

LESSON 3 - RESERVOIRS & COLLECTING WATER



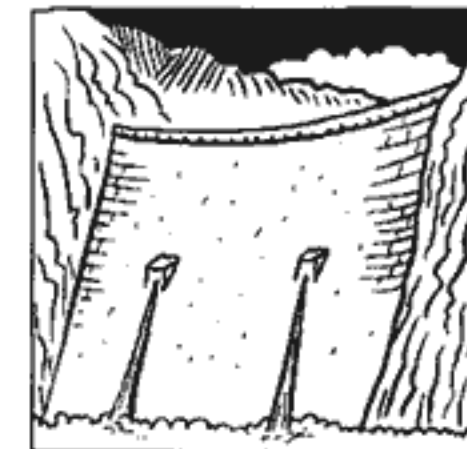
LESSON 3 - RESERVOIRS & COLLECTING WATER

Where does the water in our pipes come from? In Metropolitan Boston, our water pipes are filled from two large reservoirs, Quabbin and Wachusett. Students may be familiar with the word “reservoir” or know that we depend on reservoirs. Our purpose in chapter 3 is to introduce the watershed concept at a basic level.

By building simple landscapes and raining on them (How Does Water Get Into a Reservoir?), students will reinforce a concept they already know: that water flows downhill. In the subsequent activity (Design a Reservoir), students alter their landscapes to create reservoirs to collect and store rain. Finally, in Letting Water Settle, students predict and then experiment to see what happens to materials that rain carries to the reservoir.

So far we have moved from faucets to pipes to reservoirs. The next step in the process has already been introduced: precipitation and the water cycle.

Lesson 3 Reservoirs & Collecting Water



ACTIVITY 3-1 HOW DOES WATER GET INTO THE RESERVOIR?

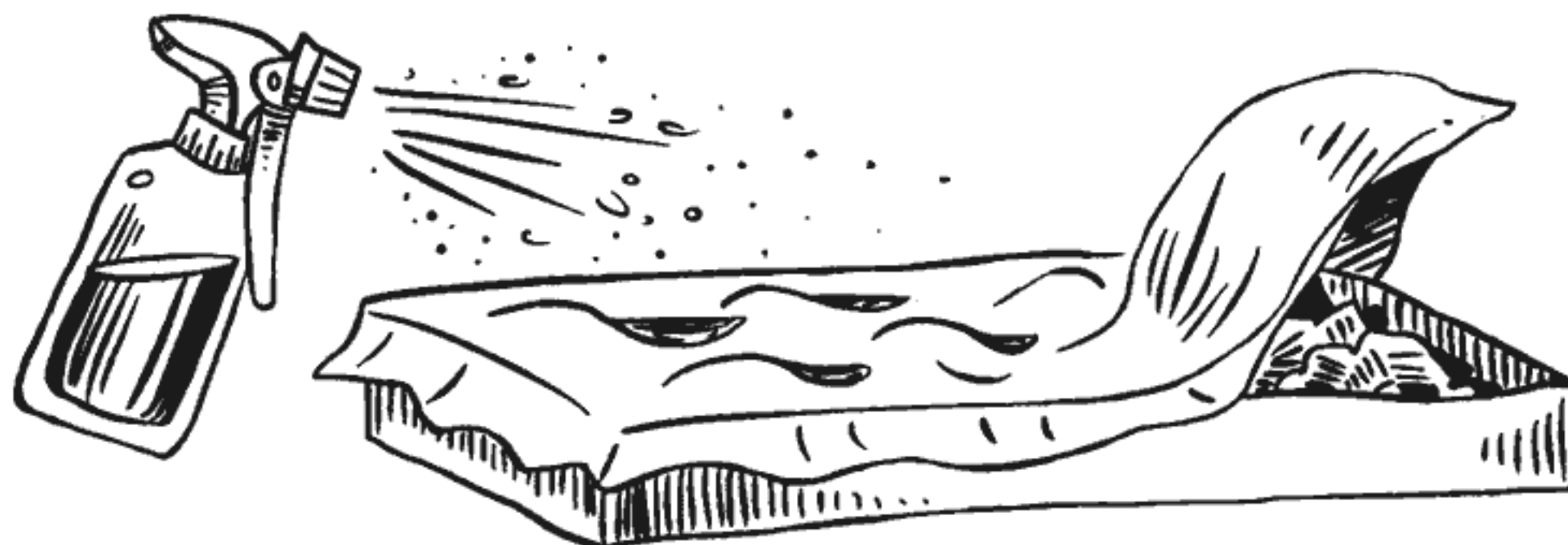
- SUMMARY** Students will create a model of a landscape and spray water over it to understand how water enters reservoirs. (Rain enters the reservoir by landing on the surface and through tributaries.)
- CONTENT AREAS** science, social studies
- GOAL** to use a landscape model to discover that water enters a reservoir through run-off (rivers) and rain.
- TIME** one session
- MATERIALS**
- plastic box or cardboard box lid (kit)
 - newspaper
 - white plastic bag ("kitchen size")
 - water with blue food coloring
 - spray bottle (kit)

ADVANCE PREPARATION

- Fill spray bottles with blue water.
- Have materials available to students.
- Create student working groups.

TEACHER PROCEDURE

1. Discuss with students the various types of water bodies: lakes, rivers, reservoirs, oceans, etc. Talk about forms of precipitation. Distinguish between fresh and salt water. Emphasize that reservoirs are fresh water.
2. Divide students into their groups.
3. Tell the students that they are going to create a landscape using the box, newspaper, and plastic bag. The box is to hold the materials. The crumpled newspaper will be the bedrock (the rock under the soil) and the plastic bag will be the soil, so the newspaper goes in the bottom of the box and the bag goes over the top of it. Students should make sure that the edges of the bag are outside the box. Everyone's model will look different, but they should all have two or three low places.



Lesson 3 Reservoirs & Collecting Water



ACTIVITY 3-1 HOW DOES WATER GET INTO THE RESERVOIR?

TEACHER PROCEDURE

4. Ask students to look at their models and describe the type of land formations they see. (Mountains, valleys and hills are the most important ones.)
5. Ask students to predict what will happen when they spray water over their landscape. They should record their predictions on the student page. (# 3)
6. Give each group a spray bottle.
7. Each member of each group should spray water over the model about ten times. Other group members should observe and record their observations. (#4)
8. Tell each group to choose one body of water in their landscape and try to determine where the water comes from that fills it. (#5)



How Does Water Get into a Reservoir?

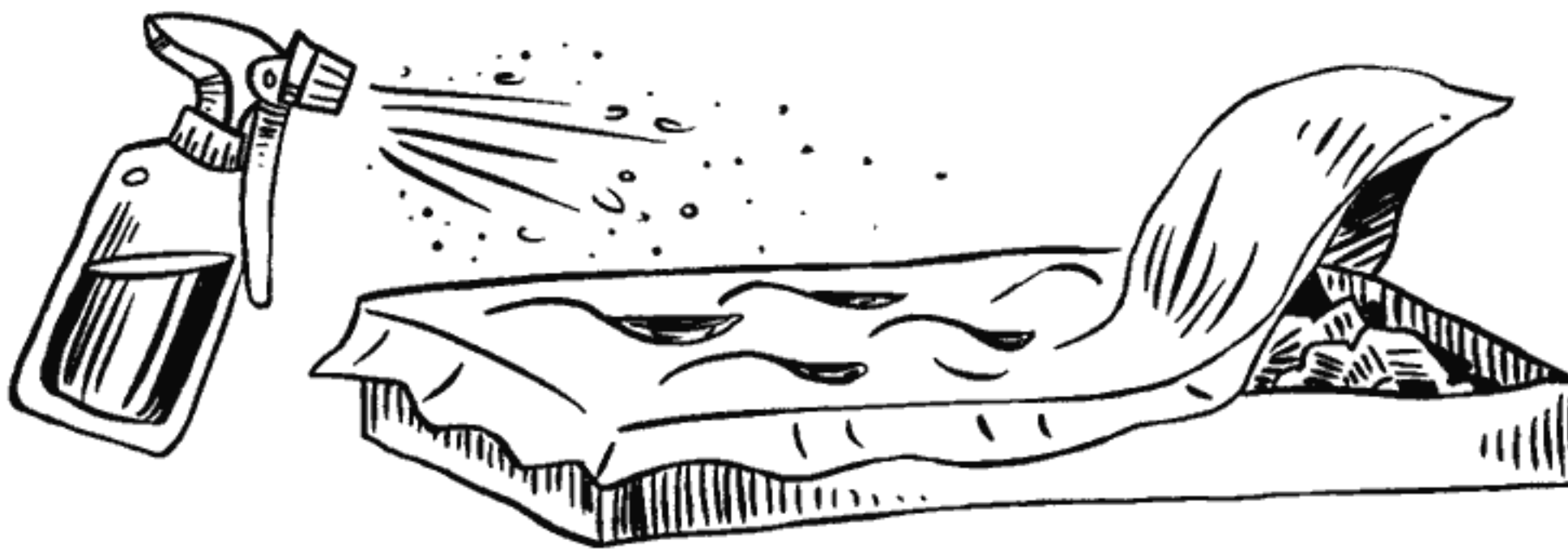
Introduction: Reservoirs store the water we will use in our communities. They are also the places where water is collected. During this activity you will investigate how water gets into reservoirs.

Materials

- plastic box or cardboard box lid
- newspaper
- white plastic bag
- spray bottle with blue water

Procedure

1. The group leader should get the materials and bring them to the table.
2. You are going to create a model of a land area using a box, newspaper, and a plastic bag. The box is to hold the material. The crumpled newspaper will be the bedrock (the rock under the soil) and the plastic bag will be the soil, so the newspaper goes in the bottom of the box and the bag goes over the top of it. Make sure that the edges of the bag are outside the box. Each group's model will look different.



How Does Water Get into a Reservoir?

3. What do you predict will happen when you spray water over your landscape?



4. Each member of your group should spray water gently over the landscape for about 10 sprays. Other group members should watch carefully as the water is sprayed. What do you observe?

5. Choose one body of water in your landscape and describe how rain is getting into that body of water.

How Does Water Get into a Reservoir?

6. Describe the ways that water fills reservoirs.

7. Pick up the plastic bag with the water in it. Dispose of the water down the drain or in a bucket. Dry the plastic bag with towels and fold it neatly.

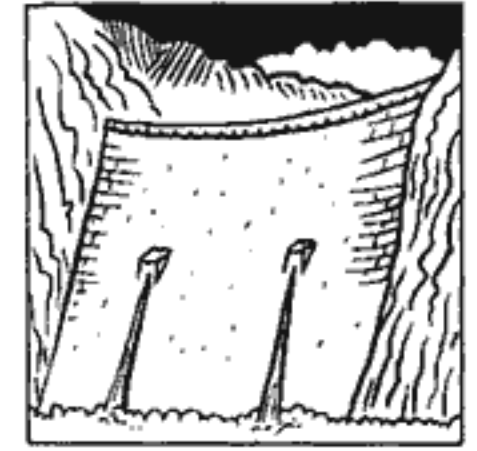
8. If the container is wet, dry it with a towel.

9. The newspaper can be used again if it is dry.

10. Return materials to your teacher.



Lesson 3 Reservoirs & Collecting Water



ACTIVITY 3-2 DESIGN A RESERVOIR

SUMMARY Using simple materials, students will discover how a reservoir is formed.

CONTENT AREAS science, social studies

GOAL to help students understand that you need a valley, mountains, and a dam to collect rainwater for a reservoir; to allow students to see and experience the formation of a reservoir

TIME one session

MATERIALS (for each group of 3 or 4 students)

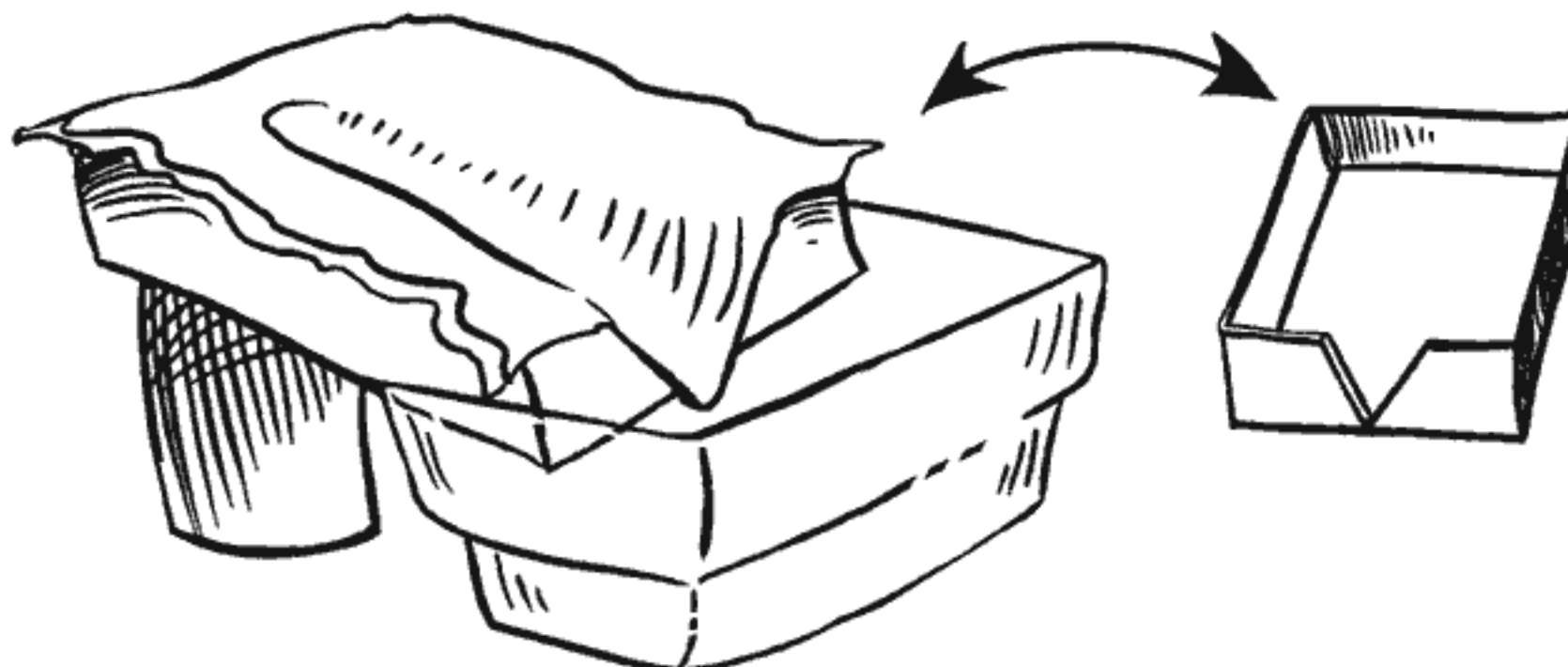
- cardboard box lid with a notch cut out (picture)
- white plastic bag ("kitchen size")
- newspaper
- spray bottle (kit)
- water with blue food coloring
- plastic container (kit)

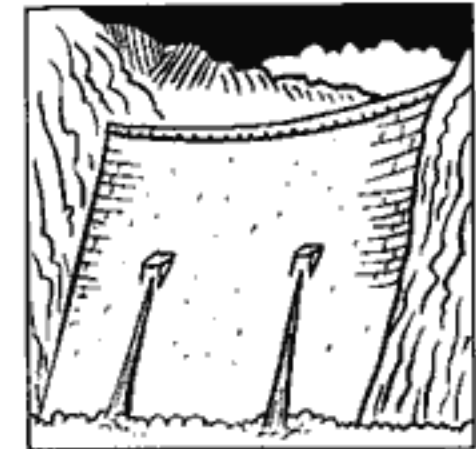
ADVANCE PREPARATION

- Prepare box lids.
- Fill spray bottles with blue water.
- Create student working groups.
- Copy student pages.

TEACHER PROCEDURE

1. Tell the students that they are going to create a landscape. It should resemble two mountains with a deep valley between them. The students will build inside a cardboard box lid with a notch cut out of the end. They will use newspaper for the bedrock and a plastic bag over the top. One end of the box should be propped up. The end with the notch should be over the plastic container. Each group should use a plastic container to collect water as it flows out of the box through the notch.





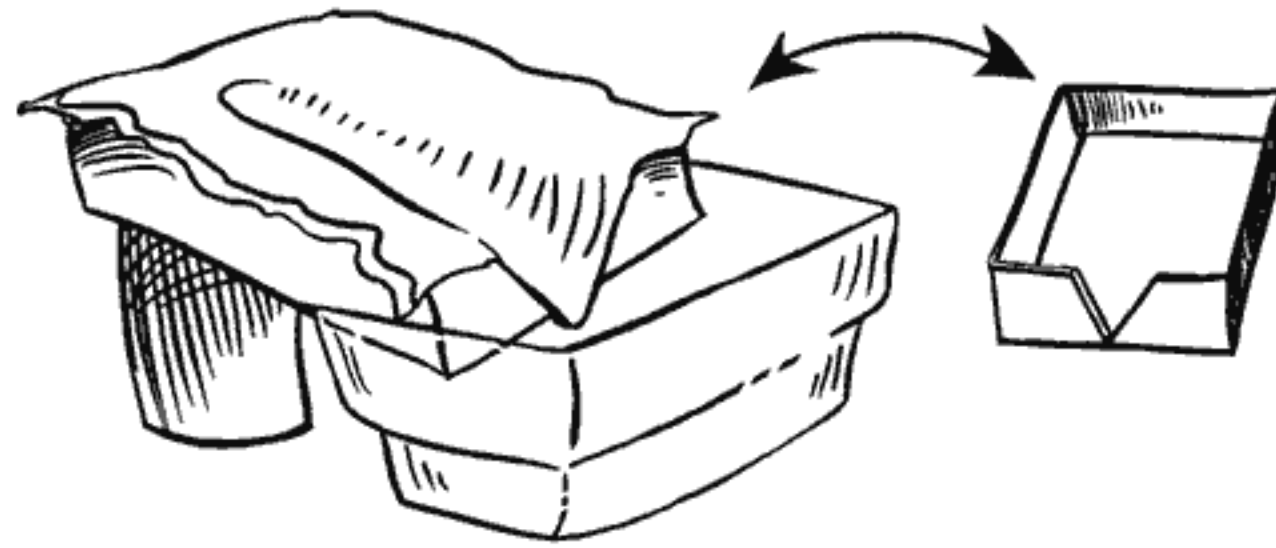
ACTIVITY 3-2 DESIGN A RESERVOIR

TEACHER PROCEDURE

2. Students should get their building materials and build their models.
3. Ask students to predict what will happen when they spray water over their landscape. They should record this prediction on the student page. (#2)
4. Give each group a spray bottle. They should spray water gently over the top and observe. They should record their observations on the student page. (#3)
5. Ask students to predict how they could change their landscape so that the rain could be collected and stored for drinking water. They should record their predictions on the student page. (#4) You may want to suggest or have materials available that the students can use to stop the flow of water.
6. Tell students to test their predictions by changing their landscape and spraying more rain. They should record their observations on the student page. (#5)

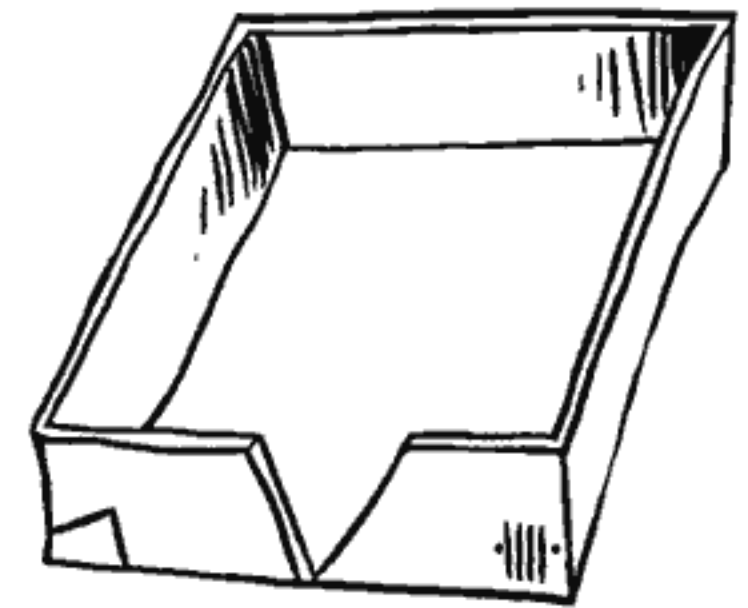


Design a Reservoir



Introduction How could you use the land to collect and store rainwater? Would you have to build anything? You will investigate these questions during this activity.

- Materials**
- cardboard box lid with a notch cut out
 - white plastic bag
 - newspaper
 - spray bottle with water
 - plastic container



Procedure

1. Use a plastic bag, newspaper, and a cardboard box to build a model of a landscape. You want your landscape to have mountains on the sides and a deep valley in the middle.
2. Prop up one end of the cardboard box. The end with the notch should be over the plastic container. Use words and pictures to predict what will happen when you spray water over your landscape.

Design a Reservoir

3. Spray water over your landscape to test your predictions. Describe what happens. (Use words and drawings.)

4. Describe (with words and pictures) how you might change your landscape to collect and store the rain to use for drinking water.

5. Test your predictions by changing your landscape and spraying water over it. Describe with words and pictures what you did to your model and how well it worked.

Design a Reservoir

6. Draw and describe your landscape. Explain why it is a good place to collect and store drinking water.



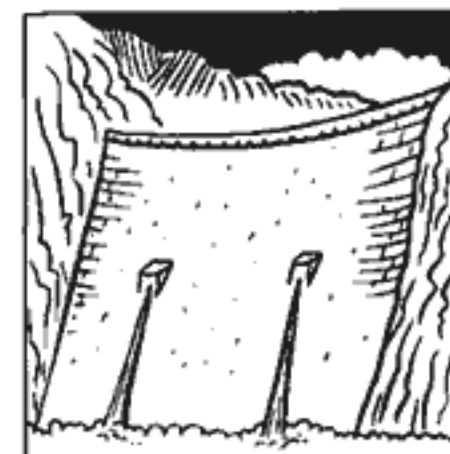
7. Remove the water from the plastic bag and dry it with a towel.

8. Save the newspaper if it is dry.

9. Dry the box if necessary.

10. Return the materials to your teacher.

Lesson 3 Reservoirs & Collecting Water



ACTIVITY 3-3 LETTING WATER SETTLE

SUMMARY Students will create model reservoirs from plastic 2-liter bottles and observe what happens to the materials they add. They will make predictions about what they think will happen as the reservoirs sit undisturbed.

CONTENT AREAS science

GOAL to help students understand that materials that do not dissolve in water settle to the bottom or float to the top

TIME one regular session and two short sessions

MATERIALS for each group of students:
-two liter bottle with the top cut off
-four small paper cups (kit)
-graduated cylinder (kit)
on materials table:
-water
-sand (kit)
-soil (kit)
-pebbles (kit)
-sticks (broken in small pieces) (kit)
-small scoopers (coffee or smaller) for scooping dry materials (kit)

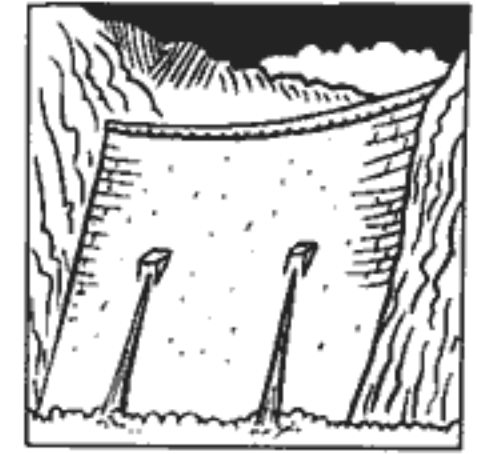
ADVANCE PREPARATION

- You may want to ask students to bring in 2-liter bottles.
- Copy student pages.
- Prepare materials table.
- Find location for reservoirs to sit for 24 hours.
- Create student working groups.

TEACHER PROCEDURE

1. Talk with students about reservoirs. (If your class has completed activities 1 and 2 in this unit review those.) Just as real reservoirs have more than just water in them, their model reservoirs will have various materials in them. Ask students how they think materials might get in reservoirs. Soil, pebbles, sticks, sand would all flow in through tributaries that help fill the reservoirs. What do students think will happen to those materials added to their reservoirs? Discuss this as a class.
2. Give each group four small paper cups and a 2-liter bottle with the top cut off. Distribute student pages.
3. Students should label their cups A, B, C, and D.

Lesson 3 Reservoirs & Collecting Water



ACTIVITY 3-3 LETTING WATER SETTLE

4. Beginning with cup A each group should send one student to the materials table to create the following mixtures for their group:
 - A.) Half scoop of pebbles + 25 ml of water
 - B.) Half scoop of sand + 25 ml of water
 - C.) Half scoop of soil + 25 ml of water
 - D.) Half scoop of sticks + 25 ml of water

They should follow all directions for mixture A before starting mixture B.

5. Remind students to make predictions on Recording Page One before they add each mixture to the reservoir. Once they have made and recorded each prediction on the recording page, they add each mixture and observe and record what happens. The mixtures are made with water to represent being brought in to the reservoir by a tributary. The amount of water is not important. They should only add a very small amount of each item to the reservoir. Don't worry if some of the material is left in the bottom of the cup.
6. Students will draw a picture of their reservoir with all of the materials added in the first space on Recording Page Two.
7. Students will predict what will happen if they leave the reservoir for one hour.
8. After one hour students will check their reservoirs. Remind students not to move the reservoirs.
9. Students draw their reservoirs in the second space.
10. The next day students should check their reservoirs again and draw them in the third space.
11. Meet with the entire class and let different groups report what they have discovered.
12. Have a class discussion about why the pipe that leaves the reservoir (the intake pipe) is located in the middle, rather than on the top or bottom. Also discuss why letting water sit in the reservoir for a long time helps to keep it cleaner.

Letting Water Settle

Introduction Reservoirs supply many people with the water they use every day. As water leaves the reservoir so that people can use it, precipitation and streams help refill the reservoir. What happens to the leaves, sticks, rocks, and soil that flow into the reservoirs with the stream water? During this activity you will find out.

Materials

- 2-liter bottle with the top cut off
- water
- 4 small cups for making mixtures
- graduated cylinder

Procedure

1. Your teacher will give you a 2-liter bottle with the top cut off and 4 small cups.
2. Label the cups a, b, c, and d. Label the bottle with your group member's initials.
3. Fill the 2-liter bottle with water. It represents a reservoir.
4. Find Recording Page One.

Letting Water Settle



5. Send one student to the materials table to get mixture A (half scoop pebbles + 25 ml water). Predict what will happen when you add mixture A to your reservoir. Record this prediction on Recording Page One.
6. Add mixture A to your reservoir and record your observations on Recording Page One.
7. Send one student to the materials table to get mixture B (half scoop of sand + 25ml water). Predict what will happen when you add mixture B to your reservoir. Record your prediction.
8. Add mixture B to your reservoir. Record your observations.
9. Send one student to the materials table to get mixture C (half scoop soil + 25 ml water). Predict what will happen when you add mixture C to your reservoir. Record your prediction.
10. Add mixture C to your reservoir. Record your observations
11. Send one student to the materials table to get mixture D (half scoop sticks + 25 ml water). Predict what will happen when you add mixture D to your reservoir. Record your prediction.
12. Add mixture D to your reservoir. Record your observations.

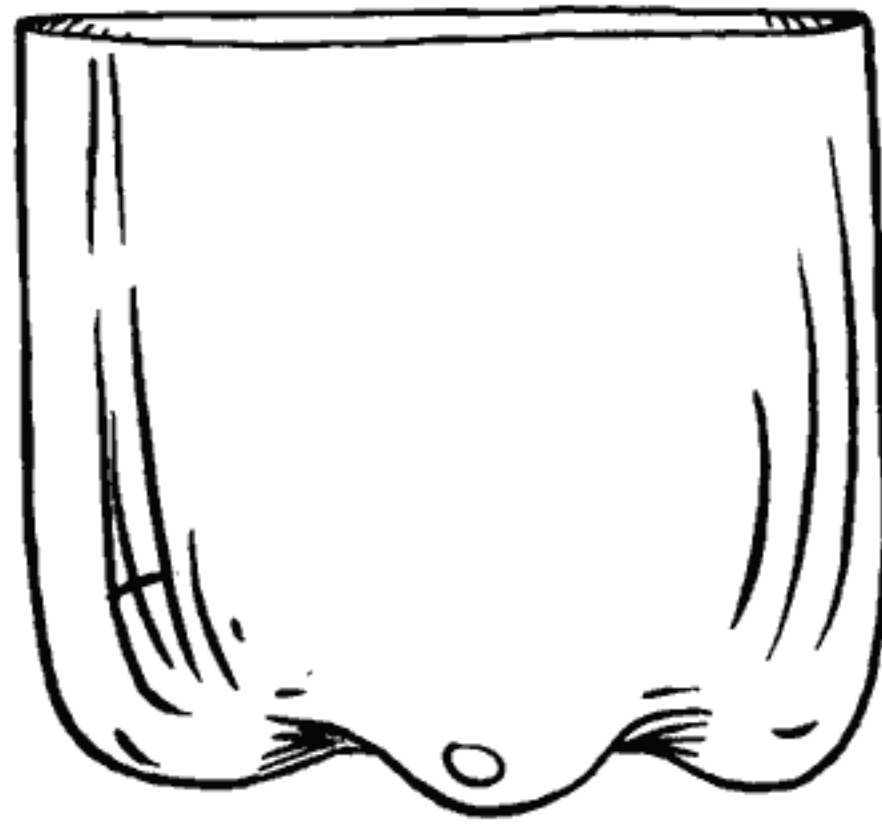
Recording Page One



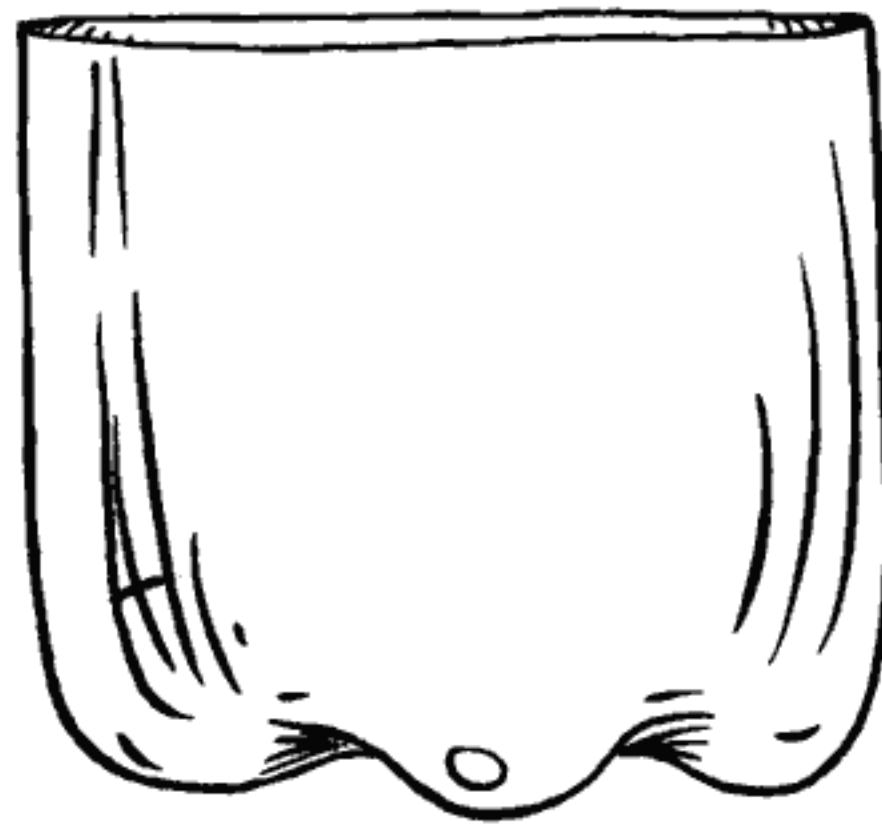
Mixture	Prediction	Observation
A pebbles + water		
B sand + water		
C soil + water		
D sticks + water		

Recording Page Two

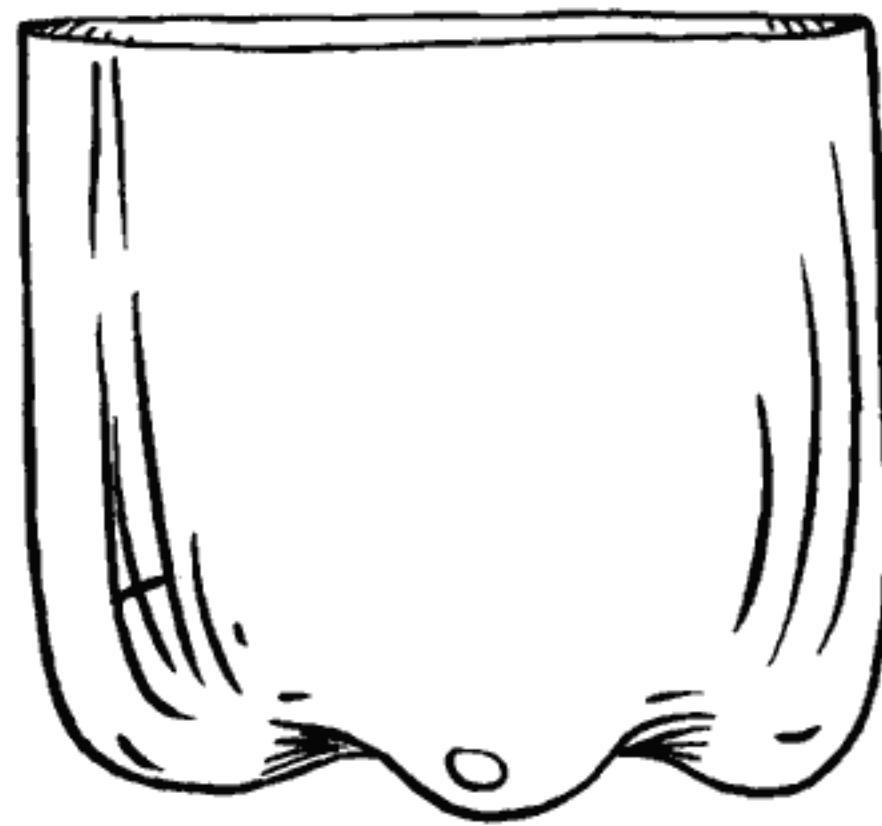
Beginning



One hour later



One day later



Letting Water Settle

- 14. Find Recording Page Two on the back of Recording Page One.
- 15. In the first space of Recording Page Two (beginning) draw a picture of your reservoir. Include all of the items you added.
- 16. What do you think will happen if you leave your reservoir for one hour?

- 17. Put your reservoir in a place where it won't be disturbed. You will leave it there for one day and check it twice during that time. It is important not to move your reservoir for the rest of the activity.
- 18. Check your reservoir after one hour. How has it changed?

Letting Water Settle

19. Draw a picture of your reservoir in the second space of Recording Page Two (one hour later).

20. What changes do you expect to see when you observe your reservoir tomorrow?

21. Check your reservoir the next day. Describe how it has changed.

22. Draw a picture of your reservoir in the third space of Recording Page Two (one day later).

LESSON 4 - THE WATER CYCLE



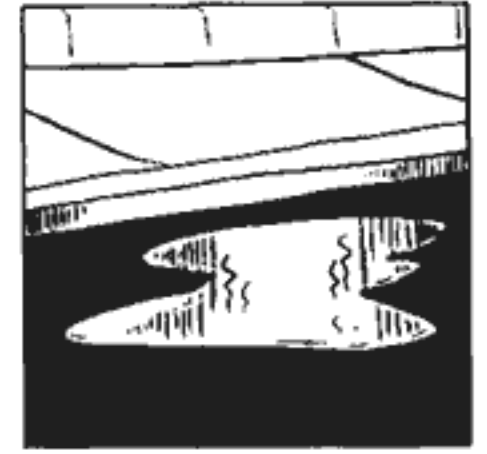
LESSON 4 - THE WATER CYCLE

Water has been cycling about our planet for several billion years, shaping the land and sustaining life. Earth's most basic forces, the sun's energy and gravity, deliver fresh clean water as rain and snow to higher elevations, then pull it down hill into rivers and ultimately to the ocean. Along the way it carries waste products (autumn's leaves, for example) to serve as raw material for other processes. Sometimes water's return trip is a quick one, as mighty rivers carry spring rain to the sea. Other journeys are longer, if it finds its way to deep aquifers or is locked frozen in glaciers or ice caps. But always the sun lifts water through evaporation, and gravity reclaims it as condensation. The water cycle embodies one of nature's most enduring balances.

"Rain" and "snow" are some of the earliest words we learn. As adults we remember that rain is part of the water cycle. But how did we learn about it? Did we memorize terms such as "evaporation" and "condensation" and only later apply a more complex grasp of these phenomena? Did we see a poster in the classroom, or fill in a worksheet with those words?

Puddle Poetry asks students to consider a familiar phenomenon: puddles. They observe puddles systematically and write poetry about them. Evaporation and Condensation moves the puddles indoors into petri dishes and adds substances, salt and gravel. Our World in Two Jars demonstrates condensation by closing the system.

Lesson 4 Water Cycle



ACTIVITY 4-1 PUDDLE POETRY

SUMMARY Through measurement and observation, students will discover what happens to puddles on a sunny day. They will write poems to describe what they discover.

CONTENT AREAS language arts, math, science

GOAL to become familiar with evaporation and the water cycle

TIME several short sessions during the day

MATERIALS

- puddles
- measuring tape or rulers
- clipboards for students will be helpful

ADVANCE PREPARATION

- Find location to do activity. If your black top area is very new it may be too smooth. You might want to use a plastic tarp for the puddles.
- Create puddles if necessary.
- Create student working groups.
- Students may want to wear boots.

TEACHER PROCEDURE

1. Investigate the parking lot or paved play area at your school. Find several spots where puddles form when it rains. Ideally you will do this activity the morning after it has rained, but you can also create your own puddles. During the activity students will measure the length and width of a puddle. Each student can determine where to measure the length and the width because the puddles will be shaped irregularly.
2. Bring students to the puddles. Several students can work at each puddle and measure together, but everyone should complete his or her own data form and poetry.
3. Have students look at their puddle. They should measure its length and width. They can measure any part of the puddle, but they must measure the same way each time. Then they should make other observations. After making and recording observations they can write the first line of their poem.
4. After an hour, they should repeat their observations and measurements and write the second line of their poem.
5. Repeat the measurements every hour or so for as often as possible during the day. After each measurement students should write another line to their poem.
6. You might want to have students check the puddles the next day.
7. After completing the conclusion section students should revise and complete their poems.
8. When students have written the poems on the puddle page they can be displayed in the classroom.