

Water journeys through our town—Part 1

» Lesson overview

In the previous lesson, students explored the uses of water in their home, school and community, and conducted a home water use audit. They also began to consider how they might create a promotional product about saving water. In this lesson, students investigate sources and destinations of water moving through their local catchment, and distinguish between groundwater and surface water.

If possible, arrange for a guest speaker to visit your class to explain water supply in your community. Before the expert's visit, students prepare questions they will use to interview the guest.

» Lesson objectives

In this lesson, students:

- collate the home water use survey data
- distinguish between firsthand and second-hand data
- identify their prior knowledge about water supply and distribution in their local area
- investigate the sources of fresh water in Australia
- prepare interview questions on water management to ask a guest speaker.

» Equipment

For the class

- butcher's paper or poster paper

For each student

- copy of 'Sources of fresh water in Australia' (Resource 4)
- student journal

About 30% of the water used in Australia comes from groundwater. About 44% of the total water used in Queensland comes from groundwater.

» Preparation

For a lesson in the near future, arrange for a guest speaker to talk to the class about the water supply in your community. If that is not possible, you or a colleague can play the role of the water supply 'expert' to whom students can address their questions. General information is included in the *Background Information for Teachers* section of this resource available at www.nrw.qld.gov.au/waterwise/education/units/teacher_background.html.

The best source of local information is your council water resource management staff. Ideally, the guest speaker could also talk about the work of the council to promote the Waterwise program in the community.

» Lesson steps

Collate the initial home water use audit results

1. Review students' responses written on their 'Home water use—Recording sheet'. Ask the students to share ideas or insights that they had while conducting the survey. Students record in their journal any ideas they could incorporate into their promotional product. Make sure that they also record the data or evidence used to draw any conclusions.

2. Ask the students to suggest ways that the class might collate the information from the home water use survey so that it can be used as data for the design of their promotional product.
3. Discuss the advantages of using a table to organise data. Choose a method to collate the data and make a class 'Home water use results table' on a large sheet of paper or an overhead transparency. Students will need to copy the results table into their journal. Keep the results table (chart or overhead transparency), as students will need to refer to it throughout the unit, and at the end of the unit for their reflection assessment task.
4. Highlight the difference between firsthand and second-hand data. (The survey data is firsthand data because the students collected the data themselves. Data collected by another class would be second-hand data).

Where does our drinking water come from?

5. Explain to the students that the focus of the rest of this lesson will be on safe drinking water. Ask students to brainstorm and share ideas about safe drinking water. Ask students to think about the following questions, and to write their initial ideas in their journal under the heading 'My first ideas'.

Some questions could include:

- Where does the water that supplies our community come from?

- How is it stored?
- Where do the toilet pipes at home go?
- Where does water go when it leaves your home and your school?
- Where does the rain landing on your roof at home go? Where does it end up?
- Where does the rain from your school roof go? Where does it end up?

Firsthand data is collected by the students themselves; second-hand data is collected by other people.

Use a whole-class discussion about these questions to begin the 'What we think we know' column of a KWL chart about 'How does the water flow through our community?' Create the chart on a large piece (or pieces) of poster paper and attach it to the wall. Ask students for questions to add to the 'What we want to learn' column.

Encourage students to add to the 'What we want to learn' column as new questions occur to them. Keep this list and refer to it as questions arise. At the end of the unit, review the unit by completing the last column.

6. In the discussions about sources of water, clearly differentiate between groundwater and surface water supplies for communities; acknowledge the importance of rainwater tanks as the main water storage for many communities.

How does the water flow through our community?

The KWL chart

The KWL chart		
what we think we Know	what we Want to learn	what we Learned

A KWL chart is a graphic organiser for students. The charts lists what students think they Know, what they Want to learn and what they have Learned in the unit. Note that a variation on a KWL chart is presented in Unit 2.

Discuss the fact that, in some areas, water sources could include 'manufactured water', a term that includes desalinated water and purified recycled water. Also, washing water can be reused as greywater in the garden; stormwater run-off can be harvested for landscape use.

Discuss the meaning of the term 'sustainability'. A universal definition of sustainability from the Brundtland Report, offered by the United Nations, is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. It is acknowledged that the definition for sustainability varies from country to country and from community to community. <www.un.org/Pubs/chronicle/2007/issue2/0207p58.htm>. Ask the students to identify ways that water can be used more sustainably in your community.

7. Ask students to read the fact sheet 'Sources of freshwater in Australia' (Resource 4) and identify the important differences between surface water and groundwater. Have them record their ideas in their journal and discuss their answers as a class group.

A kitchen timer with an alarm is a good signal to students to move to the next phase of the task.

Interview preparation

8. Before the guest speaker visits, students could construct and record their questions in their journal. Encourage students to ask open-ended questions that require an explanation, rather than closed questions that require a 'yes' or 'no' answer.

The students can use a Think-Pair-Share strategy to refine the quality of their questions. You can allocate a set time, such as two minutes, for each phase of the activity.

9. Ask a speaker from each team of four students to present their questions to the class; collate the questions on butcher's paper into a class list. Students can add new questions to this list as they arise from discussions. Prompt the students to ask questions about how the council manages its water supply sustainably.
10. Allocate the guest speaker questions to individual students; ask them to record their question in their journal. Check that each student has a different question.
11. The students could practise asking their question with a partner to develop confidence. Remind the students that they need to look at the guest when asking a question, and that the volume and pace of their voice needs to be appropriate.
12. Recruit a student to welcome the guest speaker, and another student to thank the guest speaker at the end of their visit. The student who welcomes the guest should prepare by asking the guest their name, title and the type of work that they do. The student will present this information to the class in their welcoming speech.
13. The student thanking the guest should summarise a number of key points from the guest's presentation, state some ways in which the guest's presentation helped the class, and thank the guest for their presentation.

Resource 4

❖ Sources of fresh water in Australia

Australia's freshwater comes from surface water (rainfall and run-off into streams and rivers), and groundwater (water from underground sources).



» Surface water

Surface water includes greywater, blackwater, recycled water and stormwater that falls on roofs. Water from any or all of these sources may be collected by being directed into recycled water tanks; pumped directly from rivers and creeks; or collected from lakes, dams and weirs. To ensure a reliable water supply during periods of drought, Australians have built large water storages called dams or reservoirs. In fact, Australia stores more water in dams per head of population than anywhere else in the world. The environment also needs water when rivers are dammed or regulated; the river ecosystems are affected because their normal seasonal flows are altered.

For many Queensland towns and cities, water is collected from surface run-off into dams. During severe droughts, the levels in many supply dams fall well below their capacity.

Another source of water run-off is roofs. In many places, people are being encouraged to collect water from their roofs and store it in water tanks installed on their property.

The residents of South East Queensland have been faced with diminishing dam levels for some years now; in 2007 the combined levels for the three major dams in the region were critically low, dropping to 17% of water-holding capacity.

» The Great Artesian Basin

The Great Artesian Basin is one of the largest aquifers in the world. It underlies approximately 23% of Australia and extends beneath arid and semi-arid regions of Queensland, New South Wales, South Australia and the Northern Territory, stretching from the Great Dividing Range to the Lake Eyre depression. The term 'artesian basin' means an aquifer in which the stored water is under pressure.

The natural pressure in the Great Artesian Basin pushes water to the surface. Many bores in this area flow freely. The water can be very hot if it comes from great depths, and towns such as Thargomindah in western Queensland have to cool the bore water in ponds before it can be piped to houses.

People not living in the Great Artesian Basin area may be able to use a bore, but have to pump their water to the surface because there is not enough natural water pressure. Bores supply water to many towns and cities.

About 30% of the water we use in Australia comes from groundwater. Our groundwater is generally of good quality, but it can become polluted or contaminated from leaking underground petrol tanks and seeping rubbish tips or septic tanks, or when too much fertiliser or pesticide is applied to fields or lawns. Salinity is another problem lowering the quality of some of our groundwater supplies.



❖ Sources of fresh water in Australia



Australia receives little more than 1% of the world's water run-off, yet occupies 5.6% of the total land mass.



» Groundwater

When rainfall soaks into the soil, the water seeps down into the ground because of gravity. It passes between particles of soil, sand, gravel or rock until it reaches a depth where the ground is filled, or 'saturated', with water. This process is called 'recharge'.

The area that is filled with water is called the saturated zone; the top of this zone is called the watertable. The watertable may be very near the ground's surface, or tens to hundreds of metres below. Groundwater is stored in the spaces between the rock particles in materials like gravel and sand. In this case, the earth acts like a big sponge, holding all that water in aquifers (underground zones and layers where water is stored). Water can also move through porous rock formations like sandstone, or through cracks in rocks.

Once rainwater has moved underground, it does not stop there. The groundwater moves slowly through the spaces and cracks between the soil particles on its journey deeper into the ground. When the water reaches a layer of rock or clay that it cannot move through (impermeable layer), it then travels sideways through the ground along the top of the impermeable layer.

This movement of water underground is called groundwater flow. Eventually, after years of underground movement, the groundwater may come to the surface again (discharge area) where it can enter a lake or stream. Eventually, the water will be evaporated and begin the cycle over again.

Water stored in underground aquifers can be pumped to the surface by a windmill, or flow out under its own pressure through a bore. This groundwater from aquifers often has to be treated before it is piped to houses as drinking water. Untreated bore water can be used to irrigate crops.