

# Lesson 1: Exploring Watersheds

**Activity:** Students collaboratively build models of watersheds by placing a large piece of butcher paper over various sized objects in a large pan.

**Grade level:** 4-8

**Subjects:** Science, social studies

**Setting:** Classroom

**Duration:** Two 50-minute periods

**Key terms:** Elevation, Model, River system, Run-off, Slope, Watershed

## Objectives

By creating a model of a watershed, students will be able to:

- Explain how water flows through a watershed
- Describe the characteristics of a watershed
- Demonstrate scientific concepts using a model
- Share ideas about science through purposeful conversation in collaborative groups
- Evaluate data, claims, personal knowledge through collaborative science discourse
- Communicate and defend findings of observations using evidence

## Summary

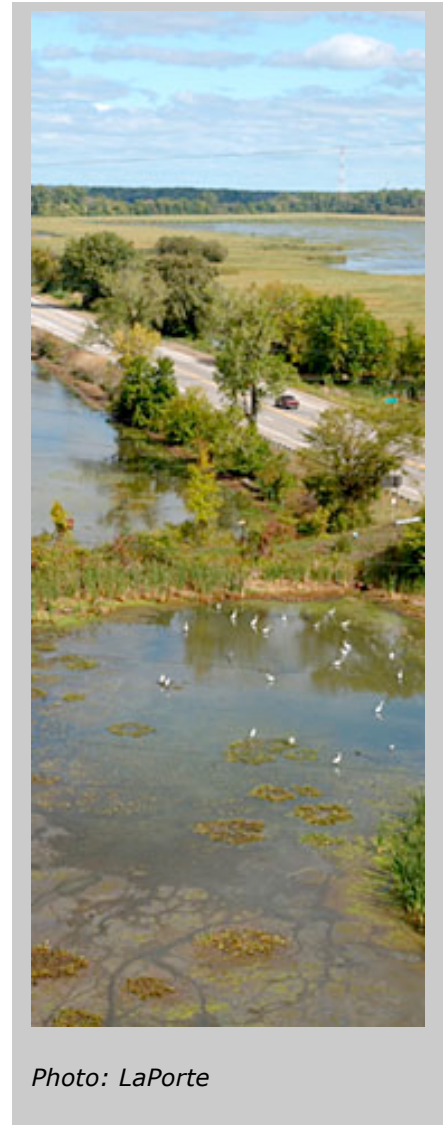
Students collaboratively build models of watersheds by placing a large piece of butcher paper over various sized objects in a large pan. As students spray their model watersheds with water, they observe and mark on their map the movement and pooling representing rivers, lakes and ponds.

## Background

A **watershed** is an area of land that drains into a **river** system. Any water entering a watershed, usually as precipitation, travels from higher **elevations** to lower elevations. As the water moves downward, it forms streams and rivers. The channeling and pooling of water is determined by the shape or topography of the land. Water continues to move downward, and rivers may join with lakes or other rivers as they head toward the ocean.

## Materials and Preparation

- Several tall objects and short objects (2 or 3 of each per model)
- White butcher paper (3' x 4' sheets)
- Large waterproof tin trays
- Transparency film
- Small spray bottles with water
- Newspaper



*Photo: LaPorte*

- Food coloring or tempura paint
- *Student worksheet. Part 1: What is a Watershed?*
- *Student worksheet. Part 2: Elevation and Observation Map*

*Preparation:* Educators should construct and test the watershed model prior to class to ensure that materials work appropriately.

**Note:**

- **See Student worksheets, Parts 1 and 2, at the end of this lesson (supplemental materials).**

## Procedure

### Preliminary Discussion

Ask students key questions:

- Does anyone know what causes a river to flow in a certain direction or how its shape may be altered?
- Do you think the land around our rivers affects the quality of the water?
- Introduce the term watershed. One way to introduce this term is to ask students to separate the word into “water” and “shed” (to pour or cause to pour off; to emit) and discuss what each word means. Ask students what “sheds” water? (The land around a river.)
- Inform the class that they will be learning about watersheds using a **model**, which is a simplified representation of a natural phenomenon. Models help scientists represent their current understanding of natural phenomena as well as construct new understanding.

### Advance Preparation

1. Preview the materials and demonstrate how to build the watershed model. Connect the watershed model to the real world. Ask: What might be the purpose of this watershed model? Have students describe what the pieces of the model represent. (Paper = land. Spray bottle = precipitation.)
2. Have students form groups. Hand out Part 1 of the student worksheet: What is a Watershed?
3. Assign roles to group members: object placer, paper placer, taper, watershed transparency map creator, and/or sprayer. (Assigning roles is one strategy to facilitate small group interaction until students become adept at working together.)
4. Remind students that they are all responsible for creating individual watershed maps, filling out their predictions, observations, and explanations, and taking notes on the concepts they identify.
5. Distribute materials. Do not have the students get water bottles yet!

### Build a Watershed Model

1. Review set-up procedure with students. (Steps 1-4 on the work sheet.)
2. Monitor students as they build their watershed models.

3. Create an elevation map. Describe the procedure for making an elevation map. (Steps 5-6 on the work sheet.) Students will mark high areas with "H" and low areas with "L" on both their model and on a separate transparency. Monitor students as they create maps.
4. Have groups raise their hands when maps are completed.
5. Predict water flow. Review steps for making predictions. (Step 7 on the work sheet.)
6. Monitor students as they make predictions and explanations on their worksheets or in journals, about how water will flow over their watershed model.
7. Have groups raise hands when predictions are completed.
8. Observe and test models. Inform the students that they are now ready to test their models and make observations. Remind them to keep detailed notes of their observations: they will use their observations to help explain their models.
9. Give each group a spray bottle. Students will use spray bottles to test their watershed model.
10. Monitor groups as students make observations. Return materials.

### Source

Used with permission: Center for Highly Interactive Classrooms, Curricula and Computing in Education (Hi-ce), University of Michigan School of Education.

## Discuss the Results

1. Have a few groups share their transparency elevation maps using an overhead projector. Ask:
  - a. How did the water flow over the surface of the land? What patterns did you observe?
  - b. How did the water accumulate? Where did the water accumulate?
  - c. In what direction did the water flow? What caused the water to flow that way?
  - d. The students have built a model (a representation) of a watershed. Review key concepts:
    - What is a model? What is the purpose of a model?
    - Have students describe what the pieces of the model represent.
2. Previously introduced watershed model parts:
3. Paper = land
4. Spray = precipitation
5. Newly introduced watershed model parts:
6. Branching pattern of the water flow (smaller rivers leading into larger rivers) = a river system
7. Wet portions of the paper = absorption of water by land
8. Flow of water over the paper = run-off
9. Change in elevations on land = slope
10. Entire model = watershed
11. Discuss how using the models can help them investigate their river.
12. Remind students that they observed the results from testing a model. To enhance understanding, students may wish to take notes, create a classroom chart, or make entries in a journal. The following key concepts should emerge:
  - a. A watershed is an area of land that drains into a river system.
  - b. Water moves from areas of high elevation to areas of lower elevation, following the slope in land.

- c. The flow of water occurs in a branching pattern in streams and rivers (i.e. stream system). Branches may combine to form lakes or larger rivers
  - d. Effects of precipitation— i.e. rain and snow might be absorbed by the ground, or might form run-off that feeds into rivers.
13. Ask student to describe the direction of water flow within the watershed. Prompt students by asking them how elevation affects the flow of water. A common misconception is that all rivers flow south. Be sure to emphasize that rivers flow in all directions depending on the change in elevation in the watershed. (Use Michigan as an example.)
  14. Ask students to draw the flow of water on their own maps.
  15. Have students come to the front of the room and draw the flow of water for a specific part of the map. Students should explain why the water flows as they predict.
  16. Repeat the above step until all map parts are explained.

## Teaching Tips

### Predict, Observe, Explain

The cycle of predicting, observing, and explaining is a strategy to support students in constructing understanding. Emphasize the reasons that predictions, observations, and explanations are made. Encourage students to question each other, elaborate on their ideas, and share their thinking with other groups.

### Time Management

The purpose of sharing ideas is to determine that students understand main ideas. Often, however, there is not enough time for all groups to present their observations. Consider having a few groups present ideas, while others participate in the discussions by stating whether or not they observed the same patterns.

## Assessment & Standards

**See separate document: FLOW\_Assessment\_GLCE.pdf**

## FLOW Feedback

Please take 10 minutes to provide us with your feedback.

Go to: <http://www.miseagrant.umich.edu/flow/flow-feedback.html>

## Supplemental Materials, FLOW Unit 2

### Lesson 1 - Exploring Watersheds - Documents:

- Student worksheet Part 1: What is a Watershed?
- Student worksheet Part 2: Elevation and Observation Map

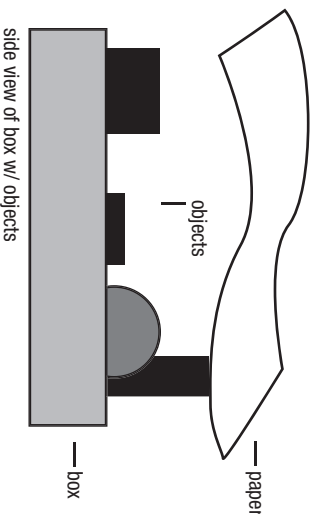
# WHAT IS A WATERSHED?

## Unit 2, Lesson 1

### Part 1

#### Build Your Watershed Model

1. Place newspaper under the tray.
2. Arrange a tall object near one edge of the tray and arrange the shorter objects toward the center of the tray.
3. Crumple up a piece of butcher paper. Be careful not to rip any holes in the paper.
4. Carefully cover the tall and short objects with the sheet of butcher paper, pressing the paper down so that it looks like tall and short hills. Use pieces of tape to keep the paper from lifting up from the tray.



#### Draw Your Elevation Map

5. On the model, mark high areas with an H and low areas with an L.
6. On the next page, draw an elevation map of your model. Sketch a bird's eye view of the high and low areas (as if you were looking down at your model). Mark the high areas with Hs and the low areas with Ls.

Note: Each member of your group should draw his or her own elevation map. Choose one member to draw the map on a piece of transparency film.

#### Make Your Prediction

7. On the next page, predict how the water will flow over the model if you spray water on it. Include where water will flow and accumulate. On your elevation map, draw arrows to show how the river will flow and draw circles to indicate where the water accumulates.

#### Observe Your Model

8. Hold the spray bottle about 5 inches from your model and spray for several minutes until you get a continual flow of water. Take turns spraying your model. Alternate where each person sprays.
9. Return spray bottles to the teacher.
10. Using a different color pen, draw on your map how the water flows over your model and where the water accumulates. Note the pattern of how the water flows over your model, how smaller rivers join to form larger rivers and how rivers flow into lakes.

Note: Each member of your group should draw his or her observations. One member should draw on the transparency film.

# WHAT IS A WATERSHED?

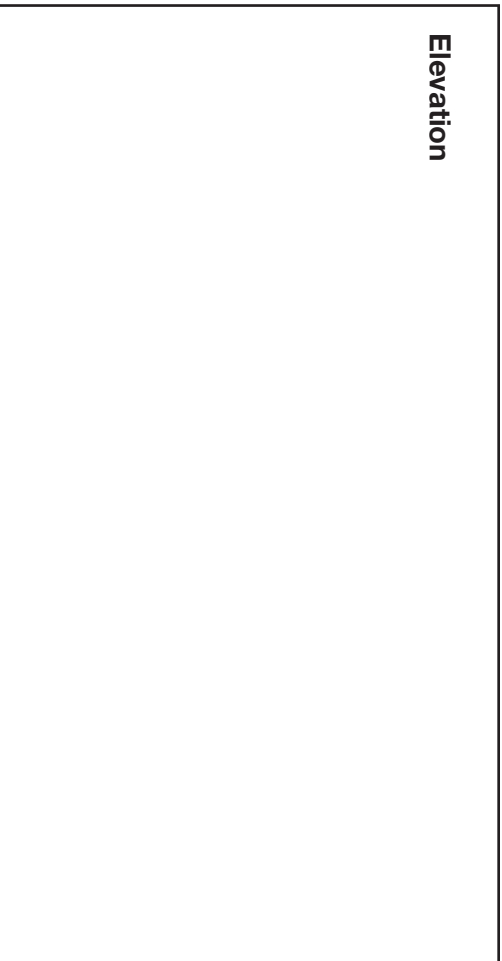
Unit 2, Lesson 1

Part 2

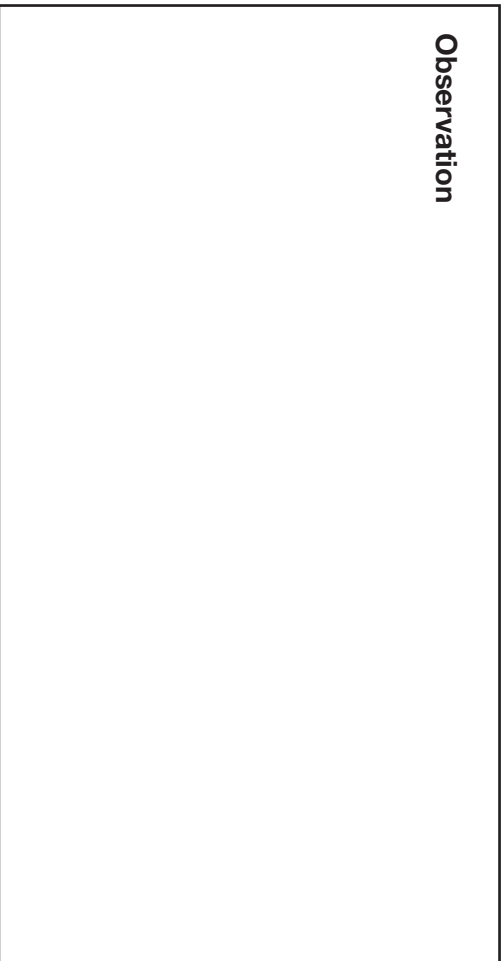
## Elevation and Observation Map

Use space provided to make an elevation map and observation map of your watershed.

**Elevation**



**Observation**



1. Explain how the water flowed over your model (what patterns occurred)? What caused the water to flow the way it did?

2. Did your observations agree or disagree with your predictions? How were they similar or different?