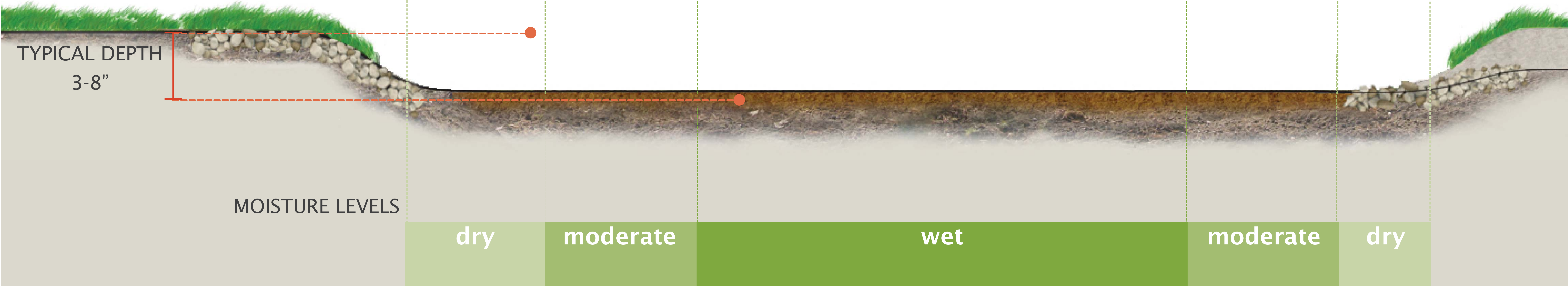
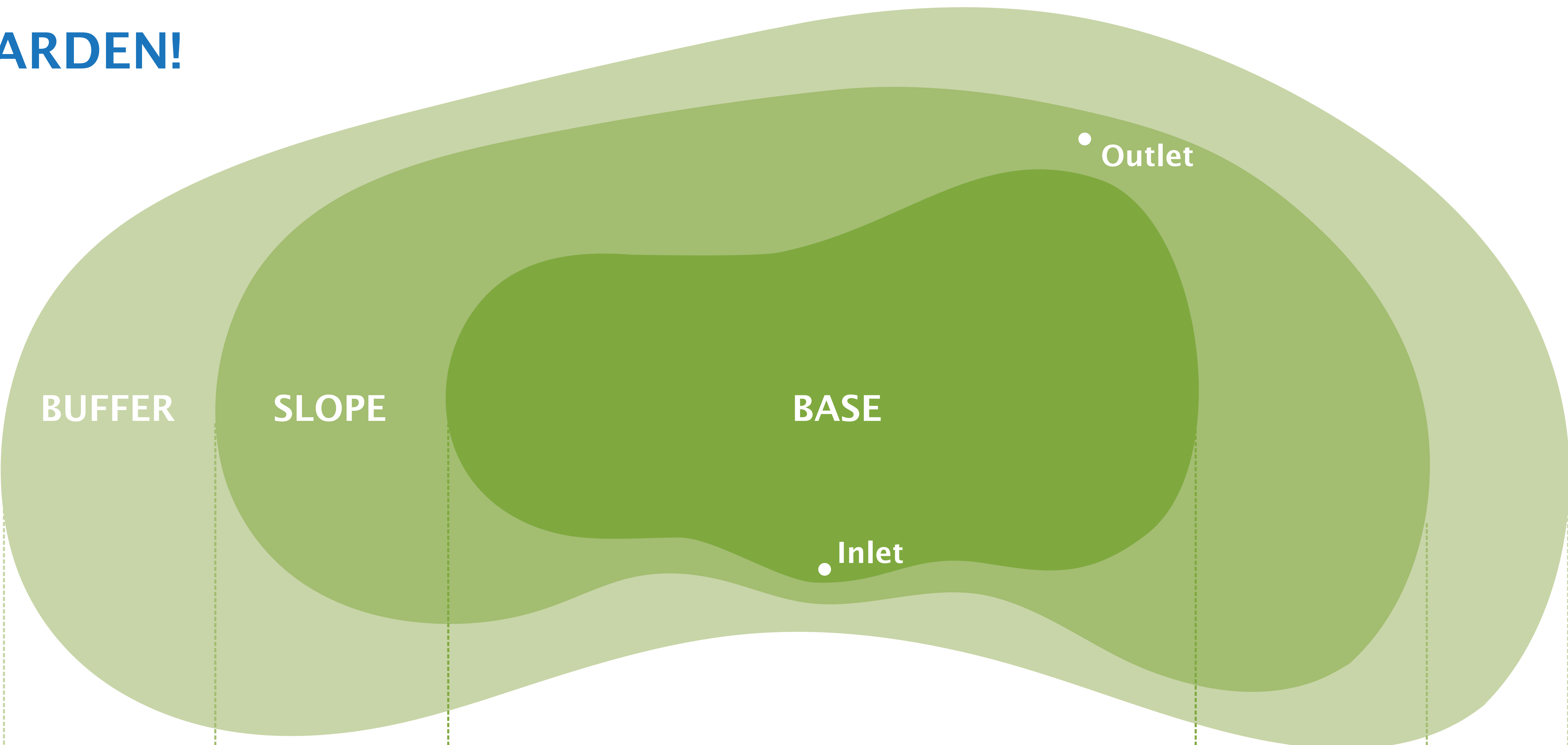


DESIGN YOUR RAIN GARDEN!



Names: _____

Design Your Rain Garden

1. Water Flow

Identify what impervious (hard) surfaces the rain garden will be capturing runoff from.

2. Soil & Vegetation

The best soil type for your rain garden: _____

Which native plants are you placing in the **base** of your rain garden? What months of the year do these plants produce flowers?

Plant	Flowering Period
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

Which native plants are you placing in the **slope** of your rain garden? What months of the year do these plants produce flowers?

Plant	Flowering Period
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

Which native plants are you placing in the **buffer** of your rain garden? What months of the year do these plants produce flowers?

Plant	Flowering Period
1. _____	
2. _____	
3. _____	
4. _____	

3. Wildlife

Identify what kinds of wildlife you expect to find in your rain garden.

Names: _____

Rain Garden Native Plant Worksheet



1. What is the scientific name of the plant you are researching?

2. What is the common name of the plant you are researching?

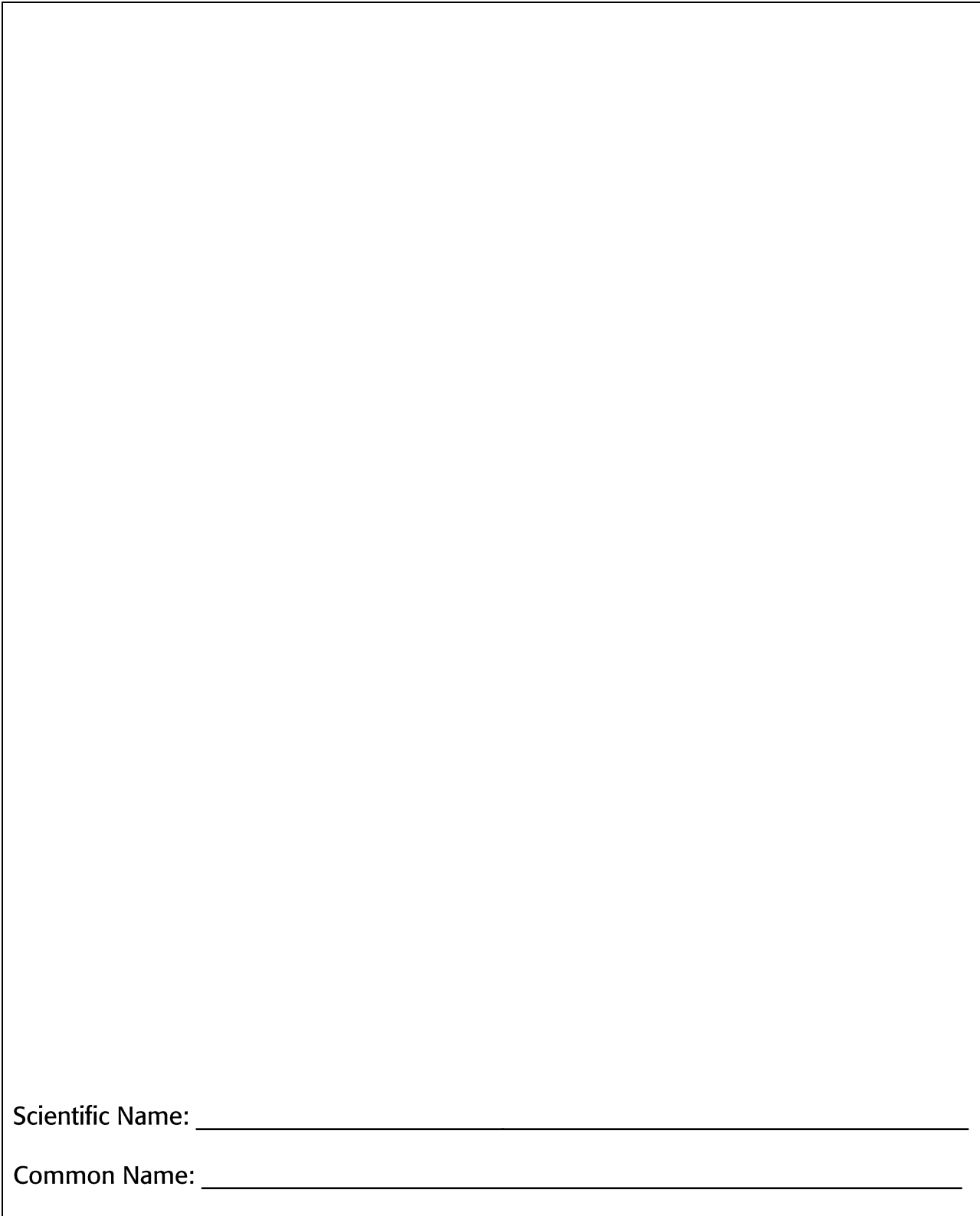
3. How much water does your plant prefer? (wet, moderate, or dry conditions?)

4. What part of the rain garden do you think this plant should be placed? (base, slope, or buffer?)

5. Is your plant an annual or perennial?

6. Describe the appearance of your native plant (height, flower/fruit color).

7. Using a pencil, sketch the native plant in the box below. Use colored pencils to color in the native plant.



Scientific Name: _____

Common Name: _____

EXTENSION

If the actual native plant is available to observe, answer the following questions:

1. Measure the plant's height:

2. Measure the plant's width:

3. How can you tell the plant has grown? What signs of growth do you see?

4. Can you identify the following on your plant (check those that apply):

- Stamen
- Pistil
- Sepals
- Petals

5. In what ways do you believe this plant pollinates?

6. Pine cones are a pine tree's seed. Can you find a seed for this plant? If yes, please describe the seed (color, shape, size, etc.).

MODULE ONE: An Introduction to Watersheds

ESTIMATED TIME: 45 minutes

OBJECTIVES:

Students will be able to:

- Understand what a watershed is and how we all live in a watershed
- Understand how watersheds affect the quality of water in a stream
- Know what river their school, or local watershed drains to

REQUIRED MATERIALS:

Educator:

- Maps of the school, or local Watershed. Rutgers lesson plan on CD/binder (provided).
*Directions for finding information on New Jersey watersheds are located at the end of this section. Educators should use maps from school, or local watershed.

Students: Crumpled Paper Watershed Project

- Water based markers (blue, black, Red, and brown)
- Sketch pad (8.5 x 11) for blank papers
- Spray plastic bottles with water
- Pencils
- Erasable markers for writing on laminated map

PROCEDURE:

Part 1: 20 Minutes {this project is adapted with permission from the Crumpled Paper Watershed Project from the Alice Ferguson Foundation retrieved at http://fergusonfoundation.org/teacher_resources/crumpled_paper.pdf on October 17, 2013.

1. Understand what a watershed is:

WATERSHED: all the land that drains to a stream, river, lake, ocean, or other body of water. Ridges, or high points surround the area and all the area within is one watershed. You can think of your cereal bowl. If you pour a little milk on one side of the bowl or the other side of the bowl the milk will all go down and wet your cereal. If you miss the bowl and are on the other side of the “ridge line” the milk will spill on the table and won’t go in the bowl. The rim of the bowl is like the ridge line.

This project is utilized with permission from the Alice Ferguson Foundation.

Student Sheets - Crumpled Paper Watershed

Objectives

By the end of this activity, you should be able to ...

- Define the word "watershed;"
- Understand how to tell where the boundaries of a watershed are; and
- Understand how runoff affects our water quality.



Set Up Experiment #1



Follow the instructions below to set up the experiment.

1. Crumple up the piece of paper your teacher gave you, and then smooth it back out most of the way. It should still be a bit crumpled, showing small ridges (high points) and valleys (low points).
2. Imagine that this paper is a section of land, and find the ridgelines (the tops of the fold-lines).
3. Use a washable blue marker (not permanent) to color along the ridgelines on your "land."

Make Your Hypotheses

You are going to "rain" on your landform. Answer the following questions to make your hypotheses before conducting the experiment.



1. What do you think will happen to your land when it "rains?"

2. What will happen to the blue ridge lines you colored?

3. Where will the "rainwater" travel?

Continued on next page

Student Sheets – Crumpled Paper Watershed

Run the
Experiment

Follow the directions below to conduct the experiment.

1. Use a spray bottle of water to create a “rainstorm” over your land. You want to create gentle sprays of mist.
2. Observe what happens after every misting.
3. As your “rainfall” accumulates, observe the pathways where the excess “rainfall” travels.



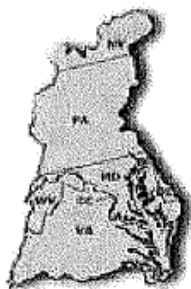
Record Your
Observations

In the space below, record your observations about what happened (Use words and pictures if you wish).

Analyze Your
Data and
Draw
Conclusions

Answer the following questions or complete the activities to analyze and draw conclusions about your data.

1. Explain how your hypotheses were or were not accurate.
2. How did the “rainfall” travel over your land?



Continued on next page

Student Sheets – Crumpled Paper Watershed



Analyze Your
Data and
Draw
Conclusions
(continued)

3. Where did the water collect? Explain why this happened.
4. Find an area on your land where water collected. This is a lake, and you get to name it! My lake is Lake _____.
5. Look for the major stream running into your lake. Name this stream as well. My stream is called _____.
6. This stream may have several tributaries (small streams which run into the larger stream). How many does your stream have? _____.
7. With your finger, trace your stream all the way back up to where it starts at the top of the ridge. (This should be a path of blue ink.) When you reach the top, this is the edge of the watershed for your stream and lake.
8. Trace the entire edge of the watershed with your finger, by following the ridgeline. This will be something like tracing the edge of a bowl.

All of the inside, downward-sloping area you have just outlined is the watershed for your stream and lake.

9. Draw a picture of your watershed below. Label your stream and lake.



10. How many other watersheds can you find on your "land?" _____

11. How would you define the word "watershed?"

Continued on next page

Student Sheets – Crumpled Paper Watershed



Set Up Experiment #2

Follow the instructions below to set up the second experiment.

1. On a fresh sheet of paper, draw some of the ways people use the land. Include a house/community, farm, factory, and some streets/highways.
2. Using the color key below, color your areas with markers.

Use this color...	To Represent...	What Might be on this Land that You Wouldn't Want in the Water?
Brown	Farms	
Red	Landfills & Factories	
Black	Houses & Streets	

3. Crumple this paper, and smooth it in the same way you did the first one.
4. Use the blue marker to trace the ridgelines on this paper.

Make Your Hypotheses

Make hypotheses about what you think will happen when you “rain” on your land this time.

Run Your Experiment

Gently mist your new land with water from your spray bottle. Observe what happens, and how the water travels.

Record Your Observations

Record your observations (in words and pictures) here.



Continued on next page

Student Sheets – Crumpled Paper Watershed



Analyze the
Data and Draw
Conclusions

Answer the following questions to analyze and draw conclusions about your data.

1. What happened in your second experiment?

2. What do you think the colors could represent in real life?

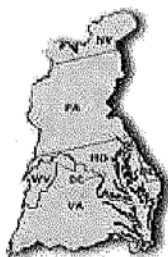
• Brown = _____

• Red = _____

• Black = _____

3. Where were the colors in the end? _____

4. Where are you in this watershed? What kinds of pollution do you think you add to the watershed?



Continued on next page

Student Sheets – Crumpled Paper Watershed

Checking For
Understanding

Circle the letter of the correct answer for each of the following questions to show you understand the information in this activity.

1. Choose the best description for the **watershed** of a stream:
 - a. the water of a stream and all the tributaries that feed into it, including wetlands
 - b. all the land that slopes toward the stream and drains rain and melting snow into the stream
 - c. a large wet area of land that completely surrounds the stream.

 2. You are hiking along a trail in a hilly countryside. You know that you have reached the watershed of a different stream because:
 - a. the ground changes from soggy soil to dry forest
 - b. you can see another stream
 - c. you are standing on a high spot and the land starts to slope downward again.
-



Alice Ferguson Foundation, Hard Bargain Farm Environmental Center

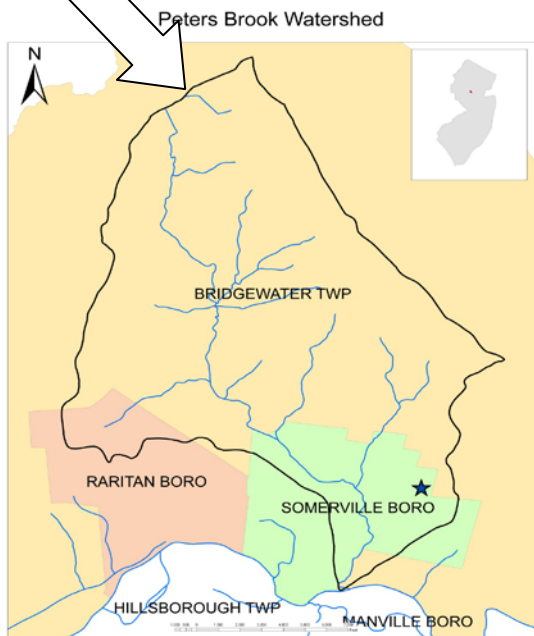
10

A watershed activity can also be done utilizing an Enviroscape which is a model of a watershed that can be found at <http://www.envirosapes.com/> or by building one with a paint can and clay <http://treeonline.wordpress.com/2nd-grade/activities/enviroscape/> . The built Enviroscape model may cost over \$800 after shipping.

Part 2: 15 Minutes

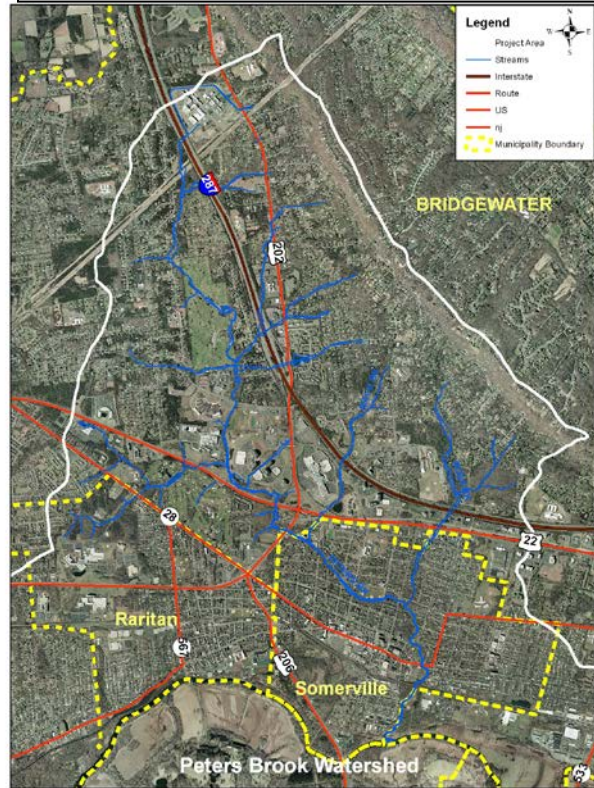
Explain to the students that we all live in a watershed. This example shows Bridgewater Township in New Jersey. Pictures below show the students the maps of the Peters Brook Watershed. (Show your own school, or local watershed maps. Access your maps at <http://www.state.nj.us/dep/gis/> Steps are listed at the end)

This is a flat map of your crumpled paper watershed. The arrow is pointing to the ridgeline.



Map courtesy of New Jersey Water Supply Authority, Watershed Protection Unit.

Here you can see the watershed and also how many buildings and houses and roads there are in the watershed.



Map Courtesy Rutgers Water Resources Program, Rutgers Cooperative Extension.

2. Describe that when it rains all the water runs to the lowest point in a watershed, such as a stream, river, or lake. On its way, water travels over the surface of farms, fields, forest lands, suburban lawns, and city streets; or it seeps into the soil and travels as groundwater.



Top photo: Forest in Blairstown, NJ. Paulinskill watershed 2011. Photo Pat Rector.
Bottom photo: Parking lot at Rockaway mall, Rockaway Township, NJ, Rockaway watershed. 2010. Pat Rector.

Point out on the Watershed maps that more than one town can be in a watershed. Point out that part of a town can be in one watershed and part of a town can be in a different watershed. For example: The Peters Brook Watershed is contained within the towns of Bridgewater, Somerville, and Raritan. These towns include heavily populated neighborhoods. Ridgelines do not stop at a town border. Rivers do not stop at a town border. Would it work well if one town was a good neighbor and took care of its stream and another town was not a good neighbor?

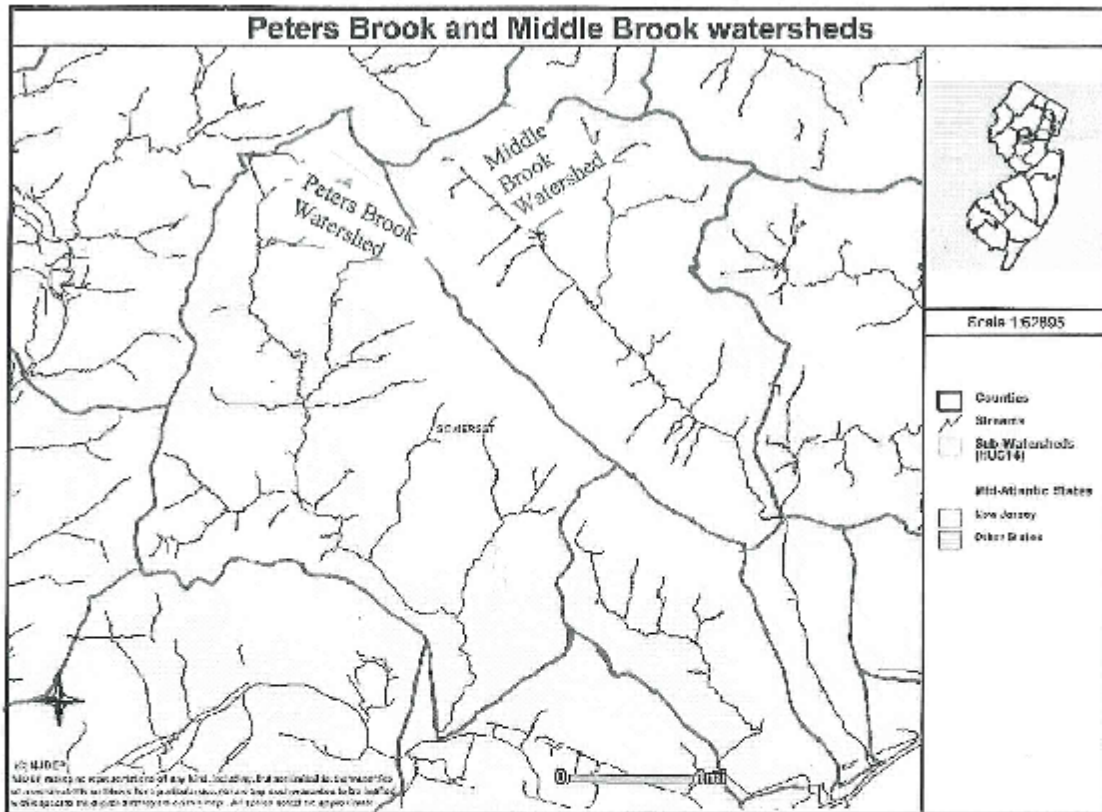
Point out on the Watershed maps the streams. For example: There are two smaller streams Ross' Brook and Mack Brook which connect to the Peters Brook (Show large map if available). These smaller streams are called tributaries. Peters Brook is also a tributary. It is a tributary to the Raritan River.

TRIBUTARIES: A stream or river which flows into a larger river.

Point out the following examples using your school, or local watershed:

1. Because the watershed drains all the land surrounding the Peters Brook and its tributaries almost everything that happens in the watershed can affect what happens in Peters Brook and the Raritan River. Why the Raritan River? If pollutants are carried to Peters Brook they will be carried in it as it moves through the watershed and joins the Raritan River.
2. Peters Brook is almost 10 miles long and it enters the Raritan River. The watershed is almost 10 square miles. (Show large laminated map).
3. Explain how the ridge line or divide is the highest point in the area that divides one watershed from another. If rain falls on the other side of the ridge it will go into a different watershed. Use the map of the Peters Brook and Middle Brook to discuss how everywhere there is a watershed; one watershed is next to another watershed, and several smaller watersheds may then be within a larger watershed.
4. Hold your hand in an inverted V over a sink or bowl. Have a student spray water onto your hands from a spray bottle to help the students understand that water will go on one side or the other of your hands (the watershed divide).
5. Van Derveer School is in the Peters Brook watershed. A part of Bridgewater Township is in Peters Brook watershed. Another section of Bridgewater Township is in the Middle Brook watershed (on the other side of the "ridge line"). But anywhere you stand, you are in a watershed and when rain falls, that rain water will travel down to a body of water.

Both Middle Brook watershed and Peters Brook watershed and many other smaller watersheds are within the larger Raritan watershed. This means that all of their rivers eventually empty to the Raritan River. That is the larger watershed. And eventually the water travels to the Raritan Bay and the ocean.



Map from New Jersey Dept. of Environmental Protection i-map

If you are in Bridgewater Township you might be in the Peters Brook Watershed or you might be in the Middle Brook Watershed. It depends where in town you are standing. But remember- wherever you are standing you are in a watershed.



Peters Brook Headwaters



Peters Brook downstream near the mouth

Part 5: 5 Minutes

1. Point to the watershed picture on **part 1** again. Explain that as rain water travels over the surface and across farms, fields, forest lands, suburban lawns, city streets, and storm drains in these watersheds it can pick up pollution which affects the quality of the water.
2. Inform students that this rain water that does not seep into the ground but rather runs off of the land is called stormwater runoff.

STORMWATER RUNOFF: Rain water (or snow melt) that does not seep into the ground but runs off over the land.

3. When the stormwater runoff picks up pollutants from traveling over the land that is called Nonpoint Source Pollution. It is called Nonpoint source pollution because it is pollution that cannot be traced to a direct source. Discuss the food coloring and how by the time it mixed with the Raritan it was hard to tell where the color came from, it was just dirty looking.

Explain that the next lecture will go into more details about stormwater, nonpoint source pollution, and storm drains.

4. Give out the worksheet/test questions.

Part 6: 5 Minutes

1. Give the students a watershed worksheet and have them fill it out (last page attached).
2. Collect to see what students learned.

VOCABULARY

TRIBUTARIES: A stream or river which flows into a parent river.

WATERSHED: All the land that drains to a stream, river, lake, ocean, or other body of water.

HEADWATERS: Part of a stream or river at/near the source of the stream.

STORMWATER RUNOFF: Rain water (or snow melt) that does not seep into the ground but runs off over the land.

RIDGE-LINE:




Sources for information: Rutgers Water Resources Program “Stormwater in Your Back Yard” program lectures. <http://www.water.rutgers.edu>

The NJWSA New Jersey Water Supply Authority – Peters Brook’s stormwater reduction project. <http://www.raritanbasin.org/peters.html>

Modified: Lesson was modified with information from these different sources and customized for the Van Derveer School and the Peters Brook watershed.

Guide to Finding your Watershed Online:

<http://www.state.nj.us/dep/gis/>

1. On the left side of the page will be a button for Interactive mapping 
2. iMap NJ DEP (Turn off Pop up Blocker on your computers Tool Bar under Tools) 
3. Launch iMap NJ DEP (a map of the State will open up) 

On the right side of the page is **Query**

Find Location of Interest Click

Put in the county and municipality the school is located in

The map will zoom to the municipality with it outlined in yellow

On the left you will see Data Layers

Hit **Auto Refresh**

4. On the Top of the map are Orange Buttons. You will see a **Zoom in** button. You will want to zoom in. If a **Data Layer** is grayed out it is because you are not zoomed in sufficiently.

5. The data layers have squares and circles that can be clicked on to activate. The squares will add a layer, and you can add as many as you would like. The circles are the active layer and you can only have one at a time active.
6. The first task is to find your school. Scroll down on the **Data Layers** side until you see the Roads layer. Click the square and circle. Roads should appear on your map. If they do not, check if you are **Zoomed in** sufficiently so that the Roads layer will appear. You should also check that you have clicked the **Auto Refresh** button or that you clicked **Refresh Map**. From the roads and other landmarks you will need to find the school. If a road does not have a name on it you can click the orange **Identify** button along the top row and then click on the road and the name will come up in a separate window. If it does not check that you have the circle checked in the **Data Layers** list. If you try this and you are taken back to the large extent state map this means that the pop up blocker is not taken off on your tools bar.
7. When you have found the school you should unclick the circle on the roads and check the circle on **Sub-watersheds by name HUC-14** {located further down on the **Data Layers** list). When you click the school with the Sub-watershed active a window will come up that identifies the watershed and stream that the watershed drains to.

Acknowledgements:

Crumpled Paper Watershed Project from the Alice Ferguson Foundation
http://fergusonfoundation.org/teacher_resources/crumpled_paper.pdf

Rain Garden Manual New Jersey Student Education

Watershed Questions

Student Name: _____

Please circle the best answer.

1. My school, or local watershed is located in the _____

2. When it rains all the water will run...
 - A. To the highest point in the watershed, the mountain.
 - B. To the watersheds.
 - C. To the lowest point in the watersheds, the stream.
 - D. To the lawn.

Please answer the question below in one or two sentences. If you do not know the answer, please write "I do not know." If you need more space, please continue writing on the back of this paper.

3. What is a watershed?
