







Groundwater Guru

Classroom Resources
Book 3

GROUNDWATER

SOIL

WETLANDS

GROUNDWATER AND THE DREAMTIME

SALINITY

GROUNDWATER POLLUTION

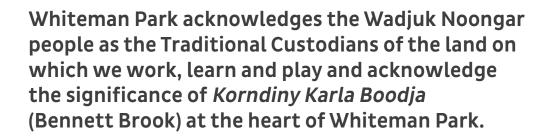
WASTEWATER

WATER FOR OUR FUTURE



WHITEMAN PARK

CONSERVATION • RECREATION • EDUCATION



Noongar is the official language of the Aboriginal people of the South-West of Western Australia. Traditionally an oral language, Noongar is made up of fourteen different dialects, resulting in variable spellings. Whiteman Park acknowledges the variations in pronunciation and spelling of Noongar words and refers to South West Land and Sea Council for consistency, except when referring specifically to an external organisation that utilises alternative spelling.

Acknowledgements

These resources were developed by Whiteman Park's education team for general classroom use associated with the Children's Gnangara Groundwater Festival. Teachers may duplicate these resources for education purposes only.

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Edited by

Sarah Stevenson Sinead Wilson

Design

Key2creative

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The Western Australian Planning Commission c/- Whiteman Park 233a Drumpellier Drive Whiteman WA 6068 Published June 2025

Web: whitemanpark.com.au

Email: enquiries@whitemanpark.com.au

08 9209 6000

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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.

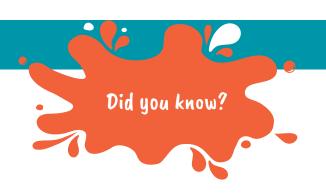
The first activity that is recommended is a KWL chart.



Activity



Activity Sheet



70% of Australia's dryland salinity affected areas are here in WA.

The Western Australian **Government's 2019** Waterwise Perth Action Plan aims for a 10% reduction in groundwater use by 2030.

97.5% of the world's total water supplies are made up of saltwater just 2.5% is freshwater!

Earth's atmosphere contains approximately 13,000 km³ of water.

"The earth, the air, the land, and the water are not an inheritance from our forefathers but on loan from our children. So we have to handover to them at least as it was handed over to us." MAHATMA GANDHI

Salinity

What is salinity?

Salinity is a huge environmental threat that has become a serious problem in many parts of Australia, including Queensland, Victoria, South Australia and Western Australia. It affects everything from agriculture and land to water quality and infrastructure. Salinity is caused when the concentration of salt that is naturally stored in all landscapes and soils becomes too high.

Salt is found in all soils, either having been being carried inland from the ocean by wind or rain, developed naturally in deep sediments and rock minerals or accumulated in clay sub-soils over time. This salt does not become problematic if it remains deep in the soil, but there have been many changes made to the Australian landscape that have brought this salt closer to the surface where it causes major problems, upsetting the natural balance.

Clearing native vegetation has a direct effect on where salinity occurs, so protecting what remains is a vital part of managing the salinity problem!

Unsuitable land management activities and changes to the landscape and soils since European settlement have brought about the salinity crisis. The clearing of native vegetation and replacing it with crops and pastures that have much shallower roots has intensified the problem. Native Australian vegetation is salt-tolerant and has evolved over time to grow in the harsh Australian conditions. They have a deep root system which feed the plants water from well below the salty-soil line, unlike the European crops and pasture with their shallow roots that allows the groundwater table to rise into the salty soils.

Salinity and groundwater

Australia is a naturally salty continent and the salt that is found in soils has been carried across the Australian landscape over thousands of years by winds and rain, accumulating in the soil structure. This amassing of salt is expressed in many lakes and rivers in Western Australia which are naturally salty. As long as the salt stays deep in the soil it poses no problems, but changes have occurred on our land that are bringing the salt closer to the surface where it can cause major problems.

Looking back at the water cycle, we know that when rain falls, the water moves towards a catchment area and can either run off the surface of the land, be used by trees and plants, evaporate back into the atmosphere or soak into the ground to recharge groundwater systems.

Dryland salinity occurs when salt stored deep in the soil is brought close to the surface by rising groundwater levels. As this water nears the surface, the water starts to evaporate and the salinity levels in the ground increases to a point where plants can no longer survive.

When the water table rises, it also dissolves the salt that is naturally found in the soil causing the groundwater to become salty, resulting in the contamination of the land as well as local surface water. This saline groundwater can make its way into streams and drains where it will affect wetlands, river life and drinking water. In towns, the build-up of salt on the surface can damage roads, buildings, rail embankments and other infrastructure. It can be a very expensive problem!



The effect of salinity

Dryland salinity can have a devastating effect on the environment and is widespread throughout Australia. It is generally concentrated around agricultural areas where the native vegetation has been cleared for crops. Salinity can cause vegetation and crops to die, pollute rivers and dams which can harm water supplies for drinking and irrigation and can also affect our natural ecosystems, river systems and groundwater.

Salinity and its related problems have the potential to affect all Australians, whether they live in the country or in the city.

Salt is visible in some places as white salt scars on the surface of the land, particularly around rivers, streams and wetlands. In other areas the salt cannot be seen as it sits just beneath the surface of the soil.

Salinity and Western Australia

Western Australia has the largest area of dryland salinity in Australia and it is one of the biggest environmental threats that we face. Areas in the south west region of Western Australia have been identified as being high risk in developing salinity, since 18 million hectares out of 25 million hectares has been cleared of its native vegetation. Currently, over one million hectares is salt-affected.

Salinity is expected to continue to expand in WA for another 50 years or more, possibly affecting five million hectares. Other high risk areas include the eastern wheatbelt, eastern sections of the northern wheatbelt and coastal areas around Bunbury and Donnybrook.

Almost every stream and river in south west WA is affected to some extent by salinity. It is estimated that 850 endemic flora and fauna species were at threat of extinction as a result of dryland salinity.



Solving the salinity problem

A big effort would be required to reverse or reduce the salinity problem in Western Australia: over 80% of the Wheatbelt would need to be replanted with deep-rooted species. Even then, it would take decades for the water table to restabilise and farming would no longer be possible in the region. But there are still lots of things that can be done at a local level to combat salinity issues.

More than half of all farms in Western Australia show signs of salinity.

In WA, the Department of Water and Environmental Regulation is tasked with managing and protecting key water sources. After years of research, a range of resources have been prepared to assist landholders and communities where salinity is a problem in these areas.

So what can be done?

- Some unaffected areas can be protected.
- Smaller areas can be restored through planting deep rooted native plants.
- Salt tolerant plants are suitable for planting in some areas.
- Wetlands can be protected from salt water flow by diverting the salty water.
- New uses can be found for salt affected land.
- Educating communities about salinity and how to manage the problem.



Salinity

Links at a glance – Saliwity

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		ACSHE062		74		74	74	
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		ACTIVITIES	Activity 20: Salt, See and Suggest	Activity 21: Watch, Think, Write	Activity 22: Seed Growth	Activity 23: Salinity Role Play	Activity 24: Salinity Remedies	Activity 25: Salinity Crossword



Salt, See & Suggest

For this activity, being by showing the class the three stages of dryland salinity image on the next page. Explain, or go over, the meaning of some of the words shown on the image, and the stages of the water cycle:

- precipitation = rainfall (or snow, or sleet)
- evaporation = when water particles warm up and turn into a gas
- transpiration = water moving through a plant and evaporating from the leaves, stem and flowers
- infiltration = when water soaks into the soil
- percolation = when water filters through the soil particles and porous rock

After this review, have your students look at the first image 'before clearing' closely and discuss:

- What can they see?
- What do they predict is happening?

Now, look at the second image that shows the land 'after clearing' and discuss these questions as a class:

- How has it changed from the first image?
- What do they think has happened to cause this change?
- How has the water cycle changed?
- Why has it changed?

Finally, take a look at the third image, which shows the land 'later' after more time has passed and discuss:

- What can the students notice about this image?
- How has it changed from the first and second image?
- What do they think the white dots in the soil represent?
- What has happened to the trees in the third image?
- Why has this change happened?

ACTIVITY 21 WORKSHEET



Watch, Think, Write

As a class, watch the CSIRO's 'Soil Salinity in Australia' video.

Link: https://csiropedia.csiro.au/soil-salinity-australia-2001/

After watching, ask your students to think about, discuss and write down in their GABs the answers to the following questions:

- How did soil get into the ground in Australia?
- What is the water table?
- How do native trees keep the water table low?
- How did farming cause a problem?
- What problems does salt cause?
- What could we do to help?

Seed Growth

For a classroom experiment, plant some seeds in two different containers and water one with fresh water and the other with salty water each day. Over two weeks, record the growth rates of the two seeds and discuss the results.

Note: easy sprouting seeds such as wheat are ideal for this experiment.



Salinity Role Play

As a class or in groups, research how the salinity crisis may affect different sectors of the community. The *Useful Salinity Information* links in the Guru are a good place to start.

Then have your students create a play that showcases the impact of salinity. Students can play the role of someone or something affected by salinity and present their point of view on the topic.

Roles to consider featuring in their play include farmers, shop owners, families, plants, native animals and local government.

Salinity Remedies

As a class, research some of the different solutions that are being used for the salinity problem. Then ask the class:

- Do they think that there is one solution better than another?
- Or would a mix of all remedies be the best solution?

One of the recommendations to counteract and/or prevent a salinity problem, is to plant indigenous (local) trees. Research local community and Landcare agencies that conduct community planting sessions, then use the information that they provide to create posters advertising any upcoming tree planting sessions (note: you may need to contact them for permission to use their name/information).



Salinity Crossword

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Across

- Perth's main waterway, a place for black birds.
- Salt in a landscape can sometimes cause a _ _ _ where no plants will grow, and you can see the salt area on the ground.
- As part of the watercycle, when rain occurs, groundwater levels increase, or are 'topped up'. This is known as groundwater _ _ _ _ _ _
- Unconfined aguifers allow the water to rise, collecting salt. What is the other main type of aquifer?
- When the water table rises, it collects the salt in soil, which causes the groundwater to become _ _ _ _ _ .
- 12 Groundwater can sometimes be seen at the surface as a river, _ _ _ or waterhole.
- How does salt get washed into waterways? 13
- The water____ is the name of the top level of groundwater in an unconfined aguifer.
- If only 3% of all water on Earth is freshwater, 97% of our water is...

Down

- The name of the process that water takes between ocean, the atmosphere and land.
- This impermeable (liquids can't pass through it) soil-type can confine an aquifer.
- What type of plants are best to help keep salinity 7 under control?
- When surface water from the ocean, lakes, or on the ground turns into a vapour and rises into the atmosphere, it _ _ _ _ _ _ _
- What is a high-risk region in Western Australia for developing salinity issues? (Its north-east of the metropolitan area of Perth and grows much of our crops)
- Native vegetation has deep _ _ _ _ that keeps the water table low and out of highly saline top soil.

Groundwater Pollution



We used to think that the ground had some kind of purifying property – that pollutants could be poured on the ground and disappear out of sight. Well they do disappear out of sight sometimes, but they don't disappear – pollutants lie beneath the surface and can cause major health and environmental problems.

It has only been in recent history that pollution has become a problem. This is because of how long pollutants can remain in soils. Many pollutants do not break down and can build up in large amounts over time.

Pollutants like nutrients, bacteria, pesticides, herbicides, petrol, oil, heavy metals and chemicals can work their way down into the groundwater by filtering through the soil. Movement of groundwater can spread pollutants through a larger area, and rising groundwater can bring pollutants trapped in the soil back to the surface. This means that some pollutants might end up in our drinking water or feed into wetlands and rivers affecting the ecosystems in these areas.

Alternatively, if water levels rise beneath the soil surfaces, pollutants trapped within the soil can mix with water and cause problems for plants and animals in the affected area and humans relying on the groundwater for domestic consumption.

Groundwater can become polluted from many different sources such as suburban run off from backyards, fertilisers from farms or suburban areas and dumping grounds from factories.

Sources of groundwater pollution

Groundwater pollution occurs when waste products or other substances change the chemical or biological characteristics of the water and degrade water quality so that animals, plants or human uses of water are affected (WRC, 1998).

There are many different things that can contaminate groundwater, all of which can be broken into five different types of contaminants:

- 1. Synthetic man-made chemicals that are not found in nature;
- 2. Hydrocarbons petrols and oils etc;
- 3. Inorganic salts and minerals, fertilisers and pesticides, some of which can occur naturally;
- 4. Pathogens bacteria and micro-organisms that may cause sickness; and
- 5. Radio nuclides radioactive material (some of which may occur naturally).

There are many sources of groundwater pollutants, some of which will be discharged directly into groundwater (point source pollution) and some of which indirectly contributes to the pollution of groundwater sources (non-point source pollution). These sources can be grouped into three different categories:

- Those intended for release i.e., septic tanks, injection wells etc.;
- Those intended for storage which have leaked i.e., landfill, storage tanks etc.; and
- Unintentional release of pollutants by chemical spill, disasters, etc.

Pollutants may include plant nutrients, bacteria, viruses, pesticides, herbicides, hydrocarbons (including petrol and oil), heavy metals and other toxic chemicals.



Does land use lead to groundwater contamination?

Pollution of groundwater resources has become a major problem today. The pollution of air, water and land has an effect on the pollution and contamination of groundwater. The solid, liquid and gaseous waste that is generated, if not treated properly, results in pollution of the environment. This affects groundwater too. For example, when air is polluted, rainfall will settle many pollutants on the ground, which can then seep into and contaminate the groundwater resources.

Catchments can transport non-point source pollutants. Non-point source pollution is associated with rainfall runoff moving over and through the ground, carrying natural and human-made pollutants into water sources. Pollutants accumulate in catchments as a results of various human driven and natural events. Below are some examples of land use and their potential problems:

LAND USE		ACTIVITIES	POLLUTION PROBLEMS			
1	Agriculture	Tillage, cultivation, pest control, fertilisation and animal waste	Sediment, nitrate, ammonia phosphate, pesticides and bacteria			
1	Construction	Land clearing and grading	Sediment			
	Forestry	Timber harvesting, road construction, fire control and weed control	Sediment, pesticides			
7	Land Disposal	Septic systems	Bacteria, nitrate, phosphate			
>	Surface mining	Dirt, gravel, mineral excavation	Sediment, heavy metals, acid drainage and nutrients			
////	Urban Storm Runoff	Car maintenance, lawn and garden care and painting	Oil, gas, antifreeze, nutrients, pesticides and paints			

The plastic problem

Groundwater isn't the only water source we rely on that is experiencing pollution issues. While groundwater feeds our lakes and wetlands, rivers feed into our oceans and more and more pollutants are ending up in these waters. Plastics are just one of the pollutants that are being found in more and more waterways. While you might not think that the empty plastic water bottle floating downstream is that big a problem, its once the plastic starts to break down that things get serious.

Plastic has become an integral part of our human lives with consumption continually increasing over the past 70 years. Plastic is a lightweight, versatile and strong material that is also relatively inexpensive to produce, making it a seemingly ideal resource for many different purposes. But plastic also creates a big issue given much of it is designed to only be used once. In Australia alone, over 3.5 million tonnes of plastics was consumed in 2016/17, yet less than 300,000 tonnes was recycled, despite the fact that plastics recycling is well established in Australia and accessible to all households. This means that much of the plastic we use is not making it through the recycling process. So where is it ending up? While much of it is going to landfill, it is also finding its way into our waterways and oceans.

Plastic micro pollution

Plastic is the most common type of debris found in the ocean and is a major environmental problem worldwide. Millions of tons of plastics are making their way into the oceans and waterways each year from coastal areas. Plastic pollution can come in all shapes and sizes from the large pieces that we can see floating on top of the water or sitting on the bottom, to small and microscopic pieces from broken up plastics or synthetic fibres. These small microscopic pieces are called microplastics.

Plastics bottles and packaging eventually break down in the elements (sunlight, wind and waves etc) into smaller pieces while floating plastic bags can resemble jellyfish, both of which are being mistaken for food getting eaten by aquatic animals.

What can you do to prevent groundwater pollution?

A large portion of water that is supplied to Perth comes from groundwater supplies and it is important to make sure that our vital groundwater supplies are kept clean. Everybody can play their part in this by following these rules:

- Use phosphate-free fertilisers on the garden and use the directed amount that is written on the pack.
- Dispose of paints, oils and chemicals correctly and do not pour them down the drain. Call your local council for disposal advice if required.
- Recycle paper, can, bottles, plastic and compost food scraps. This reduces the amount of rubbish making its way into tips and landfills. Recycle, reuse and reduce.
- Check your driveway for any oil spills and leaks from the car that may be washed into drains after any rainfall.



GROUNDWATER POLLUTION

Links at a glance – Groundwater Pollution

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		ACSHE062					74	74	74	74
	Mature and Development	ACSHE098		Уб	У6			У6	У6	
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Science		ACSSU095							У6	
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	Biology	ACSSU094		У6	У6		У6	У6		
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		ACTIVITIES	Activity 26: Guess the Link	Activity 27: How Fertilisers Travel	Activity 28 No Water Off a Ducks Back	Activity 29: Defining Pollutions	Activity 30: Pollution Prevention	Activity 31: Clean It	Activity 32: Choices, Choices	Activity 33: Design Challenge



Guess the Link

Begin by reading through this list with your class, making sure that the students understand what each word means:

- factory
- graveyard
- landfill
- pesticide
- petrol station
- sewer

Split your class into groups and task each group with finding an image in a magazine or online for each of these words.

Then, looking at the images they have found, ask the students to guess what the link between all of these things are.

The answer is that they are all man-made and can all be the cause of groundwater pollution.

Pollution happens when something harmful goes into the natural environment that can hurt living things.

As a class, brainstorm how the places and things in these images could pollute groundwater. You can read the pollution topics in the Guru to help this process.



Science Skills

Questioning and Predicting: ACSIS064 (Year 4) ACSIS231 (Year 5)



How Fertilisers Travel Through Soils

AIM

Students will be able to see that fertilisers and other pollutants aren't necessarily all filtered out by soils, and may end up in our groundwater.

INTRODUCTION

Explain that new farming methods, which include using pesticides (bug and weed killer), and fertilisers (plant nutrients) have helped farmers keep up with the growing population. These chemicals help increase the amount of food grown by farmers. These pesticides and fertilisers also have nitrogen-containing substances called nitrates which can seep down through the soil as they are carried in water that soaks into the ground.

MATERIALS REQUIRED

- 3 Paper cups
- Top soil (the surface layer of soil from your garden)
- Green food colouring
- Water

PROCEDURE

- Put three holes in the bottom of a cup and fill it \(^3\)4 full of top soil.
- Explain to the students that the green food colouring symbolises fertilisers. In another cup, mix a few drops in with the water (enough that you can see the colour, but not too dark!).
- Hold the soil-filled cup over an empty cup to catch the water that will seep through.
- Poor the coloured water into the soil-filled cup and instruct the students to observe the colour of the water that seeps out of the soil.

CONCLUSION

Discuss with the students the following questions based on the results of the experiment.

- Was there evidence of the green food colouring in the water?
- Did the soil remove all the fertilisers (food colouring) or is it still greenish in colour?
- What do you think would happen if there were a high concentration of manure or chemical fertiliser above a groundwater source?



Science Skills



No Water off a Duck's Back

AIM

In this activity, students will try several ways to clean up an oil spill, similar to the methods used by real-life clean-up crews. It is good to know just how hard it is to clean up an oil spill, and hence its likely effect on the environment.

BACKGROUND

Contaminated and polluted water has a major effect on the animals and plants that live in the water sources. A common pollutant that is found in rivers and estuaries amongst many others is oil. Oil has a major effect on many waterbirds, especially ducks. When ducks come in contact with oil floating on top of the water it has a major effect on the feathers of these animals. The feathers become matted, which affects the duck's ability to insulate and keep themselves warm. This could lead to them dying from the cold. Another risk is that the ducks could suffer from stomach ulcers if they swallow any of the oil when they try to clean off their feathers.

BEFORE YOU START

As a class, research how oil can find its ways into water sources and list the reasons. Investigate how oil covered birds are treated to remove the oil from their feathers. What is used to save the birds that have been exposed to excess oil?

Complete the activity below trying different methods in cleaning up an oil spill. These methods are similar to what crews use in cleaning up major oil spills.

MATERIALS REQUIRED

- One large bowl with a lid
- Measuring cup
- Water
- Cooking oil
- Different dishwashing detergents
- Paper towel or cloth
- Sponges
- String



Science Skills

PROCEDURE

- 1. Fill up the bowl of water halfway.
- 2. Pour a ¼ cup of oil into the water.
- 3. Cover the bowl with the lid and gently shake the water. Did the oil and the water mix?
- Using these different methods try and remove the oil from the water:
 - Try using the cloth or paper towel try cleaning up the oil from the water.
 - Use the string to make a border around the oil. Drag the oil to one side of the bowl.
 - Will the sponge soak up the oil?
 - See if the detergent can clean up the oil.
- In your workbook, rate the effectiveness of each method with a score between 1 - 10, with '1' being the least effective and '10' the most.

Source: United States Environmental Protection Agency



Defining Pollution

1. NNCONMITAATIO										
Definition:		•••••	 •••••		•••••		•••••	 •••••	 •••••	
2. CDPTSIIEE										
Definition:	••••••	•••••	 •••••	•••••	•••••		•••••	 •••••	 	
3. LLTIPOUON										
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4. EEWRS Definition:										
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10. HAARZUSDO										
Definition:			 					 	 	



12 Simple Ways to Reduce Groundwater Pollution

Be a waste warrior.

- Put it in the right bin, not the red bin: there are special collections for batteries, paint, chemicals and gas bottles.
- Make the toilet a 3Ps zone. Never flush medicines down the toilet – the toilet is for pee, poo and (toilet) paper only!
- Pick up after your pooch. Our pets have different bacteria in their poo, so pick it up and put it in the bin safely.
- Wash it wisely. Help mum and dad wash the car on the lawn, so the soapy water doesn't go down the drain!
- Do some green cleaning. Use vinegar, lemon, bicarb soda and tea tree oil to clean your house instead of chemicals.
- Confuse, don't kill. There are lots of ways that you can stop pests eating your plants without using pesticides.
- Keep it native. Gardening with native plants uses less fertiliser and water while also helping local wildlife.
- Become a litter reporter You can report pollution and illegal dumping to your local council.
- Stop microplastics! 9 Using less plastic means less microplastics get into our environment.

Go phosphorus free!

- Get mum and dad to check if the laundry detergent, washing up liquid and dishwater cleaners are free of phosphorous, which is bad for our waterways.
- Choose organic. Foods grown without fertilisers and pesticides are better for our groundwater - and for you!
- Pass it on. Teach your family, friends and neighbours how to look after groundwater too.



Pollution Prevention

What can we do to help stop groundwater pollution from occurring? As a class, read through the 12 Simple Ways to Reduce Groundwater Pollution and discuss how and why these steps can help to stop our groundwater from becoming polluted.

In small groups, have your students create a quiz, play or poster to spread this information (either as a whole list, or focussing on a single point) to the local community.

Clean It

Can we clean polluted groundwater? There are lots of different and innovative ways that scientists have found to clean polluted groundwater. As a class, do some online research to find some of these methods. Examples include:

- how reed beds can clean water (britannica.com)
- how palladium and gold nanoparticles can remove groundwater contamination (youtube.com/@riceuniversity)

After watching the videos, check the students' understanding of the process the scientists have used and ask the following questions:

- What problem are the scientists trying to solve?
- What ideas did they have?
- Why are the scientists working in a lab instead of outside where real pollution is?
- What did they find out?

Choices, Choices

The power of our choices makes a difference. Introduce the topic of plastic pollution by reading *The Plastic* Problem page of the Guru with your class. Discuss with student the power of their choices and how they can with contribute positively or negatively. Ask the student to start thinking about things that they can change and choices that they can make to avoid plastic pollution, for example - bringing a waste-free lunch to school, making their own body scrubs with natural ingredients, investing in a filter for the washing machine, looking at clothing labels and avoiding synthetic materials where possible.

Ask your students to choose two of their suggestions and to actively spend a week making these choices. At the end of the week they need to write a recount in their GAB about how the process was and if they felt they were making a difference. Ask the students to include:

- what did they do differently?
- was it hard to follow their choices?
- would they be able to continue this long term?



Design Challenge

Only new ideas will stop the problem with plastic polluting our waterways. Already there are clever people around the world coming up with innovative solutions to our various plastic pollution problems, such as the Great Bubble Barrier and Boyan Slat's The Ocean Cleanup. What ideas can YOU come up with?

Begin by researching these ideas as a class. You'll find some helpful information on the Stop! Micro Waste website and by watching Behind the News' "Ocean Rubbish Clean Up" story.

One of the sources of micro plastics in water are birthday balloons. When balloons burst, they become very dangerous for wildlife, who can become entangled in plastic ribbons, or swallow the balloons, thinking they are food. Breaking your class up into groups, get them to use the design steps listed below to invent an alternative to balloons for children's parties. They have to make sure it is:

- colourful
- fun
- made from a material that will naturally break down (ie., is biodegradable) in the near future.

Design steps:

- Research the problem
- Brainstorm ideas
- Build a prototype
- Test the prototype
- Make any changes necessary



Design and Technologies

Groundwater Glossary	

Aquifer	Geological formations such as those composed of sand, sandstone and limestone which contain usable 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	Nature and development of science						
Endeavour	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 (ACSISO64)						
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	Use and influence of science					
Endeavour	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 (ACSIS231)					
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 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	Use and influence of science							
Endeavour	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 (ACSIS232)							
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)							
ALL YEAR GROUPS								
CROSS-CURRICULUM PRIC	PRITIES							
CRU33-CURRICULUM PRIC								

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.

GENERAL CAPABILITIES

Literacy

Numeracy

Critical and creative thinking

Ethical understanding

Personal and social capability

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ANSWERS FOR TEACHERS

Salinity Crossword

- 1. Swan River
- 2. water cycle
- 3. rock
- 4. scar
- 5. recharge
- 6. confined
- 7. native
- 8. evaporates
- 9. wheatbelt
- 10. saline
- 11. roots
- 12. lake
- 13. rain
- 14. table
- 15. saltwater

Defining Pollution

- 1. contamination
- 2. pesticide
- 3. pollution
- 4. sewer
- 5. environment
- 6. plastic
- 7. landfill
- 8. graveyard
- 9. waste
- 10. hazardous

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