

WHITEMAN PARK
Children's Gnangara
**GROUND
WATER**
Festival 2024

Groundwater Guru

2024 Teacher Resources Book 4

GROUNDWATER

SOIL

WETLANDS

GROUNDWATER AND THE DREAMTIME

SALINITY

GROUNDWATER POLLUTION

WASTEWATER

WATER FOR OUR FUTURE



WHITEMAN PARK
CONSERVATION • RECREATION • EDUCATION

Welcome

Firstly, we would like to officially welcome you and your class to the 2024 Children's Gngangara Groundwater Festival.

As a unique and inspiring education event, we want the Festival to be a fun and educational day of activities for your students. To maximise your students learning in the lead up to the Festival and help you with activities to use in the classroom, we have developed this education resource, the Groundwater Guru.

While you can certainly treat the Festival as a "stand-alone" experience for your class, it can also be the focal point for a variety of related lessons and classroom activities, before and/or after the event. The Guru will provide you with comprehensive background information on groundwater, especially relating to the topics of:

- what the water cycle is,
- soils and how they affect groundwater,
- Noongar culture and the Dreamtime,
- salinity and groundwater pollution,
- water conservation.

All activities are linked to the curriculum.

We look forward to seeing you all at the Festival!



Acknowledgements

Whiteman Park simply wouldn't be able to offer this unique event without the support of our long-term major sponsor, the Department of Water and Environmental Regulation.

The provision of environmental specialists and educators from a large number of government and private stakeholders to help present the workshops and activities to classes is also critical to the event's success.



Government of **Western Australia**
Department of **Water and Environmental Regulation**

About our sponsor

The Department of Water and Environmental Regulation supports Western Australia's community, economy and environment by managing and regulating the state's environment and water resources.

We plan and manage the availability and quality of water throughout WA to support the state's growth and development.

As a part of our role we investigate the state's water resources to understand how water interacts with the environment. We use this information to decide how much water can be used and what it can be used for. The department also works to protect waterways and water-dependant environments.

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ssshhh... ANSWERS ARE ON PAGE 23

Note to Teachers

There is a global recognition amongst environmental and political leaders of the need to educate young people about the importance of groundwater and how groundwater connects to all other resources.

For your students to make the most of their attendance at the Children's Gnangara Groundwater Festival it is important for them to develop an understanding of the concept of groundwater and how precious a resource it is.

This resource book has been designed for all year levels attending the Festival, from years 4 to 6. Some activities may not be appropriate for the year level that you are teaching, so please adjust activities accordingly.

The activities given for each section are intended to develop your students understanding of the topic.

A great way to make the most of this topic is to start a Groundwater Activity Book (GAB) for the students to record all their learning throughout the topic.

The first activity that is recommended is a KWL chart.



Activity



Activity Sheet

Did you know?

Western Australia uses 71% of all its water supplies for residential use.

Hydrology is the science of looking at water on land.

70% of the world's freshwater resources are contained in ice and snow.

Fresh surface water is scarce, this makes groundwater an important source of water for Perth.

Education about water –
the **world's most precious** resource
– is of **global concern**.

What is wastewater?

Wastewater is all the water that goes down the drain, including water from your shower, toilet, kitchen sink, dishwasher, bathroom, washing machine and laundry. This wastewater is collected in sewers and transported to a treatment plant. In Western Australia, over 450' million litres of wastewater is created every day. The majority of the treated wastewater is then released into the sea.

Recycling this water offers a reliable and sustainable water supply for the future.

Down the drain

Damage to home and water waste systems is often caused by people flushing the wrong things down the toilet or pouring them down the sink. But how do we know what is safe for our drains and what isn't?

- Oils and fats cause around 30% of all blockages in the water waste system. Instead, seal the oil/fat in a container and dispose of in the rubbish bin.
- Chemicals are hazardous and can remain in the water even after treatment. Contact your local council to find out where your nearest hazardous waste drop off point is.
- Unused medicines can remain in the water and make their way into the environment. Always return unused medication to a pharmacy for safe disposal.
- Food scraps can cause blockages in the water pipes and should be disposed of in a compost bin.

To flush or...

- ✓ toilet paper
- ✓ pee
- ✓ poo

Not to flush

- ✗ nappies
- ✗ hygiene products (including cotton buds)
- ✗ unused medicines
- ✗ wet wipes/ baby wipes
- ✗ fish

Useful wastewater websites and videos

Melbourne Water: Video 'Can you flush it'
melbournewater.com.au/media/13526

Microplastics in Estuaries poster
scseagrant.org/wp-content/uploads/Microplastics-in-Estuaries-poster.pdf

Upworthy Voices: Anna Du is Saving Our Oceans!
youtu.be/ZWN2U0xWsSQ

Water Corporation YouTube:
"Inside a wastewater treatment plant"
"What happens at an Advanced Water Recycling Plant"
"Looking after our wastewater system"
youtube.com/Watercorpwa



Then what?

After you flush the toilet or pull out the plug what happens to the water? Once the wastewater has left your home it moves through part of the 17,280 km of wastewater pipes in Western Australia until it arrives at one of the wastewater treatment plants where it is recycled.

Recycled? How do you recycle water?

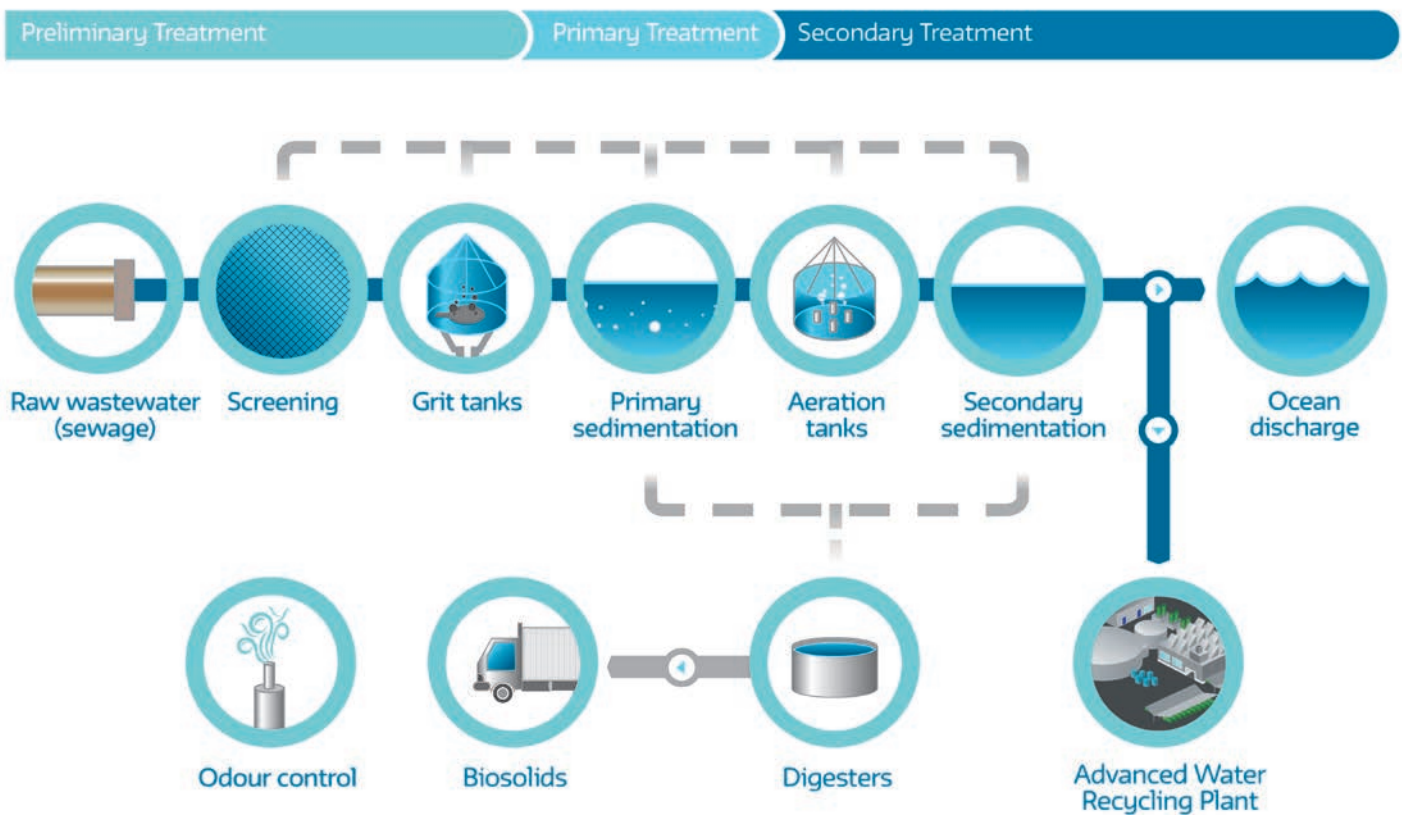
By treating wastewater! The treatment of wastewater is done according to strict health regulations. The first steps remove the large objects by passing the wastewater through filter screens and into large settling tanks, where the remaining solid matter sinks to the bottom to form sludge. Oxygen is used to encourage the growth of microbes which break down organic matter.

Once the water has been through these steps, it can either be used to irrigate recreational areas, re-used by industry or used for specific irrigation purposes where some water will permeate back into groundwater supplies and some will evaporate.

Groundwater replenishment

Australia's first full-scale groundwater replenishment scheme opened in Perth in 2017. Wastewater is treated at an Advanced Water Recycling Plant until it meets Australian guidelines for drinking water. This treated water is then pumped back into the ground to recharge the Leederville and Yarragedee aquifers. These deep aquifers will store high quality recycled water until it is needed, while also ensuring superficial aquifers like the Gnangara Mound will not be overused, leaving more water for our environment.

Wastewater Treatment Process



Courtesy of Water Corporation

Links at a glance – Wastewater

ACTIVITIES	5 Es					Delivery			Science								Science Inquiry Skills			HASS	Cross Curriculum Priorities					
	Engage	Explore	Explain	Elaborate	Evaluate	Individual	Small groups	Whole class	Biology	Chemistry	Earth and Space	Nature and Development		Use and Influence			Questioning and Predicting			Geography						
Activity 34: Wastewater KWL	●					●		●	Y4	ACSSU074	ACSSU077	ACSSU095	ACSSU075	ACSH061	ACSH098	ACSH062	ACSH083	ACSH100	ACSI064	ACSI231	ACSI232	Y4	ACHASSK090			●
Activity 35: Treat This!	●						●	●	Y4	Y4		Y6	Y4	Y4	Y6	Y4	Y4	Y5	Y6		Y5	Y6	Y4	Y4		●
Activity 36: Microbead Examiner		●					●		Y4	Y4	Y4			Y4		Y4	Y4	Y5		Y4	Y5	Y6	Y4	Y4		●
Activity 37: How Degrading			●			●		●	Y4	Y4	Y4	Y6		Y4	Y6	Y4	Y4	Y5	Y6	Y4	Y5	Y6	Y4	Y4		●
Activity 38: Reducing Microplastics				●		●			Y4	Y4	Y4	Y6		Y4	Y6	Y4	Y4	Y5	Y6	Y4	Y5	Y6	Y4	Y4	Y4	●
Activity 39: FICIRIBI					●	●				Y4	Y4	Y6			Y4	Y4	Y4	Y5	Y6				Y4			●



Wastewater KWL

On a piece of paper or in their GABs, have the students draw up a 'KWL chart' (know, want to know, learnt).

Get your students to fill in the first column (Know) with all the information that they already know about wastewater before studying the topic further, and in the second column (Want to know), fill in all the information that they would like to learn about.

As a class, collate a list using their individual responses to determine what the class wants to learn.

Leave the last column blank (Learnt) and fill this in after the Festival. This will be for the students to list what they have learnt about wastewater and to reflect on the topic.

Treat This!

AIM

Students will be able to see how we create wastewater and how it needs treatment to be reused.

MATERIALS REQUIRED

- Clear containers
- Pollutants:
 - Coffee grains
 - Liquid soap
 - Plastic beads
 - Tissues
 - Vegetable oil
- Filter materials:
 - Activated charcoal
 - Coffee filters
 - Gravel
 - Mesh fabric
 - Sand

PROCEDURE

1. Explain to the class that water that enters our homes is clear, but when it leaves our house as wastewater, it is not clear.
2. As a class create wastewater by adding coffee, oil, soap, tissues and plastic beads to water in a clear container and talk about how these could get into our water at home.
3. Divide the class into groups and give them the challenge of creating a water filter from the materials provided. Note: the students will need to reserve some 'wastewater' to compare their filtering results.
4. Explain that it is a good idea to create several filters, starting with filters that catch large particles first, then moving to something that catches smaller particles.
5. Compare the filtered water after several filtering attempts with the student's wastewater.
6. As a class, discuss how they could reduce creating wastewater at home in the first place.
7. Finish by watching some of the Water Corporation's videos on how water is cleaned on their YouTube channel ([youtube.com/Watercorpwa](https://www.youtube.com/Watercorpwa)).



Microbead Examiner

AIM

Microbeads are a microplastic that is easily washed out to see, as they are too small for water filtration and treatment plants to collect. In this activity, students will get to determine first-hand, just how many microbeads can be found in a single tube of product containing these microplastics.

MATERIALS REQUIRED

- cosmetic product that contain microbeads
- petri dishes
- magnifying lens or a microscope
- tap water
- dishwashing detergent
- coffee filter
- cup

PROCEDURE

1. Break your class up in to groups and give them a tube of product containing microbeads.
2. In their GABs, get your students to write down the name of the product you are investigating and what the microbead is listed as in the ingredients. Common names for microbeads include:
 - Polyethylene (PE)
 - Polypropylene (PP)
 - Polyethylene terephthalate (PET)
 - Polymethyl methacrylate (PMMA)
 - Nylon (PA)
3. Add 5ml of the product to the petri dish. Ask your students to write down what the product looks like before examining it under the microscope.
 - What colour is it?
 - What does it feel like?
 - Can you see or feel the microbeads?
4. Now place the petri dish under the microscope and get them to write down these observations. Can they see the microbeads now?
5. Through the microscope, ask your students to try and count how many microbeads are in the 5ml sample of their product.
6. Next, scrape the product into a cup half filled with tap water and add 5ml of dishwashing detergent.
7. Stir the mixture around for one minute and then, over a sink, carefully pour the mixture into the coffee filter. The coffee filter should retain the microbeads.
8. Either with the naked eye, or under the microscope (depending on how small the beads are) count how many beads were in the 5ml of product that they started with. Can they estimate how many beads would be in the whole container? Get your students to write their estimates in their GABs.
9. Reflect as a class on the impact that this one product could have on the environment if everyone in the class used a similar product.



How Degrading—The Toilet Tissue Test

AIM

Toilet paper is a common additive to our waste water, but we often don't consider what happens to it once it is flushed down the toilet. This toilet tissue test allows students to study what happens to toilet paper once it is flushed down the toilet.

MATERIALS REQUIRED

- 2 jars
- 2 different types of toilet paper – suggestion: include something that has an environmental claim such as “recyclable”, “contains oxygen bleach” (rather than chlorine bleach), etc.

PROCEDURE

1. Place one type of toilet paper in each jar and label before filling the jars with the water. Give the jar a good shake (suggest ~20 times) to replicate the process of the toilet paper being flushed and travelling through the wastewater system.
2. Get your students to make an observation in their GABS book about what happens immediately after the toilet paper has been ‘flushed’.
3. Leave the jars for one week and have the students observe and record their observations again.
4. Then get your students to draw their conclusion about which type of toilet paper is the most environmentally sound (easiest to treat at the treatment plant).

Note: Materials that stay together in larger pieces are easiest to treat at the treatment plant as they can be removed in the early screening stages. Small slushy pieces that contain dyes involve chemical removal.



Reducing Microplastics

Match the action with its corresponding information explaining how it helps reduce microplastics.

Check the label -
what material is it made of?

Skip the spin cycle

Wash less

Do you really need it?



Use shorter wash cycles

Don't tumble dry clothes!

Use a filter!

Reduce your use of
single use plastics

Check the ingredients
of your products

Wash at 30 degrees
or less

Use a neutral
washing detergent

The washing machine spin cycle creates friction between the garments in the load, releasing microfibrils.

The less plastic used means there is a reduced risk that your plastic waste will end up breaking down in our waterways.

Try to find a product that protects clothes in the wash from releasing microfibrils, or attach a filter to the water outlet to collect the fibres.

Read the fine print of cosmetic products and toothpastes to avoid microbeads. You can also write to the company of your favourite products and ask them to stop using microbeads in their products.

Try to avoid synthetic materials such as polyester, acrylic and nylon.



Harsh washing powders and bleach can contain mineral abrasives to break down stains and cause friction in the clothing, releasing more particles. A detergent with a neutral pH value will be gentler on your clothes.

Water combined with heat weakens the yarn which releases more plastic particles.

The longer you wash your clothes, the more plastic fibres are released.

Tumble dryers are also a culprit of creating microplastic pollution from the heat and the force inside the dryer. Air drying is best.



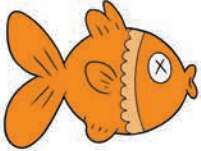
Air out your clothes and wash stains by hand to reduce how often you need to wash.

Aim to buy less and check if you actually need it!



Flush it, Compost it, Recycle it or Bin it?

Draw a line from each product to where it SHOULD be disposed.



Gold fish



Wet wipes



Oil



Paper bag



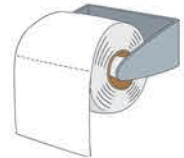
Plastic bottle



Pee (urine)



Poo (faeces)



Toilet paper



Nappy



Cotton buds



Lolly wrapper



Newspaper



Coffee cup



Paper hand towel



Apple core



Tea bag



Not all water is freshwater

Look at a picture of the Earth. What do you see?
Lots of big blue oceans, right?

Despite having vast areas of our planet covered in water, just 2.5% of all water sources are actually 'fresh water', and less than 1% is accessible and available for human use.

In Western Australia, demand for water is higher than ever before. Our increasing population, drying climate and limited rainfall in the southwest doesn't help.

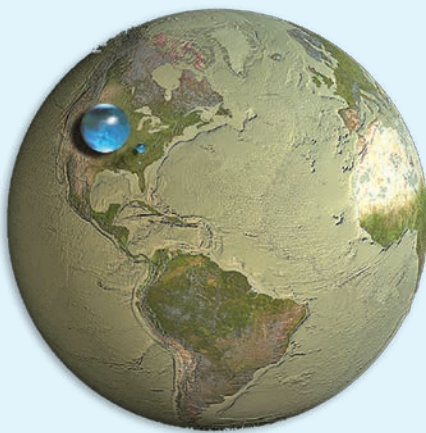


Image courtesy of the USGS Water Science School; illustration by J. Cook, Woods Hole Oceanographic Institution.

This illustration represents all of the water on, in and above the Earth. The largest sphere is all of Earth's water, including oceans, ice caps and the water in living beings like humans and plants. The mid-sized sphere is the total amount of fresh water on Earth. The tiny little dot, which you can barely see, represents the total amount of fresh surface water; the water sources easiest and most likely to be used by people and life on Earth.

Since 1980, **groundwater levels** across the Gnangara aquifer have **fallen** by up to **10 metres** in some areas!

Climate change in Perth

Until the 1970s, Perth's drinking water came from rainwater runoff into our dams, which collected around 420 billion litres of water a year. Climate change has caused average annual rainfall in Perth to decline by 15 per cent since 1975 and this reduction is expected to get worse. Today, our dams receive just 73 billion litres – a vast difference.

With less surface water available, groundwater has been an important water source in Perth. But groundwater is also suffering from the decline in rainfall to recharge the aquifers and the water table is dropping. With such limited fresh water sources available, it is important for all Western Australians to participate in water saving behaviours to help conserve our water for the future.



If the **Earth** was the size of a **basketball**, then all of the world's water would fit in a ping pong ball!

Water conservation

Water is a necessity for life, but it has to be used wisely. The best way to ensure Perth has enough water is to use less – this is the cheapest and most environmentally friendly solution to our water problem. At home, it is estimated that 40% of water is used for gardening and over 50% inside the house. There are many practical ways that water use can be reduced, to help conserve our resources. Many of these you would have heard of before, but how many are you actually doing?

- Take shorter showers. Aim for 4 minutes or less (a shower timer is a great reminder for this!).
- Install low-flow showerheads and water-efficient appliances.
- Use containers to catch the warm-up water when you're waiting for the hot tap to get hot. Store the containers nearby and use it to water indoor plants, pot plants and the garden.
- Insulate hot water taps. This helps to avoid wasting water while waiting for the hot water to flow through, as well as saving energy (a double win!).
- Set your hot water thermostat so that you don't have to add cold water to it to cool it down.
- And the easiest of all... turn off the tap while you're brushing your teeth!

You can also visit the Water Corporation website for more water saving ideas.

Sustainability

Ensuring that we have adequate fresh water supplies both for our requirements now and for use in the future is a challenge we currently face in Western Australia. But new technologies are allowing us to use and reuse our water sources creatively. There are three main ways that we are doing this in WA:

- Wastewater recycling: treating waste water so it can be reused to water parklands and sports grounds, added to wetlands, used in our home for flushing toilets and clothes washing or to water non-food crops. Currently, recycled water is not suitable for drinking.
- Groundwater replenishment: returning treated wastewater to our groundwater aquifers to help slow groundwater decline and store water for the future.
- Desalination: removing salt from seawater to produce fresh water. Over 40% of Perth's water supply is now desalinated seawater. Even more of Perth's water will come from desalination in the future.



Waterwise gardening

Green spaces and gardens around our home contribute to our wellbeing, as well as cooling the area and providing much-needed homes for wildlife, making them important to maintain. But how can we continue to have gardens AND still save water? That's where waterwise gardening comes in: designing and planting your gardens to use the least amount of water possible!

Here are some ideas:



Choose mainly 'waterwise' plants. Local native plants are already adapted to the area's climate and soils. In Perth, this means that can thrive with very little water. There are also many 'exotic' plants that are suitable for Perth's long, hot, dry summers.



Use mulch! A thick layer of mulch can cut water needs in half by reducing evaporation. It acts much like a jacket does to keep you from losing heat, but instead, stops your plants from losing water.



Collect rainwater or warm-up water for plants. Rainwater tanks can collect water in winter that can be used to water your garden in summer. And while you wait for your shower to warm up to a nice temperature, use a bucket to catch the cold water and use that to water your plants!



Reduce the size of your lawn. Grass lawns are one of the thirstiest type of plants you can have!



Improve your soil. If soil has large particles (sand) water passes through rapidly. Adding compost or manure will help your soil to better hold moisture and nutrients. This means you also won't need to use chemical fertilisers which can contaminate groundwater.



Water efficiently by making the most of the water you use! The best time to water is at dawn when evaporation will be less. You can also use drip or soaker hoses to deliver water to the root zone, meaning less water is lost through evaporation. And of course, turn off those sprinklers in winter!



Plan your garden so plants with the same water needs are together. This is called 'hydrozoning' and will make it easier to deliver the right amount of water for your plants' needs so you don't overwater.



Links at a glance – Water for our Future

ACTIVITIES	5 Es					Delivery			Science								HASS				English	Cross Curriculum Priorities																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Activity 40: What's the Problem?	●					●		●	Y4	ACSSU073		Y4	ACSSU043	Y6	ACSSU094	ACSSU074	ACSSU095	ACSSHE061	ACSSHE098	Y4	Y4	Y4	Y5	Y6	ACHASSK119	ACHASSK120	ACHASSK149	ACHASSK150	Y4	Y4	Y4	Y5	Y5	ACHASSK113	ACHASSK112	Creating texts	Sustainability																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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What's The Problem?

As a class, watch the ABC News story, '*Hard decisions needed to solve Perth's dwindling ground water supply*'.

Link: <https://www.youtube.com/watch?v=OyhHK9lfXU>

After watching, ask your students to recall what they learnt from the video. Discuss the following questions:

- Why is groundwater declining in Perth?
- What problems will this cause?
- What solutions were shown for how to solve this problem?
- Who did not want to reduce their bore water use? Why?
- Which solution do you think is better?
- Can you think of any other ideas?

Looking at Rainfall

Set up a rain gauge in the playground at school and measure the amount of rain that is collected each week. Use a chart in the classroom to record the rainfall. After a few weeks, ask your students if they can see any patterns that have occurred.

Compare your schools' rainfall record with that of other states in Australia and compare any differences in that state's environment with ours.

Discuss with your students what issues Australia faces for our water supply with our increasing population.

Water at Home

As a class, get your students to brainstorm all the ways that water is used in the home by themselves and their family members.

In their GABs, get your students to draw a table and write down the list of ways water is used at home. Ask each student to monitor their water usage at home by counting how many times each activity happened over the course of one week. Pick a timeslot to work with, such as between 7.00am and 8.00am or 5.00pm to 7.00pm.

At the end of the week, get your students to tally up their results and present the information in a graph. From this information, ask your students to brainstorm ways that the amount of water used for each household activity is reduced.



Waterwise Gardening

TEACHER INFO

This activity allows students to apply their learning on saving water in a practical exercise. They will research waterwise plants and design a waterwise garden.

INTRODUCTION

Before beginning this activity, remind your students that 40% of the water used in Perth households is used on the garden.

Ask them what ideas they have for saving water in the garden, then introduce them to some of the ways you can save water listed in the Groundwater Guru teacher resources. You can also find some handy resources on the Water Corporation website.

Explain to your students that they are going to design a waterwise garden, using waterwise plants. The waterwise plants they can choose might be native to WA, native to Australia or an exotic species (ie., from another country). Waterwise exotic plants are not from Australia but are adapted to climate conditions that are similar to Perth's long, hot, dry summers and cool winters and can also thrive in our soil.

PROCEDURE

- As individuals, or in groups, ask your students to draw a garden plan using an A4 piece of paper. Their garden should include:
 - somewhere to sit
 - shade
 - some lawn
 - garden beds
 - paths
 - play equipment
- Direct your students to the Water Corporation website to choose waterwise plants for their garden at [**www.watercorporation.com.au/Waterwise/Waterwise-plants**](http://www.watercorporation.com.au/Waterwise/Waterwise-plants)

Instruct the students to fill out the filters as follows:

- Search by suburb or plant name = enter their home or school suburb
- Availability = Readily available
- Origin = *student choice*
- Garden type = All
- Colour = *student choice*
- Growth Habit = advise your students to choose plants from each of these categories only: Edible, Herbaceous, Groundcover, Shrub and Tree.



ACTIVITY 43 continued

- Students choose the plants they want from four of the Growth Habit types above. Explain to your students that when they find a plant that they want to include in their garden, they can click on the image to find details about the plant. Most importantly, they will see the plants water needs displayed as one, two or three water drops. Even though all these plants are waterwise, some still need more water than others.
- Students draw the plants they have chosen on their garden plan where they think it should grow. Remember to consider their size! Some other things to consider include:
 - Hydrozoning - grouping plants with the same amount of water needs (the water drops scale) together
 - Limiting the use of lawn
 - Having flowers all year round
- Students can then add other waterwise elements to their garden drawing, such as mulch or a rainwater tank.
- Class discusses finished plans. Did they think about:
 - Hydrozoning (grouping plants with the same amount of 'waterdrops' together)
 - Limiting the use of lawn
 - Having flowers all year round
- As a class discuss their finished plans.
 - Do they think these would be nice gardens?
 - How will they water their garden?
 - How would they encourage local wildlife to visit?
 - Why do we need gardens?



Getting More Water

Saving water is important, but can we get more water? As a class, begin by brainstorming how we could get more water in Perth. Then, in groups, research one the following topics to find out more about how we can get more water:

- Desalination
- Groundwater replenishment
- Cloud seeding

Hint: the Water Corporation website and the information in the Guru is a great place to start!

Have your students create a presentation or poster explaining how these scientific methods work and any disadvantages they've found about their topic.

Water Scarcity

As a class, watch the ABC News story, '*Coke voluntarily pauses taking free water from Perth bore*'.

Link: <https://www.youtube.com/watch?v=skZXlmtJ7lc>

Ask your students to do some further research about the issue of Coca Cola taking groundwater for free from the Perth Hills before undertaking the final activities. Some questions you may like to pose include:

- Who does taking groundwater affect?
- What does taking groundwater affect?
- Is it fair to charge for something they take for free?

After doing their research, have your class complete the following two activities:

- '*Is bottled water a want or a need?*' Prepare a class debate with one team arguing for 'want' and one team arguing for 'need'.
- Write a persuasive text on the topic of '*People should use less water*'.

Groundwater Glossary



Aquifer	Geological formations such as those composed of sand, sandstone and limestone which contain useable quantities of groundwater are called aquifers.
Catchment area	A drainage area, usually with higher areas feeding water into lower areas and rivers.
Confined aquifer	An aquifer where the water is confined under pressure between relatively impermeable layers. Sometimes called artesian aquifers.
Contaminants	Something that renders another thing impure and/or unusable.
Dispersion	When something is scattered, diffused or spread out amongst another.
Dryland salinity	The movement of salt to the surface of the land.
Ecosystem	The interaction of organisms and their environment and how they relate to one another.
Evaporate	When surface water turns into vapour.
Fauna	The animals of an area.
Flora	The plants of an area.
Impermeable	A substance that liquids (and gases) are unable to pass through.
Infiltrate	To filter through or 'permeate'.
Permeable	A substance that liquids (and gases) can penetrate and move through.
Permeability	How well a substance allows water to move through it.
Pollutants	A substance that pollutes another object, resulting in that object being harmful or unsuitable for its usual purpose.
Pollution	The act of polluting, or the result of pollutants.
Porosity	How much water a substance can hold in its pores.
Recharge	The water that passes through the ground to replenish an aquifer.
Superficial aquifer	See 'unconfined aquifer'.
Subsurface	Below the surface, in this instance, below ground level.
Surface water	Water that flows or is held in the streams, rivers, lakes and wetlands of a landscape.
The Dreaming	The time before Creation in Aboriginal Noongar culture. Also known as Nyitting in Noongar.
The Dreamtime	The Dreaming, has different meanings for different Aboriginal groups across Australia. In our local Noongar country, the Nyitting relates to the Waugal, a mythical serpent who created the rivers and the land formations of the south-west Western Australia. Dreamtime stories are Creation stories.
Transpiration	When water is taken up by plants, it is released through the leaves as vapour, the process is called 'transpiration'.
Unconfined aquifer	The aquifer closest to the ground surface is called the shallow, or unconfined aquifer. Its upper surface is the water table.
Water cycle	The continuous cycle of water between the ocean, atmosphere and land.
Water table	The level at which groundwater sits in an unconfined aquifer. Swamps and lakes in low-lying areas are often the surface expression of groundwater.

Curriculum Links

The following Western Australian Curriculum and Australian Curriculum content descriptions apply to the activity ideas and activity sheets provided in these resources.

YEAR 4 LINKS	
SCIENCE	
Science Understanding	Biological Sciences Living things depend on each other and the environment to survive (ACSSU073)
	Chemical Sciences Natural and processed materials have a range of physical properties that can influence their use (ACSSU074)
	Earth and Space Sciences Earth's surface changes over time as a result of natural processes and human activity (ACSSU075)
Science as a Human Endeavour	Nature and development of science Science involves making predictions and describing patterns and relationships (ACSHE061)
	Use and influence of science Science knowledge helps people to understand the effect of their actions (ACSHE062)
Science Inquiry Skills	Questioning and predicting With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (AC SIS064)
HASS	
Geography	The importance of environments to animals and people, and different views on how they can be protected (ACHASSK088)
	Aboriginal and Torres Strait Islander Peoples' ways of living were adapted to available resources and their connection to Country/Place has influenced their views on the sustainable use of these resources, before and after colonisation (ACHASSK089)
	The natural resources (e.g. water, timber, minerals) provided by the environment and different views on how they can be used sustainably (ACHASSK090)
HASS Skills	
Questioning and Researching	Identify current understanding of a topic (e.g. brainstorm, KWL chart) (WAHASS26)
Evaluating	Draw conclusions and give explanations, based on the information and/or data displayed in texts, tables, graphs and maps (e.g. show similarities and differences) (WAHASS35)
Communicating and Reflecting	Reflect on learning, identify new understandings and act on findings in different ways (e.g. complete a KWL chart, propose action in response to new knowledge) (WAHASS39)
ENGLISH	
Literacy	Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features (ACELY1694)

GROUNDWATER GURU CURRICULUM LINKS

YEAR 5 LINKS

SCIENCE

Science Understanding

Biological Sciences

Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)

Chemical Sciences

Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077)

Science as a Human Endeavour

Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083)

Science Inquiry Skills

Questioning and predicting

With guidance, pose clarifying questions and make predictions about scientific investigations (ACIS231)

HASS

Geography

The way people alter the environmental characteristics of Australian places (e.g. vegetation clearance, fencing, urban development, drainage, irrigation, farming, forest plantations, mining) (ACHASSK112)

Features of environments (e.g. climate, landforms, vegetation) influence human activities and the built features of places (ACHASSK113)

The impact of bushfires or floods on environments and communities, and how people can respond (ACHASSK114)

ENGLISH

Literacy

Plan, draft and publish imaginative, informative and persuasive print and multimodal texts, choosing text structures, language features, images and sound appropriate to purpose and audience (ACELY1704)

GROUNDWATER GURU CURRICULUM LINKS

YEAR 6 LINKS

SCIENCE

Science Understanding	Biological Sciences The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)
	Chemical Sciences Changes to materials can be reversible or irreversible (ACSSU095)
	Earth and Space Sciences Sudden geological changes and extreme weather events can affect Earth's surface (ACSSU096)
Science as a Human Endeavour	Use and influence of science Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)
	Nature and development of science Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098)
Science Inquiry Skills	Questioning and predicting With guidance, pose clarifying questions and make predictions about scientific investigations (ACIS232)

ENGLISH

Literacy	Plan, draft and publish imaginative, informative and persuasive texts, choosing and experimenting with text structures, language features, images and digital resources appropriate to purpose and audience (ACELY1714)
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ALL YEAR GROUPS

CROSS-CURRICULUM PRIORITIES

Sustainability	Sustainability addresses the ongoing capacity of Earth to maintain all life. Education for sustainability develops the knowledge, skills, values and world views necessary for people to act in ways that contribute to more sustainable patterns of living.
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GENERAL CAPABILITIES

Literacy
Numeracy
Critical and creative thinking
Ethical understanding
Personal and social capability

References

Wastewater References

Gnangara Groundwater Allocation Plan. June 2022. Department of Water and Environmental Regulation, WA.

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Teacher Resource: Microplastic Oceans. Behind the News, Australian Broadcasting Corporation: abc.net.au/btn/ (accessed May 2019)

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The Story of Microfibres. The Story of Stuff Project: storyofstuff.org/ (accessed May 2019)

Water Corporation: watercorporation.com.au (accessed June 2016)

Waterwise Perth Two Year Action Plan. October 2019. Department of Water and Environmental Regulation, WA.

What are microplastics? National Ocean Service: oceanservice.noaa.gov/facts/ (accessed May 2019)

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Gnangara Groundwater Allocation Plan. June 2022. Department of Water and Environmental Regulation, WA.

How much water is on Earth? USGS Water Science School: water.usgs.gov/ (accessed July 2015)

Living Labs: Your guide to waterwise gardening fact sheet. Josh's House: joshshouse.com.au/resources/living-labs-lifestyle-factsheets/ (accessed June 2023)

Water Corporation website: watercorporation.com.au (accessed July 2015)

Waterwise gardens, lawns and verges. Department of Water and Environmental Regulation: begroundwaterwise.wa.gov.au/waterwise-gardens-lawns-and-verges (accessed June 2023)

Waterwise Perth Two Year Action Plan. October 2019. Department of Water and Environmental Regulation, WA.

Whiteman Park Conservation and Environment Management Plan. 2019. Western Australian Planning Commission, WA.

ANSWERS FOR TEACHERS

Flush it, compost it, recycle it or bin it

FLUSH = toilet paper, wee, poo

COMPOST = tea bag, goldfish, apple core, newspaper

RECYCLE = newspaper, bottle, paper bag

BIN = nappies, oil, cotton buds, wet wipes, paper towel, coffee cup, lolly wrapper

Reducing Microplastics

Check the label	>	Try to avoid synthetic materials
Skip the spin cycle	>	The washing machine spin cycle creates friction
Wash less	>	Air out your clothes
Do you really need it?	>	Aim to buy less
Use shorter wash cycles	>	The longer you wash, the more fibres are released
Don't tumble dry clothes!	>	Tumble dryers are also a culprit
Use a filter!	>	Try to find a product that protects clothes
Reduce your use of single-use plastics	>	The less plastic used means a reduced risk
Check the ingredients of your products	>	Read the fine print of products
Wash at 30° or less	>	Water combined with heat weakens the yarn
Use a neutral washing detergent	>	Harsh washing powders contain abrasives