Exploring your catchment

» Lesson overview

In the previous lesson, the students identified the main sources of water in their community. In this lesson, students investigate how water flows through their local catchment.

The term 'catchment' is used to describe that area of land which is bounded by natural features, such as hills or mountains, from which all run-off water flows to a low point. Simple analogies are water in a bathtub flowing to the plug hole, or water that falls on a roof flowing to a down pipe. In a natural catchment area, the low point could be a dam, a river, an inland lake, or the mouth of a river where it enters the ocean. A single ridge defines a catchment's boundary.

Catchment areas vary in size and make-up. Large catchment areas, such as those drained by the Fitzroy and Burdekin rivers, are bordered by mountain ranges and include major drainage networks of creeks and rivers. Large catchment areas are made up of hundreds of smaller subcatchment areas. These may be bordered by low hills and ridges and drained by only a small creek or gully. Refer to the *Background Information for Teachers*, available at ‹www.nrw.qld.gov.au/waterwise/education/units/teacher_background.html›, for more details.

» Lesson objectives

In this lesson, students:

- investigate the features of catchments
- use maps to locate their local catchment
- build a model to investigate how a catchment works.

A catchment is the area from which a river, stream, lake or other body of water receives its water.

Remind the students to use full sentences in their journals.

» Preparation

- Prepare the area or table on which you will build your catchment model.

» Equipment

- groundsheet or polypropylene tarpaulin
- sandpit or grassy area where a mound can be built
- two buckets (one full of water)
- clear plastic tubing
- obstacles to shape a catchment landscape
- student journals

» Lesson steps

1. Ask students to identify where the water in your local creek or river comes from. Where does this creek or river flow to? Does it flow into another creek or river? Does this river flow into the ocean or towards the centre of Australia?
2. Use maps to trace the journey of your local waterway. Regional maps can be ordered online from the Department of Environment and Resource Management, Queensland at ‹www.nrw.qld.gov.au/products/products_online.html›. Students can sketch a map of their catchment in their student journal.
3. Discuss the meaning of the term 'catchment'.
4. With the students' help, build a model of a catchment. The catchment concept is much easier to understand when shown on a working model. Building a mini-landscape helps students understand how height, slope and aspect affect the flow of water.

Explore

You can extend this activity by testing the effects of different types of vegetation cover to produce or reduce erosion and silting of water storages.

To simulate a watercourse, encourage the students to build a sand or soil mound on the groundsheet on a grassy area, or on a table as in the diagram. Shape the sand to form a stream bed; you could mimic the shape of your local catchment. Cover the stream bed using a sheet of plastic wrap to prevent the sand being washed away. The model can be decorated with sprigs of vegetation to simulate the trees and plants in your catchment.

5. Ask the students to record in their journals what they predict will happen when the water flows down the stream bed. They might suggest that the water will flow downhill.

6. Place an empty bucket at the end of the stream bed to catch the water flowing out. Place the bucket full of water on the table near the beginning of the stream bed, and elevate it so it is higher than the model.

7. Completely immerse the plastic tubing in the bucket of water, allowing the tubing to fill to begin the siphoning process. Put your thumb over one end of the tube to seal it. Take this end of the tube out of the bucket and place it at the top of your 'catchment'. Release your thumb so that the water flows down through the model into the second bucket. The end of the siphon delivering the water to the model must be lower than the level of the water in the bucket. (Explore the workings of a siphon with students.)

8. Ask the students to observe what happens when the water runs through the model, and record their ideas in their journal.

9. If you have time, encourage the students to suggest ways to make the water run faster or slower and to test their ideas. Students can record their observations and ideas in their journals.

10. Ask the students to think about their local catchment. How does the water get into the stream or river? Discuss where the rain in your local catchment would fall to supply your local creek or river. Is it possible for groundwater in the catchment to find its way into the creek? Do any students know of a spring in the local area? Does it flow into a creek? Refer the students to Resource 4 to remind them that groundwater can seep out of the ground and replenish a stream or river.

11. Where does the water go after it leaves your local area? If necessary check the map of the catchment again.

12. Are there any bores, dams or weirs in your area? Place markers on the catchment model to mark the location of bores, dams or weirs. (Labels—card attached to toothpicks—could be added to the catchment model.)

13. Discuss where the water supply for your local community comes from. Ask the students to suggest where they might go to get answers to this question. Some sources of information include the local council, local catchment groups, your natural resource management regional body, or local staff of the Department of Environment and Resource Management, Queensland. Ask the students to identify examples showing how water is managed sustainably in your area.

14. If the use of groundwater is important in your area, you might like to test the rate at which water soaks into different surfaces as a scientific investigation (Resource 5).

Investigation—How long does water take to soak into different surfaces?

When rain falls on land, the surface run-off flows directly into gullies and streams; the rest soaks into the soil (infiltration). This activity investigates water run-off and infiltration on different surfaces and can be applied to catchment areas. In this activity, students place a tin can (with no lid or base) on a variety of ground surfaces and fill it with water to investigate the time taken for the water to soak into the surface.

In this investigation, the students are provided with quite a lot of scaffolding. If your students are seasoned investigators, ask them to design a fair test to investigate the research question. They will still need to critically evaluate their experimental design using the questions in Lesson Step 2.

» Equipment

For each team

- tin cans with both ends removed
- water
- stopwatch

Safety note: Ensure that the edges of the tin cans are not sharp.

» Preparation

Choose several surfaces around the school grounds:

- grass
- sand
- packed earth
- soil
- bitumen or concrete.

» Lesson steps

1. Ask the students to predict on which surface the water will soak into the ground in the shortest time. On which surface will the water take the longest time to soak into the ground? Over which surface will water move the fastest? Have them write down their ideas in their journals and explain briefly how they arrived at their predictions. Discuss their ideas with the whole class group.
2. Explain the procedure for this investigation to the students. Draw diagrams on the board to assist their understanding. Students then analyse the procedure by answering the following questions to determine whether this experiment is a 'fair test'.
   - Which variables are changed in this experiment? (the type of surface)
   - What variable is the student measuring in this experiment? (the time that it takes the water to soak in)
   - Which variables will be kept the same? (the size of the tin, the amount of water)
   - Is this experiment a fair test? (In a fair test, only one variable is changed.) In this experiment, the tin would have to be pressed into the surface to the same depth. Students may suggest that it is not possible to press the tin into the bitumen or concrete to the same depth, or that it is difficult to measure the depth to which the tin has been pressed into grass. Challenge the students to think more deeply and come up with additional ideas.

   Students can record their answers in their journal.

3. Students conduct the following experiment in cooperative teams of three. Allocate the role badges: Director, Manager and Speaker. (Refer to Appendix 1 in the Stage 3 unit materials from the Primary**Connections** program for additional information about how to organise for cooperative learning in science experiments. The materials can be ordered from the Australian Academy of Science at ‹www.science.org.au/primaryconnections/index.htm›.)

» Investigation

- Press a can into each of the surfaces (not possible on bitumen).
- Pour equal quantities of water into each of the cans.
- Time how long it takes for the water to be absorbed and record the time in the results table below. Add any other observations the team makes. Scientists repeat their experiments as many times as they can to check their results. How many times can the students replicate the experiment?

4. The students observe what happens to the water. Time how long it takes for the water to be absorbed and record the results in their journal.
5. The students write a discussion about the results in their journal. What do the results of their investigation suggest about the way that rain soaks in or runs off in a catchment? When the dam in a catchment needs filling, what surfaces would be most likely to provide good run-off to fill the dam?
6. The students discuss their results with the class. Is there a consensus on the results? Are there anomalous results? Why do the students think they had results that were different from those they were expecting? Did the investigation suggest additional research questions to investigate? In what ways could students have improved their experiment? Do the students feel that they repeated their experiment a sufficient number of times to be confident that the results are valid? Students record their answers in their student journal.

» Results

Surface	Time taken to absorb water	Comments
› Grass		
› Sand		
› Packed earth		
› Soil		
› Bitumen		