high elevation to areas of lower elevation. Where the sediments end up coming to a rest (also known as _____) depends on the size of the sediments and the force of the flowing water. Sediments are deposited in those locations where the force of the flow of water becomes too low to _____ the sediments any further. A landform that is produced by the deposition of sediments where a stream enters a lake, reservoir, or sea is called a _____.

Word Bank: delta, ice, **gravity** (used twice ☺), deposition, move, wind, water, plants, animals, erosion, sediments.

Real World Connections:



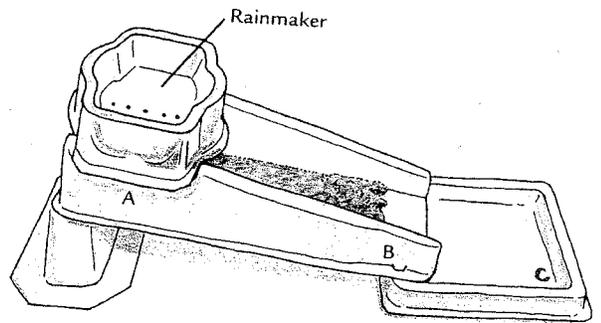
The USGS map called, Tapestry of Time and Terrain, clearly shows the area of deposition known as the giant bird's foot delta. "The giant bird's foot delta, featuring a large middle toe, that shows the end point of the lower Mississippi River in southern Louisiana marks the seaward growth of land into the Gulf of Mexico. The Mississippi-Missouri River system collects eroded debris from the entire central half of the United States." (The Continental Divide is the point in the United States in which water flowing on the west side of the boundary drains to the west and water flowing on the east side of the boundary drains to the east.) Upon reaching the Gulf the river's velocity slows, abruptly reducing its capacity to carry suspended mud and sand, and the sediment is deposited in vast alluvial fans not visible on the map. These submarine fans are major sources of petroleum, natural gas, and sulfur."

Label the features as directed in Figure 1: Circle the Giant bird's foot, draw an arrow to the Llano Uplift, label the Gulf of Mexico, and color in one possible path of sediment flow.

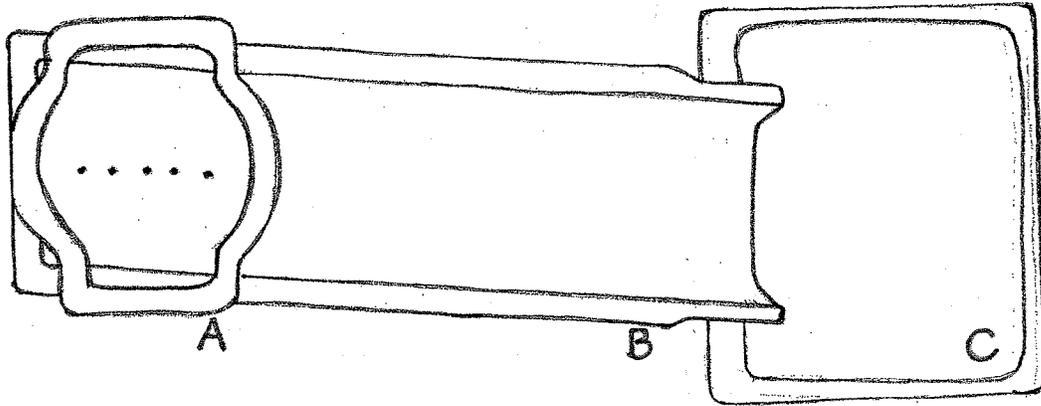
Procedure: You will work in your lab groups to complete the lab. You will be asked to make a quick "sketch" of the mini-stream tables. This activity is to model how sediment flows down the Mississippi River and creates the giant bird's foot delta. You will be asked to explain how the lab activities represent this "real world" process. Think about this as you and your lab partners follow the directions below.

1. Set up your Mini – Stream Table as shown in the diagram.
2. Add three 30-mL cupfuls of dampened Stream Sand to the middle of the stream bed. Use the spoon to pack the sand into an even layer that covers the stream bed from point A to point B.

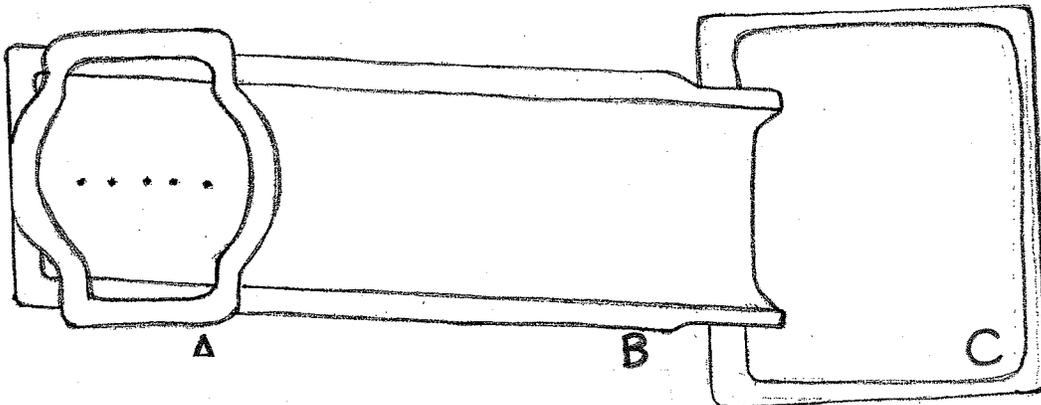
3. Place the Rainmaker over Point A of the Mini Stream Table as shown.



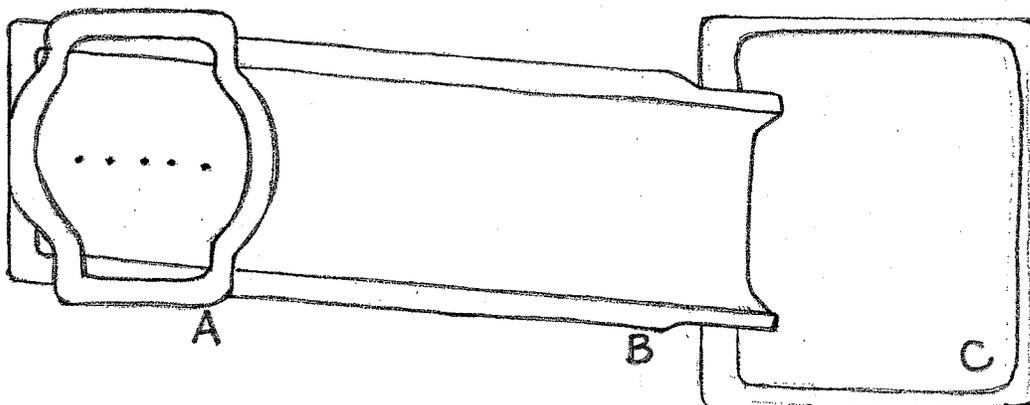
4. Add one 30-mL cup of water to the Rainmaker and observe. Sketch the patterns produced by the flowing water in the diagram below.



5. Add another 30-mL cup of water to the Rainmaker and observe. Sketch the patterns produced by the flowing water in the diagram below.



6. Add a third 30-mL cup of water to the Rainmaker and observe. Make your final sketch of the patterns produced by the flowing water in the diagram below.



Post Lab Questions:

- A. Use your words to describe the major changes that occurred each time 30-mL of rain fell on the stream bed. List at least three specific changes.
- B. At which point, A, B or C, did the greatest amount of erosion occur? Explain why.
- C. Review your sketches and determine where the greatest amount of deposition occurred and explain why.
- D. Compare your final sketch to the Tapestry of Time and Terrain. How did the Mini Stream Table demonstrate the formation of the giant bird's foot delta? Be specific and use your knowledge of watersheds in your explanation. (You may include a sketch to help support your answer.)

Bonus: Look at the Sediment Samples. On your final sketch, label where the smallest and largest sediment pieces would be found. In the space below, explain how you determined your answer.

<p>Describe 2 sources of sediment in the town model.</p> <p>List 2 sources of sediment in the area (20 mile radius) surrounding Oak Run Middle</p>	<p>Describe 2 sources of sediment in the town model.</p> <p>List 2 sources of sediment in the area (20 mile radius) surrounding Oak Run Middle</p>
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<p>What is the purpose of fertilizer?</p>	<p>What is the purpose of fertilizer?</p>
<p>What is the purpose of fertilizer?</p>	<p>What is the purpose of fertilizer?</p>
<p>What is the purpose of fertilizer?</p>	<p>What is the purpose of fertilizer?</p>
<p>Which area in our town model uses the most fertilizer? Which are in our town model uses excessive amounts of fertilizer?</p>	<p>Which area in our town model uses the most fertilizer? Which are in our town model uses excessive amounts of fertilizer?</p>
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<p>Which area in our town model uses the most fertilizer? Which are in our town model uses excessive amounts of fertilizer?</p>	<p>Which area in our town model uses the most fertilizer? Which are in our town model uses excessive amounts of fertilizer?</p>

List 3 specific pollution sources shown in our town model.	List 3 specific pollution sources shown in our town model.
List 3 specific pollution sources shown in our town model.	List 3 specific pollution sources shown in our town model.
List 3 specific pollution sources shown in our town model.	List 3 specific pollution sources shown in our town model.
What relationship exists between storm drains and your watershed?	What relationship exists between storm drains and your watershed?
What relationship exists between storm drains and your watershed?	What relationship exists between storm drains and your watershed?
What relationship exists between storm drains and your watershed?	What relationship exists between storm drains and your watershed?
Recommend 3 ways to improve or protect watershed quality in your area.	Recommend 3 ways to improve or protect watershed quality in your area.
Recommend 3 ways to improve or protect watershed quality in your area.	Recommend 3 ways to improve or protect watershed quality in your area.
Recommend 3 ways to improve or protect watershed quality in your area.	Recommend 3 ways to improve or protect watershed quality in your area.
How could the factory in our town model be tested for “point” source pollution?	How could the factory in our town model be tested for “point” source pollution?
How could the factory in our town model be tested for “point” source pollution?	How could the factory in our town model be tested for “point” source pollution?
How could the factory in our town model be tested for “point” source pollution?	How could the factory in our town model be tested for “point” source pollution?

Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.	Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.
Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.	Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.
Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.	Use a diagram to help you describe the difference between “point source” and “non-point source” pollution.
What is the affect of too much fertilizer in our waterways?	What is the affect of too much fertilizer in our waterways?
What is the affect of too much fertilizer in our waterways?	What is the affect of too much fertilizer in our waterways?
What is the affect of too much fertilizer in our waterways?	What is the affect of too much fertilizer in our waterways?
Give 2 reasons pet owners should “pick up” after their pets.	Give 2 reasons pet owners should “pick up” after their pets.
Give 2 reasons pet owners should “pick up” after their pets.	Give 2 reasons pet owners should “pick up” after their pets.
Give 2 reasons pet owners should “pick up” after their pets.	Give 2 reasons pet owners should “pick up” after their pets.
Where does New Braunfels get their drinking water?	Where does New Braunfels get their drinking water?
Where does New Braunfels get their drinking water?	Where does New Braunfels get their drinking water?

Where does New Braunfels get their drinking water?	Where does New Braunfels get their drinking water?
Due to an increase in sediment in the local river all new construction within 50 miles of the river have been banned. Discuss the PROS and CONS of this decision.	Due to an increase in sediment in the local river all new construction within 50 miles of the river have been banned. Discuss the PROS and CONS of this decision.
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How did the town model represent the limestone of the Edward's Aquifer?	How did the town model represent the limestone of the Edward's Aquifer?
How did the town model represent the limestone of the Edward's Aquifer?	How did the town model represent the limestone of the Edward's Aquifer?
How did the town model represent the limestone of the Edward's Aquifer?	How did the town model represent the limestone of the Edward's Aquifer?
Explain how a large rain event impacts watershed health.	Explain how a large rain event impacts watershed health.
Explain how a large rain event impacts watershed health.	Explain how a large rain event impacts watershed health.
Explain how a large rain event impacts watershed health.	Explain how a large rain event impacts watershed health.

Name 1 thing you can do to protect or improve the quality of your watershed.	Name 1 thing you can do to protect or improve the quality of your watershed.
Name 1 thing you can do to protect or improve the quality of your watershed.	Name 1 thing you can do to protect or improve the quality of your watershed.
Name 1 thing you can do to protect or improve the quality of your watershed.	Name 1 thing you can do to protect or improve the quality of your watershed.
How can a boat or a jet ski impact water quality?	How can a boat or a jet ski impact water quality?
How can a boat or a jet ski impact water quality?	How can a boat or a jet ski impact water quality?
How can a boat or a jet ski impact water quality?	How can a boat or a jet ski impact water quality?
Each person in your group needs to list one piece of “new information” learned during this activity. <i><u>You may not repeat answers.</u></i>	Each person in your group needs to list one piece of “new information” learned during this activity. <i><u>You may not repeat answers.</u></i>
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Name:

Modeling and Investigating Watersheds

A watershed is the basin of land that water drains into. The surface features of the land or the topography of the land defines a watershed. A ridgeline or other regions of higher elevation called a divide often define watershed boundaries. Watersheds can cover large areas that can be sub-divided into smaller watersheds. In this activity you will examine the factors that determine where water bodies form, observe how topography determines the boundaries of a watershed, and how humans can impact watershed quality.

Procedure:

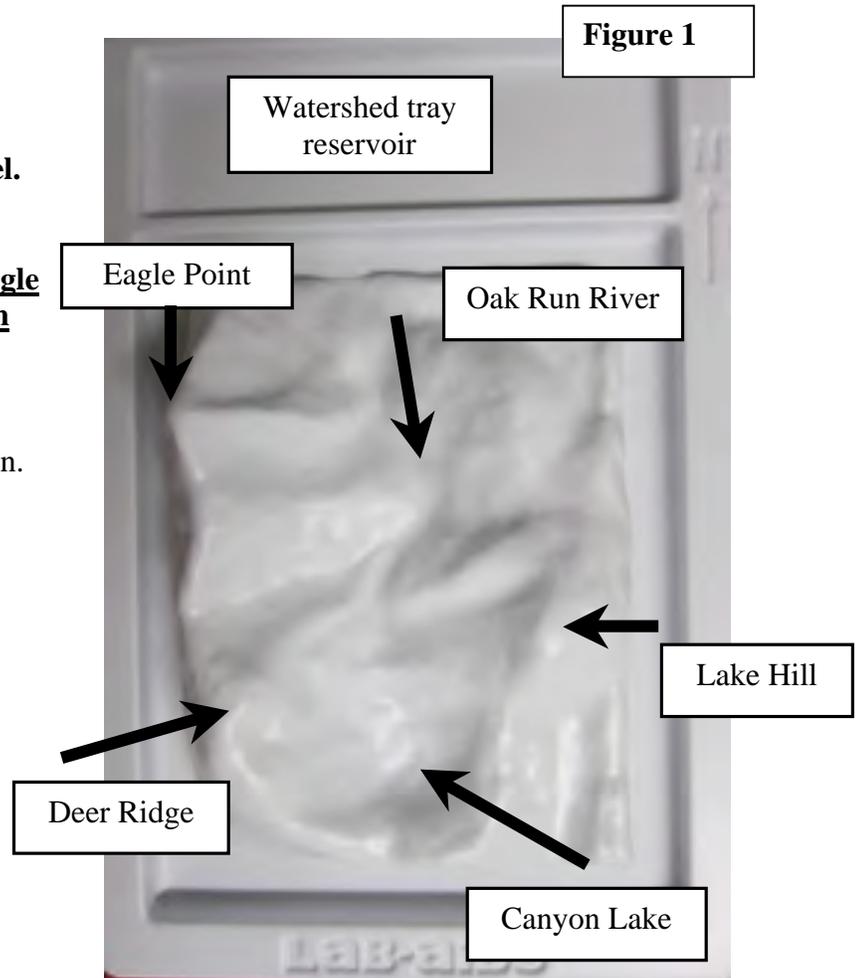
Getting to know your watershed model.

1. Look at Figure 1. Find each of these features on your watershed model: watershed tray reservoir, north mark, Eagle Point, Lake Hill, Deer Ridge, Oak Run River, and Canyon Lake.

2. Put the underlined features in order from *highest* elevation to *lowest* elevation.

- a.
- b.
- c.
- d.
- e.

3. On a topographic map, what do close lines indicate?



NOTE: Follow the directions carefully and record your observations accurately. You will be creating water “flow maps” that will be used to answer questions later in the activity.

Key:

Black = predicted water flow path

Blue = actual water flow path

Red = watershed boundaries

Name: _____



Box A – Predicted water flow path

4. Use the black pencil to draw your predicted path of water flow on the figure in Box A, if you were to gently empty a pipette of water over Eagle Point.

5. Fill the pipette with water from the reservoir in your watershed tray. Position the pipette about 2 cm above Eagle Point and gently release all the water from the pipette.

6. Use the blue pencil to draw the path of water flow that you observed in Box B.

7. Use the red pencil to mark the topographic features in Box B that caused the water to take the path it did.



Box B – Actual water flow path

8. Repeat steps 4 – 7 Deer Ridge and Lake Hill. Be sure to mark your predictions before you fill the pipette.



Box A – Predicted water flow path



Box B – Actual water flow path



Box A – Predicted water flow path



Box B – Actual water flow path

Name:

9. Which one of the three points (Eagle Point, Lake Hill, or Deer Ridge) provided the run-off to fill Oak Run River? (If you are not sure, use the pipette to confirm your answer.)

10. Which one of the three points (Eagle Point, Lake Hill, or Deer Ridge) provided the run-off to fill Canyon Lake? (If you are not sure, use the pipette to confirm your answer.)

Watershed protection and Human Impact.

11. A gasoline tanker truck wrecked on Deer Ridge during a heavy rain storm. Make a dot with the water-based marker to represent the gasoline. Gently release 2 pipettes of water over the gas spill and observe the water flow path. What part of the watershed was impacted the most from the gasoline spill? Support your answer!

12. A mining company has discovered a coal bed (a large layer of coal) at the top of Lake Hill. Your town wants to determine the impact of a mining operation on the water quality of Oak Run River and Canyon Lake. Use your water-based marker to represent the sediment that would be created and the coal that would be exposed during the mining operation to determine the impact on both Oak Run River and Canyon Lake.

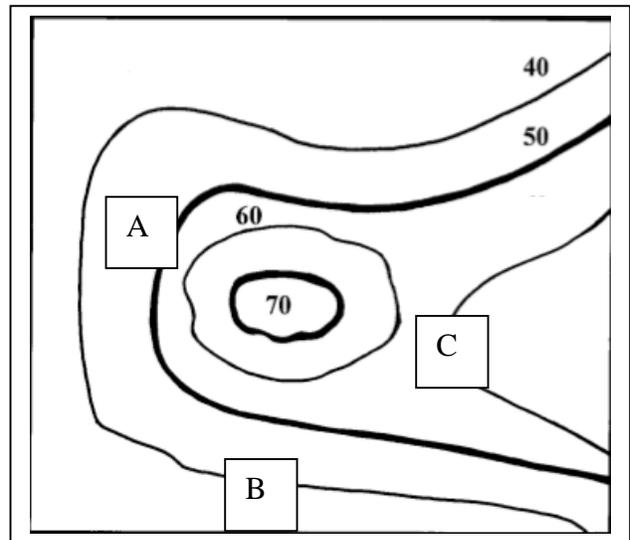
Name:

Analysis Questions:

1. What determines the boundary between two watersheds? Give a specific example from the activity.
2. Is the entire area of the model part of the same watershed? Explain why or why not.
3. Which feature on the watershed model do you think experienced the most weathering? Justify your answer.
4. On Figure 1, (Located on page one) use the red pencil to mark the boundaries of the watersheds.

Look at the contour map to the right.

5. What is the contour interval or vertical scale?
6. What is the highest possible elevation on this landform?
7. At which place (A, B, C) is the topography steepest?



8. Other than tanker truck spills and coal mines, list three human activities that can negatively impact watershed quality.

Threat 1

Threat 2

Threat 3

Wall Wisher Activity

Dear Dream Team,

You have been learning about watersheds and how humans can impact our watersheds. It is time to share your thoughts. **Go to you class period's URL** and post a comment on our Class Watershed Wall. Select and answer one of the questions below:

What did you learn? How can you help preserve your watershed? What information needs to be shared with others? What amazed you the most?

This is a homework assignment and you are required to post a "sticky" by

_____.

Class URL: _____

Remember, this is a required assignment and will be graded!

100 – Sticky posted, I can clearly tell which question was answered, answer makes sense

90 – Sticky posted, I think I can tell which question was answered, answer makes sense

80 – Sticky posted, I think I can tell which question was answered, answer "kinda" makes sense

70 - Sticky posted, I'm not sure which question was answered, answer makes sense

60 - Sticky posted, I'm not sure which question was answered, answer "kinda" makes sense

50 – Sticky posted, but the response doesn't answer a question posed nor does it make sense.

0 – No sticky posted. ☹️

Web Safety Measures

- Do NOT use your full name, just your first name.
- I have to approve all "sticky" notes before they become public, so no inappropriate comments will be posted. (Although, my students are AWESOME and I don't believe this is a concern for our classes!)
- Your response can be only 160 characters in length. So think about your answer and make it **short and concise**.

The public will be able to view our class wall. Parents are encouraged to visit the wall and see what the "next generation" thinks about watersheds and their ability to make a difference in the world.