Georges Riverkeeper

TEACHER Resource

TOPIC STARTERS

- **BASED ON KEY INQUIRY QUESTIONS**
- **ALIGNED TO STAGE 3 CURRICULUM**

Water is essential for life, but we often take it for granted. Everyone should learn to appreciate water!

Modules 1-10

Water...WOW!

Complete set supporting modules 1 - 10

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

GEOGRAPHY

Stage 3 Factors That Shape Places

Water is essential for life, our bodies need it and we use it daily

Water sustains life and is an important part of our world

Module 1

Water...WOW! Module

Water for life

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

GEOGRAPHY Stage 3 Factors that shape

Water is essential for life, our bodies need it and we use it daily

Module 1

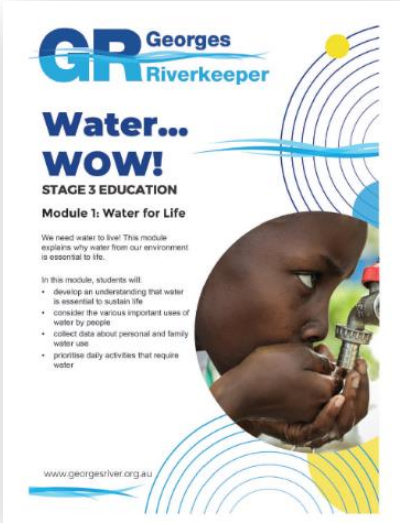
This resource supports the Georges Riverkeeper Stage 3 Education Module 1: Water for life

Outcome: Explains interactions and connections between people, places, and environments **GE3-2**

Key Inquiry Question: How important is water in our daily lives?

Learning Intentions: I understand that water is essential to sustain life. I can prioritise daily activities that require water.

Success Criteria: I can identify ways that I need water to survive. I can show how much water I use daily. I can recognise healthy and unhealthy water in my local environment. Information source.



Overview:

Here on Earth, we have life owing to the availability of water. Water is essential for our survival. The amount of water in the human body ranges from 50% to 75% of body weight (the average for children is approximately 65%). People feel thirsty when they have lost around 2% to 3% of the water in their body. However, mental performance and physical coordination start becoming impaired even before we become thirsty, after loss of about 1% of water in the body. Water is lost through breathing, perspiration and going to the toilet. To replace the water and avoid dehydration, we should drink at least two litres of water each day (the exact amount for each person depends upon things like age, gender, amount of exercise and weather). Other than making us feel thirsty, common signs of dehydration include a dry mouth, flushed skin, headaches, dizziness, constipation, fatigue or muscle cramps. Information source.

Important functions of water in our bodies and lives

Bathing is another essential day-to-day use of water by people. If we neglected to wash our bodies for an extended period, bacteria, skin and sweat would build up to produce a potent stench. Skin would become oily or dry and become infected with fungi, yeasts and bacteria. If there were a cut or abrasion to the skin, the build-up bacteria would have a high likelihood of causing infection. Dandruff (dead skin) accumulating on the scalp would cause a very itchy head, fungus would start growing between toes, dirt would become lodged under nails and both pimples and rashes would pop up across the body. Photo source

We use water to wash dishes, cutlery, pots and pans to avoid the stink, decay and associated illness that comes if food scraps are not cleaned away. We use water to wash dirt, sweat and other smelly substances from our clothes. Water carries away our wastes when we flush the toilet. Water keeps us from becoming dirty and sick! Water is also an essential component of popular recreational activities such as swimming, fishing, boating, surfing, etc.
Information source

Water is important in our daily lives

Water sustains life and is an important part of our world

Module 1

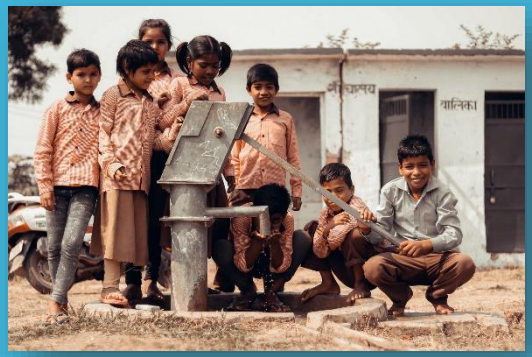
Animals rely on water to survive

People can survive for about three weeks without food, but only a few days without water. Camels famously can forgo drinking water for extended periods: up to 15 days, then can make up for it by consuming over 40 litres at one drinking session. But, the kangaroo rat from the Californian desert can go even longer without drinking water. It gets its moisture from the seeds that it eats and can survive for up to 5 years throughout its lifetime without ever drinking any water.

The United Nations Sustainable Development Goals No. 6 Clean Water and Sanitation and No.14 Life Below Water, are the blueprint to achieve a better and more sustainable future for all.

ACTIVITY 2: How valuable is water?

Imagine that you only had 10L of water a day. Brainstorm how you would prioritise the most vital uses of the water throughout the day. Consider the list of ways you use water from Activity 1 (think about how much water each activity typically needs e.g. a regular showerhead uses 10L of water per minute).



Create your list of prioritised uses and justify your allocation of water to each.

Is 10L of water sufficient to get through your day?

ACTIVITY 1: How much water do you use each day?

According to Sydney Water the average person uses 200L per day. Create a table for your daily water use. Record each time you use water and estimate (in litres) the amount of water needed each time. Use the water usage calculator to assess how you use water in your home. Make sure you click 'Find ways to reduce your usage' at the end. Is your daily water usage better than the average Sydney person? How many different ways did you use water? Photo source

ACTIVITY 3: Where is your nearest body of water? How healthy is it?

Using a mapping tool such as Google Maps, Six Maps or National Gov Map, find the nearest river, creek or lake. Write down it's name. The health of water can be determined in a number of ways. Water scientists like Dr. David Reid use scientific equipment to test the water health.

Click here to watch as he checks the health of a freshwater creek along the Georges River. Conduct a site observation. Plan a trip to your nearest body of water with an adult and conduct your own site survey. Notice and write about how clear the water is, if you see any animals in or on the water, if there is any rubbish and how much, are there any signs of people using the site you visited. Write your site observation into a paragraph.

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Living World

Sustainably managing environments to source food and fibre

How to conserve water and make simple hydroponics to produce food

Module 2

Water...WOW! Module

Virtual water

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Living World

Sustainably managing environments to source food and fibre

Module 2

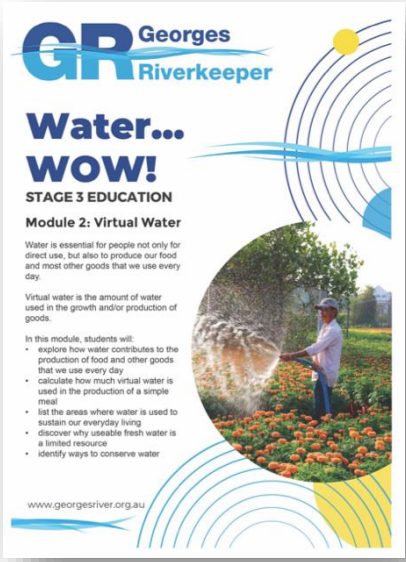
This resource supports the Georges Riverkeeper Stage 3 Education Module 2: Virtual Water

Outcome: Explains how food and fibre are produced sustainably in managed environments for health and nutrition ST3-5LW-T

Focus Question: Why is it important for food and/or fibre to be produced sustainably?

Learning Intentions: I understand how water contributes to food production. I can explain how food can be grown sustainably. I understand how Aboriginal people produce food from sustainably managed environments.

Success Criteria: I can use less water at home and at school. I can successfully grow food using simple hydroponics.



Overview:

The Georges River has been a source of food for Aboriginal people for thousands of years. Food such as fish, eels and shellfish were plentiful along the Georges River, and Aboriginal people, such as Biddy Giles, knew how to sustainably harvest these foods and shared this knowledge. With the increased competition for water in the Georges River, access to fresh clean water in the increasingly urbanised catchment is becoming a priority, especially during the recent drought. We need be able to produce food and conserve fresh water by using it more sustainably and reducing the amount of pollutants from entering it. Innovation will be the solution. The three activities outlined are aimed to show how food production can be sustainably managed while conserving water.

Aboriginal and Torres Strait Islander Histories and Cultures

Sustainably managed environments

Aboriginal people have practiced sustainably managed food production along rivers for thousands of years. Using fish traps is a way of catching fish in rivers and keeping the fish alive.

Georges River Fish Traps

Aunty Margaret Foat of the Bankstown Koori Elders Group has created this wonderful artwork of an Aboriginal fish trap out of clay. The artwork is finished in a green glaze. Aunty Margaret explained that once the fish entered the trap it would get caught by its gills. They would only take what they could eat for that meal so they would not waste food. The other artwork in the photo is a replica coolamon made out of clay. This coolamon depicts local grubs.

Brewarrina Fish Traps

The Ngemba people of Brewarrina used their advanced knowledge of river hydrology and fish ecology to trap and catch large numbers of freshwater fish. The unusual and innovative fish traps, known as Ngunnhu, are still visible in the Darling River, and have strong social, cultural and spiritual association for Aboriginal people with connections to the area (source). See the video on the Brewarrina Fish Traps. Photo source.

Water Conservation and Hydroponics

How to conserve water and make simple hydroponics to produce food

Georges Riverkeeper

How is hydroponics more sustainable than traditional farming?

The word hydroponic is a combination of the Latin words “hydro” which means water and “ponos” which means work. Hydroponics is the process of growing plants without soil. In a hydroponic system, nutrients and supplements are dissolved into water, creating a nutrient solution. Hydroponics has at least one advantage over traditional farming techniques. It uses far less water. For example, to grow 1 kilogram of tomatoes, intensive farming requires 400 litres of water, and hydroponics uses only 70 litres of water.

Information source. Photo source.

ACTIVITY 1: How to grow food in a very simple hydroponics.

Growing alfalfa seeds is very quick and easy and is one of the simplest forms of hydroponics. This 2.45 minute video shows how to set it up to grow. It is very cheap to set up. All you really need to buy is the alfalfa seeds. You can also grow many more food plants using this technique. Photo source

ACTIVITY 2: Hydroponics using a discarded celery base.

Take the base of a celery that you usually cut off and either throw away or compost. Place it in a container of water so the base of the celery is under the water. Check each day that the base is still under water. Every second day change the water, so it is in fresh water. After a couple of days, you should be able to see the celery reshoot like the photo opposite. You can also use the discarded bases from lettuce, bok choy, cabbage, shallots and chives or the tops of carrots or pineapples. There are many foods you can regrow from scraps using hydroponics.

ACTIVITY 3: How can you save water?

Let us think about the amount of water needed for food production. Watch the video ‘Is stress causing a global food emergency?’ to find out some reasons for suggesting a global reduction in water use during the growing of raw products.

For more information on water scarcity and how we can avoid wasting water go to the UN Sustainable Development Goal 6 Clean Water and Sanitation.

Discover how much water you use every day: not just the water that comes out of the tap, but also the water it takes to make the food you eat, the energy you use and the products you buy. Use the ‘Water Footprint Calculator’ to work out your water footprint.

Write a list of five things you can do at home and school to reduce water.

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

GEOGRAPHY

Stage 3 Factors that Shape Places

Investigate the impact of a contemporary bushfire hazard in Australia

Drought - Bushfire – Erosion – Water Quality

Module 3

Water...WOW! Module

Virtual water

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

GEOGRAPHY Stage 3 Factors that Shape Places

Investigate the impact of a contemporary bushfire hazard in Australia

Module 3

This resource supports the Georges Riverkeeper Stage 3 Education Module 3: Rainfall, Droughts & Floods

Outcome: Explains interactions and connections between people, places, and environments GE3-2

Key Inquiry Questions: How do people and environments influence one another? How do people influence places and the management of spaces within them? How can the impact of bushfires on people and places be reduced?

Learning Intentions: I can describe the impacts that drought and bushfires have on people and places.

Success Criteria: I can recall how Aboriginal people (or First Nations people) used fire as a tool. I can recall how fires have affected the Georges River. I can explore the Bureau of Meteorology website to obtain data.

Overview:

The Georges River is considered one of the most severely flood-prone rivers in NSW. Aboriginal people, with thousands of years of experience, would have lived through severe natural catastrophes. There is a dreaming story of the Dharawal people, whose nation stretched from the southern bank of the Georges River and beyond, describing the creation of the Gymea Lily following a huge storm that caused the death of a band of people (source). More recently bushfires have dominated the Australian landscape. Climate change may affect fire regimes across the Australian landscape through changes to temperature, rainfall, humidity, wind, and carbon dioxide in the atmosphere (source). Aboriginal Fire Management as a tool used to help reduce the impact of bushfires on people, places and the environment. Fire management is a key part of how Aboriginal people take care of country and is often called 'cultural burning' (source).

Aboriginal & Torres Strait Islander Histories & Cultures

Bushfires have always been part of the Australian natural environment. Aboriginal people learned to manage the land in ways that met their needs. Their main tool was low-intensity fire to keep the country more open and easier to travel through, to promote the growth of fresh green grass and herbs that would attract animals, as a means of signalling and hunting, and for the more obvious purposes such as warmth and cooking. They deliberately used fire to clear out some heavy bush areas and burnt the areas around fire-sensitive vegetation communities as a form of protection for the plants they used for food. As a result of Aboriginal fire use practices, large intense bushfires, such as those that occur today, were uncommon (Source). Aboriginal people used fire carry out a 'cool burn' as depicted in the video by John Daly Aboriginal Ranger.

Fire-making was hard work, and to be avoided where possible, so fire was carried about when collecting food, when moving camp, and on fishing expeditions at night (source).

Photo of burning forest

Drought - Bushfire – Erosion – Water Quality

Georges River/Holsworthy Bushfire in April 2018

Georges Riverkeeper

How did the Georges River bushfire impact the people & places?

April 2018 was the second warmest April on record and the eighth driest on record. The bushfire broke out on Saturday 14 April on the banks of the Georges River, near the Casula railway station. By the following day, more than 500 firefighters were battling the blaze, with almost 100 fire trucks and 15 aircraft. Three thousand, eight hundred hectares had burnt before the fire was brought under control several days later. Firefighters and residents saved 888 homes, six facilities and one outbuilding from destruction (source). However, many thousands of animals and plants were affected by this fire and it has a huge impact on the whole Georges River catchment. Rain events after bushfires can transfer huge amounts of ash, burnt material, soil and dead animals into our rivers (source), as demonstrated by the suggested Activity 1. The Bureau of Meteorology (BOM) has climate datasets and predictions to help us work out the likelihood of drought, bushfire and flooding events. For the latest data set for Holsworthy Military site on the Georges River refer to the BOM website. Check out the Georges Riverkeeper fact sheet on flooding for further information on flooding.

ACTIVITY 1: How do bushfires help seed germination?

Not all seeds germinate easily. Some seeds have a physical or chemical inhibitor to germination designed so that the seed will only germinate in natural habitats when conditions are favourable (Fact sheet). Banksia seeds need smoke to germinate. Check out the Gardening Australia video on how to smoke seeds. You could always just buy the seed starter granules from Bunnings that are infused with smoke. Try growing some native plants for your garden or school to help regenerate the bush, and help reduce soil erosion in the catchment that leads to lower water quality.

ACTIVITY 2: How does bushfire affect the soil and water quality?

When a bushfire goes through an area of bushland there is very little vegetation left to protect the soil from erosion during rainfall. This can be demonstrated in a simple experiment seen in this video. This outside experiment shows the less vegetation protecting the soil, the more runoff, which occurs more quickly, and it contains more sediment. Try this out.

ACTIVITY 3: Bird spotting “Firehawks”

Information dating back over a century reports the indigenous peoples of Australia's Northern Territory maintain that birds they call “Firehawks” can control fire by carrying burning sticks to new locations in their beaks or talons. These birds use fires to help find food—making easy meals out of insects and other small animals trying to flee the blaze (source). “Firehawks” like Black Kites and Whistling Kites inhabit Western Sydney. Use the Birds of Western Sydney ID chart and go outside to see if you can spot these birds where you are.

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Living World

Physical conditions on Earth affect water and the water cycle

Water is essential for the survival of living things. Where does it come from and how can we measure it?

Module 4

Water...WOW! Module

Catching Water

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Living World

Physical conditions on Earth affect water and the water cycle

Module 4

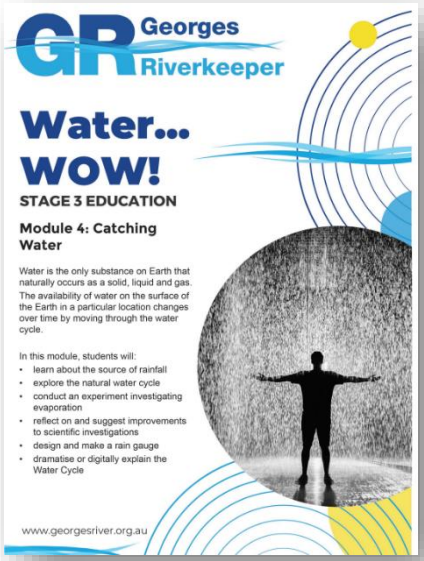
This resource supports the Georges Riverkeeper Stage 3 Education Module 4: Virtual Water

Outcome: Plans and conducts scientific investigations to answer questions, and collects and summarises data to communicate conclusions **ST3-1WS-S**

Key Inquiry Question: Where does fresh water come from and where does it go?

Learning Intentions: I understand where fresh water comes from. I can explain the water cycle using the correct terminology for each stage. I can conduct an experiment investigating evaporation. I can design and make a rainfall measurement device.

Success Criteria: I can create a paragraph that summarises where water comes from. I can successfully conduct an evaporation experiment. I can design and make device that can capture and measure rainfall.



Overview:

Water is the only substance on Earth that naturally occurs as a solid, liquid and gas. The availability of water on the surface of Earth in a particular location changes over time by moving through the water cycle.

Fresh water is a rare and wonderful thing

Earth's water journey is essential

Of the world's total water supply, 97% is salt water found in our oceans. That means that less than 3% of available water is freshwater and acceptable for our use. Think that's a small amount? Consider that of that three percent, over 68% is frozen in ice and glaciers and 30% is underground. This means that under 2% of freshwater is readily available to quench the needs of living things on Earth (source).

The water cycle above the ground

As the sun shines on liquid water it provides energy for evaporation, so that water becomes a gas that enters the atmosphere as water vapour. There is more evaporation as it gets hotter. We usually can't see water vapour, but it is measurable as humidity. As water vapour rises, it cools and changes back to tiny liquid water droplets that merge to form clouds. As droplets merge they collectively become increasingly heavy until they ultimately fall from clouds under the force of gravity. In Australia, most water falls as rain (liquid), but in colder regions it can fall as snow (solid), and we occasionally have solid hail falling from the sky. This water can flow across land and back into streams, rivers and oceans. As we experience it, this is the water cycle!

The water cycle underground

The other part of the water cycle, happens as water infiltrates through the ground. As water travels through soil it is well filtered. It can be taken up by plant roots and travel through the plant and into the atmosphere, as evapotranspiration. Alternatively, it can become groundwater (which is just water that is under the ground), which later can be discharged back into streams, rivers or oceans via springs.

Water Cycle and living things

Water is essential for the survival of living things. Where does water come from and how can we measure it?

Georges Riverkeeper

Why is water important?

Water is a precious resource and is used in many different ways. All living things need water to survive. Water is important for the environment. Wherever it travels, water carries chemicals, minerals and nutrients with it. If people pollute water or take too much fresh water from rivers or lakes, it can affect the animals and plants that rely on the water for their survival. Polluted water is a health hazard. Access to clean water is important for health.

Many people around the world do not have access to clean water supplies. Although water is a renewable resource (which means we can keep reusing it), it becomes difficult and expensive to reuse if it gets polluted (source).

ACTIVITY 1: Describe the source of water.

Think about and describe the source of water? Where does water from taps come from? Where does water in rivers and lakes come from? View video The Anatomy of a Raindrop.

Summarise the video into one paragraph (3 or more sentences). Try to use some of the technical words. This paragraph can then be shared with your teacher and class.

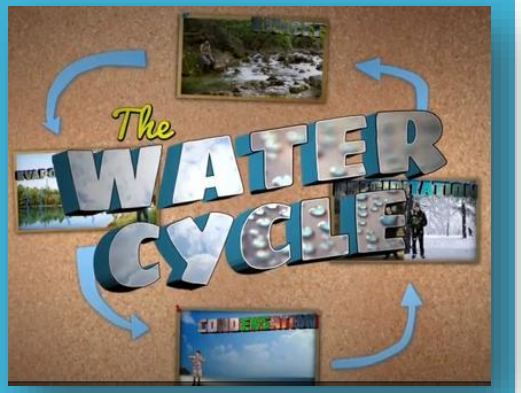


Photo source.

ACTIVITY 2: Evaporation experiment.

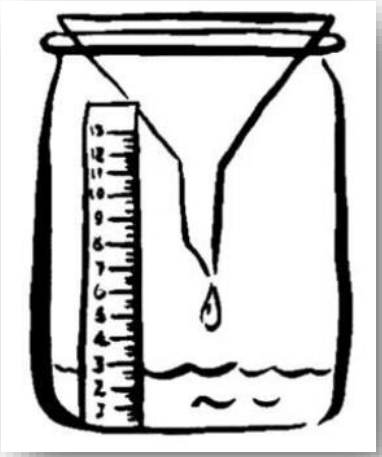
Place a cup with 100 mL of water outdoors in the sun for 4 hours, after marking the initial height of the water. Make a hypothesis. What might happen after 4 hours? Observe changes. What has happened to some of the water in the cup? Where has it gone? Discuss evaporation. View diagram to explore what happens to water vapour at Easy Science for KIDS.

Make a poster displaying your experiment and what happened to the water. Draw a before and after image of your experiment. Make and record a prediction for this experiment, what you think will happen (a hypothesis). Were you right? Share the poster with your teacher and class.

ACTIVITY 3: Make a rainfall measuring device.

Introduce that rain is measured in millimetres. View video How to Measure Rainfall with Professor Pete's Classroom. Students then design and make a device that captures and measures rainfall. Evaluate the precision of the device as a measurement for collecting rainfall.

Prepare a 2 minute presentation for your class explaining how your design works.



Georges Riverkeeper

Teacher Resource - TOPIC STARTER

GEOGRAPHY

Stage 3 Factors that Shape Places

Humans shape places

Stormwater Impacts the Georges River

Module 5

Water...WOW! Module

Water living for Living Cities

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

GEOGRAPHY Stage 3 Factors that Shape Places

Humans shape places

Module 5

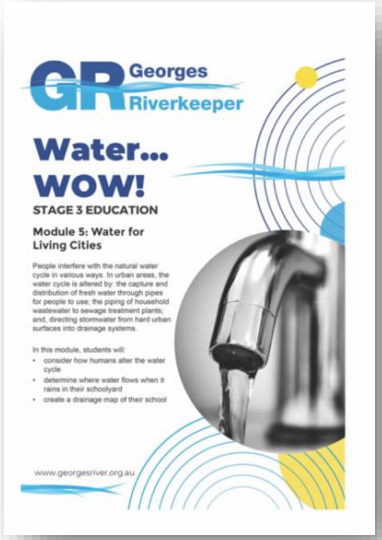
This resource supports the Georges Riverkeeper Stage 3 Education Module 5: Water for Living Cities

Outcome: Compares and contrasts influences on the management of places and environments GE3-3

Key Inquiry Questions: How do people and environments influence one another? How do people influence places and the management of spaces within them?

Learning Intensions: I can explain how people influence places and contribute to sustainability. I can help solve stormwater issues in the catchment.

Success Criteria: I can name some ways people contaminate stormwater. I can create a stormwater map as part of a stormwater audit of the school grounds. I can suggest solutions to stormwater issues at my school.



Overview: The Georges River is an urban river in southern Sydney that flows from the headwaters on the Illawarra escarpment and Appin down to the river mouth at Botany Bay. The total length of the Georges River is around 100 km long. The water is fresh above Liverpool Weir and is tidal and saltier below the weir down to Botany Bay. The Georges River catchment is home to almost 1.4 million people, 454 species of fauna (including aquatic and land animals), 30 riparian or riverside vegetation communities and 29 Endangered Ecological Communities (source). Water pollution causes major damage to the Georges River. It harms native biodiversity as well as limits our enjoyment of river activities such as fishing and swimming. What is being done about reducing pollution? Check out "Preventing Pollution in the Georges River".

Aboriginal and Torres Strait Islander Histories and Cultures

People, plants, and animals have always interacted, and their relationships have changed over time. The influx of Europeans since 1788 has accelerated this process dramatically. At the time of settlement, the mangroves lived on the edge of the Georges River, their roots partially submerged, while the salt marsh spread out low wherever there was flat land behind the mangroves. The boundary between mangrove and saltmarsh is not stable or fixed. Instead it depended always on the interaction of water, sediments, plants, animals, and humans.

The mangroves could always advance into the salt marsh habitat, except that the swamp wallaby, in one example of the pressures on the plants, fed on both young mangroves and salt marsh but preferred mangroves. So as long as there were plenty of swamp wallabies, the salt marsh would have some advantage over the mangroves. An increase in the human population hunting wallabies, however, would reduce the pressure on mangroves and consequently threaten the salt marsh, (source). Coastal salt marsh is an Endangered Ecological Community. The 'Targeted improvement of the Georges River estuarine food web' project aims to expand populations of the salt marsh species S.virginicus.

The $40,000 project is a joint partnership between Conservations Australia Volunteers, Georges Riverkeeper and Bayside Council, City of Canterbury-Bankstown Council, Fairfield City Council, Georges River Council, Liverpool City Council, and Sutherland Shire Council (source).

Photo: An artwork of a swamp wallaby created by Bankstown Koori Elders.

Stormwater Impacts the Georges River

Solutions to Stormwater

Georges Riverkeeper

How people influence Georges River water quality?

Most of the water-borne pollution that enters the Georges River comes from stormwater runoff. When it rains, water flows across hard surfaces that have no capacity for filtration (roofs, paths and roads) and carries pollutants to the waterways. Stormwater is not treated before it enters the Georges River, so everything that goes into the gutter is destined to enter the river (source). A stormwater audit will help identify problems in your school or home. "What happens to the rain" is a free iBook created by a teacher at Brewongle EEC that helps explain stormwater.

ACTIVITY 1: Where does the rain go at our schools?

If you are a Department of Education school, you can get access to school and building maps (via Staff Portal – My Essentials – AMS Application Portal – AMS on the web – PDF Sites and Building Plans). Or you could use Google Maps to print a map of the school grounds and buildings. Draw the location of all the stormwater pipes and drains, and number each one. With supervision from adults, and the appropriate safety precautions, lift the drain cover at each point and scoop out anything collected in the drain. Use the Stormwater Audit sheet to record what pollutants are contaminating the stormwater.

Photo: sample stormwater audit map (source).

ACTIVITY 2: What is Water Sensitive Urban Design (WSUD)?

WSUD aims to improve the ability to capture, treat and productively use stormwater before it pollutes natural waterways. WSUD reduces flooding impacts and the amount of water that needs to be supplied by water utilities. WSUD also provides wildlife habitat, public open space, recreational opportunities, and visual amenity. Some examples of WSUD include rainwater tanks, rain gardens, swales and constructed wetlands. Check out the fact sheet, WSUD examples and video to assess if you could use these ideas at you school to reduce stormwater contamination. Draw these solutions on your school map.

ACTIVITY 3: What are rain gardens?

Rain gardens can help reduce the amount of rainwater entering the stormwater system. This video explains how rain gardens work. Dulwich Public School used Water Sensitive Urban Design (WSUD) to create rain gardens in their school. This video help showcase their achievements and the solutions to their school stormwater issues. More information on rain gardens is available from Melbourne Water. Record on your school map where you could locate rain gardens in your school grounds.

Look into what materials you need to build a rain garden and who could help you.

Water...WOW! Module

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Living World

Adaptations of living things

How have mangroves and platypus adapted to the river?

Module 6

Water...WOW! Module

Living things in water

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Living World

Adaptations of living things

Module 6

This resource supports the Georges Riverkeeper Stage 3 Education Module 6: Living things in Water

Outcome: examines how the environment affects the growth, survival and adaptation of living things ST3-4LW-S

Focus Question: How do the structural features of living things support survival?

Learning Intentions: I can name some adaptations that enable mangroves and other fauna have to survive in the Georges River.

Success Criteria: I can name the parts of a mangrove tree. I can explain the adaptations a mangrove and platypus has that help them survive. I can explain how mangroves protect the riverbanks along the Georges River.

Overview:

Mangroves are a group of trees and shrubs that are capable of growing in marine, estuarine and, to a limited degree, fresh water. They occupy the fringe of intertidal shallows between the land and the sea. As a group of plants, mangroves share several highly specialised adaptations that have allowed them to colonise and thrive in intertidal areas. In particular they have developed special ways of dealing with concentrations of salt that would kill or inhibit the growth of most other plants (source). Mangrove adaptations are introduced in this 8 minute ABC video titled 'How do mangrove trees live in mud and sea water?. Conduct hands-on experiments on mangroves and discover platypus living in the Georges River with special adaptations for this environment.

Aboriginal and Torres Strait Islander Histories and Cultures

Aboriginal uses of mangrove trees

The Aboriginal people (or First Nations people) of the Georges River and Botany Bay depended on local and traditional materials. Mangrove wood was important for two reasons. One was the shape of the curved mangrove branches and roots: the most prized were the 'elbows' or 'knees' which could be readily carved into the boomerang shape.

The other was the characteristic qualities of this wood which was adapted to regular inundation with the tide. Joe Timbery, a senior La Perouse Aboriginal man interviewed in 1963, described the advantages of using mangrove wood because it didn't warp and, after being carefully treated, gave the best finish:

'we always left the natural colour of the wood. If the wood didn't have a good colour or grain, we used to shape it up roughly and then bury it in wet ground for a few months. That made it blue-black and tough, and it polished up well" (source page 130-131).

Photo 1: Boomerang from La Perouse Made in La Perouse Aboriginal Reserve, 1932-1940. Long wooden boomerang, constructed from a light coloured mangrove wood.
Photo 2: Mangroves on the Georges River

Adaptations of living things

How have mangroves and aquatic animals adapted to the river?

Georges Riverkeeper

What adaptations do mangroves have?

The most visible adaptation of mangrove plants, and the one which most distinguishes them from other terrestrial plants, is their root system. An obvious feature of the Grey Mangrove (*Avicennia marina* variety *australasica*) is its spiky vertical roots, called peg roots or 'pneumatophores', which can be seen at low tide protruding from the mud or sand. These roots act like snorkels, drawing air into the underlying root system, allowing the plant to breathe, survive and grow in soils that are too poorly aerated to allow other terrestrial plants to establish. Some mangroves are 'viviparous' (seeds germinate before becoming detached from the parent tree). This allows the seedlings to get a head-start before the seed falls into the water. They also have:

- salty sap (i.e. concentrations of salt in the sap),
- leaves with a waxy coating that limits saltwater penetration,
- salt-secreting pores on the leaves that allow the plant to get rid of excess salt,
- salt removal by concentrating it in branches and leaves before dropping them.

(source)

ACTIVITY 1: How do mangroves protect our riverbanks?

Mangroves protect coastal land by absorbing the energy of tidal currents and storm-driven wind and wave action, creating a natural breakwater that helps stop erosion (source). Take a look at this video that demonstrates how this works. This can be recreated in a shallow container with sand or soil up one end and a water at the other. When waves are made it erodes the unprotected sand/soil. This beach erosion video shows how you can make this experiment in class. You could also extend this activity by including something to protect the shoreline that represents what mangroves do.

ACTIVITY 2: Ephemeral Art

Take a walk outside and collect 'loose parts' found in a natural area to make an ephemeral artwork of a mangrove tree. Only use parts of plants that have fallen off. Please don't use green foliage that is picked off plants. Recreate the parts of a mangrove you have learned about, snorkel roots (pneumatophores), aerial roots, seedlings, seed pods etc. You can record a video of students explaining the parts of a mangrove and adaptations they have to help them live in this environment. You could also take photos of the students artworks and print them and ask them to annotate the adaptations.

ACTIVITY 3: What adaptations do platypus have?

Platypus have been sited in the upper freshwater sections of the Georges River (source). They are amazing animals with some equally amazing adaptations. Watch the video on platypus adaptations. Create a drawing of a platypus like Aunty Lorna form the Bankstown Koori Elders Group has done on this clay artwork. Label it with the adaptations that it has that help it survive. Platypus Fact Sheet.

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Living World

Growth and survival of living things

How do physical conditions affect growth and survival of living things?

Module 7

Water...WOW! Module

Aquatic Food Webs and Life Cycles

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Living World

Growth and survival of living things

Module 7

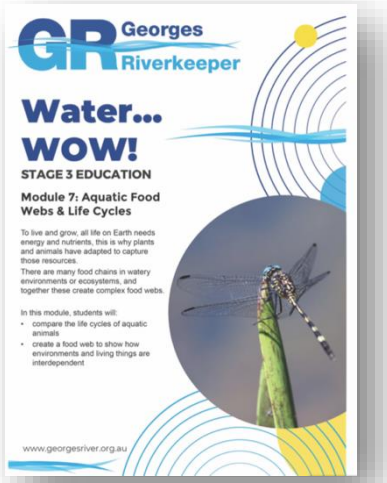
This resource supports the Georges Riverkeeper Stage 3 Education Module 7: Aquatic Food Webs and Life Cycles

Outcome: examines how the environment affects the growth, survival and adaptation of living things ST3-4LW-S

Focus Question: How do physical conditions affect the survival of living things?

Learning Intentions: I can identify some of the causes that lead to poor water quality in rivers and how they affect oysters and dragonflies.

Success Criteria: I can list some of the ways Aboriginal people (or First Nations people) and early settlers used oysters in the past. I can recall the impacts on the survival of oysters in the Georges River. I understand the role of macroinvertebrates in the Georges River.



Overview:

There are signs that recent management strategies along the Georges River are having positive effects in the water quality. Less pollutants are being discharged into the river by industries and the rehabilitation of riverine vegetation has improved biodiversity. After the decimation of oysters in the river over the last 250 years, it is unlikely that the oyster industry will return in the foreseeable future. However, recently mud oysters have returned to the Georges River and jellyfish and solder crabs have recently been sighted (source 2018). Physical conditions, such as water quality, are critical to the survival of living things in the Georges River. Oysters are a valuable environmental indicator and sometimes referred to as the 'canary of the estuary' or 'keystone species', indicating the overall health of the river ecosystem (source). Macroinvertebrate sampling can also provide a rapid assessment of the health of the aquatic ecosystem.

Aboriginal and Torres Strait Islander Histories and Cultures

Traditional Aboriginal uses of oysters

Shell middens dating back at least 6,450 years prove that oysters have been a valuable food resource for Aboriginal people (source). There were heaped piles of oyster shells in what are known as middens on the sandy shores of the rivers. Enormous numbers of shells, from oysters which Aboriginal people had gathered from the rocky shores or the trunks or aerial roots of mangroves, suggest that eating was a social time, with many people participating together, in places to which they returned frequently. These oysters were large and plentiful. When Lieutenant Cook landed in Botany Bay in 1770, he commented they were 'the largest he had ever seen' and would have been mud oysters (Ostrea angasi) and not rock oysters. Check out the Oysters NSW Snapshot to see the different oyster types.

Aboriginal people shared food with the settlers years later. One report suggested Biddy Giles "gathered native honey and oysters" to share. The pressure of these two settler desires - to taste home on their lips by eating oysters and to build homes over their heads with lime made from oyster shells – led to the decimation of the local stock of Sydney oysters (source).

Aboriginal people have used oyster and turban shells to make fishhook. They were either C- or J-shaped and curved to a point but not barbed, and attached to a line made from two strands of flax or bark fibre twisted together. A small stone was attached to the line to act as a sinker. No bait was put on the hook but chewed shellfish were spat out on the surface of the water to attract fish. The pearl lustre of the shell would have acted as a lure. Photo: Aboriginal shell fish hooks (Source).

Growth and survival of living things

How do physical conditions affect the survival of living things?

Georges Riverkeeper

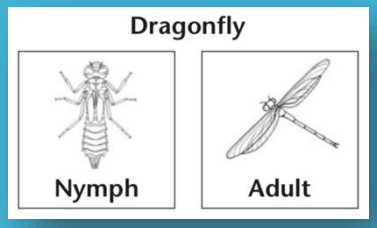
What has affected the living things in the Georges River?

Oysters - After 200 years of settlement, the Georges River estuary had NSW's second most productive oyster industry, but around the world there was growing recognition that pollution from industry and urbanisation were threatening the waterways. In the 1990s, the Georges River oyster industry was decimated, all commercial fisheries were closed and restrictions on recreational fishing were imposed. The Georges River oyster industry suffered major losses in the mid-1990s from QX disease, a protozoan parasite, Marteilia sydneyi, which is harmful to oysters but not to humans. The oysters were killed by the QX disease, but only after being weakened by years of sewage, toxins, dredging and acid sulphate sediments contaminating the river (source).

Water bugs or aquatic macroinvertebrates are small creatures that have no backbone and can be seen with the naked eye. They live all or part of their life in water, providing a food source for larger animals such as fish, frogs and birds. Macroinvertebrates include snails, beetles, dragonflies, and yabbies. Different water bugs have different tolerances to pollution and can therefore provide an indication of the health of waterways. A healthy waterway will have an abundance and wide diversity of water bugs (source).

ACTIVITY 1: Make a lifecycle of a dragonfly out of natural materials.

Flying insects such as dragonflies, mosquitoes and midges spend most of their life underwater. Adults lay their eggs in water and the juveniles live, eat and grow underwater, emerging as flying adults. Aquatic macroinvertebrates develop in a variety of ways, with 3 or 4 stage life cycles (source). Watch this amazing video on a dragonfly nymph emerging from the water and turning into a dragonfly. Take a walk outside to grab some natural materials to make a dragonfly lifecycle with. Take a photo of the finished product.



ACTIVITY 2: How can we investigate the role of oysters?

The Georges River Environmental Education Centre (GREEC) in collaboration with Elisa Bone, have been working with Bonnet Bay and Como Public Schools to engage the students in the study of the health of their local waterways. Elisa Bone, who has worked as a science adviser for the Billion Oyster Project with New York students, talked about the ways that the local rivers have changed since European settlement. She also spoke about the roles that oysters play in Aboriginal lifestyles, their ecological role, and about their decline and potential restoration. Students were shown the filtration capacity of oysters filtering the river water in tanks. Then the students worked with different types of natural materials to build 'oyster houses' to test in the Woronora River. The field trip also included visiting oyster farmers in Woolaware Bay. Students conducted water quality testing, looked at some organisms such as algae, bryozoans, worms and snails under field microscopes, and discussed the ecological goals of the seawall modifications at Carss and Dover Parks.

Photo: Carrs Park

ACTIVITY 3: Macroinvertebrates sampling in a pond

Macroinvertebrates occupy a central position in the food webs of rivers and streams. Sampling reveals information about the abundance, diversity and composition of water bugs. This in turn gives an indication of the health of the waterway. Abundance refers to the number of animals present. Diversity refers to the number of different types of animal present. NSW Waterwatch have created a Teacher's Guide and Junior Student Guide to macroinvertebrate sampling. Sampling can be a simple as using a kitchen strainer attached to a broom stick and dipping it into a pond. Use the Water Bug ID Posters to identify the macroinvertebrates you have found.

Water...WOW! Module

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

GEOGRAPHY

Factors that Shape Places

Factors that change environments

How do people influence places and the management of spaces within them?

Module 8

Water...WOW! Module

Water Pollution

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

GEOGRAPHY Stage 3 Factors that shape places

Factors that change environments

Module 8

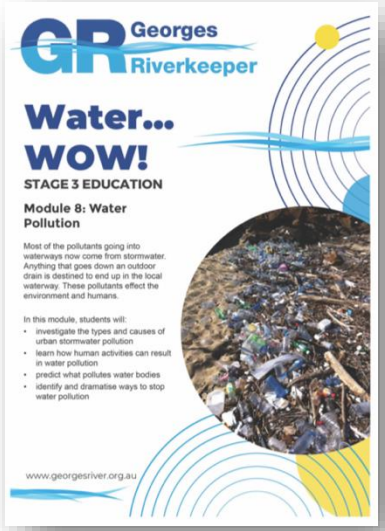
This resource supports the Georges Riverkeeper Stage 3 Education Module 8: Water Pollution

Outcome: Explains interactions and connections between people, places and environments GE3-2

Focus Question: How do people influence places and the management of spaces?

Learning Intentions: I can understand how Aboriginal people (or First Nations people) shaped the land using firestick farming. I can describe how people have influenced our rivers and oceans by polluting the water with plastic.

Success Criteria: I can describe how Aboriginal people farmed the land. I can help prevent microplastics from entering our waterways.



Overview:

We all know plastics can be transported from human populated areas to the marine environment by rivers, wind, tides, rainwater, storm drains, sewage disposal, and flooding, or can directly reach the sea from boats and offshore installations. But plastics break up into increasingly smaller pieces mostly due to the effect of sunlight and heat. These plastic fragments, commonly called microplastics when smaller than 5mm, represent the vast majority of human-made debris present at beaches, seafloor, and in the water column. The effects of plastics on food webs and ecosystems have become focus of concern over the last decade. Plastics that enter the oceans are become increasingly toxic by adsorbing oily pollutants on their surface. When plastic is ingested, these concentrated toxins can be delivered to animals and transferred up their food chains to top-order predators such as humans and large fish. There are actions we can take to influence places and help manage the water pollution entering our rivers and oceans. We can start our investigation in our school grounds.

Aboriginal and Torres Strait Islander Histories and Cultures

Firestick Farming

Take a look at this amazing video about Firestick Farming '*Using fire to shape the land*'.

Fire stick farming is a practice that demonstrates Aboriginal and Torres Strait Islander understanding of the physical requirements for the growth, germination, fruiting and regeneration of particular plant species. Through regular cultural burning, ash is provided as a source of nutrients to those species and fertilizes the land, providing optimum soil chemistry to ensure an abundance of such resources. Fire also stimulates the production of fruiting bodies of important edible fungi. For example, Laccocephalum mylittae, commonly known as "native bread", is a valued edible Australian fungus that increases the production of fruiting bodies after fire. Aboriginal cultural fire practitioners understand that adjusting the physical conditions of the environment through fire management promotes the productivity of plants such as cycads (Macrozamia communis) and yams. The application of fire on Yuin country (south coast NSW) improved productivity of cycads after fire treatment with approximately an 8-fold increase in increased proliferation of seeds. Some Aboriginal people use the practice of fire-stick farming to fertilise the land prior to planting yams. The yam harvest is promoted by tilling and aerating the soil prior to burning in a mosaic pattern, which enables the ash to penetrate through the soil and provide nutrients to the yam plantation.

Fire increases the production of food resources and demonstrates the long-held knowledge that Aboriginal peoples have of the physical conditions that particular species within their environment require for growth and survival (source).

Refer to artwork "Indigenous Australians using fire by Joseph Lycett c1817 (source).

Factors that change environments

How do people influence places and the management of spaces?

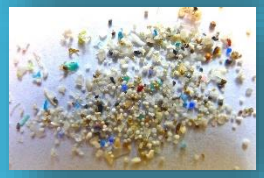
Georges Riverkeeper

What are microplastics?

Watch the amazing 3.36 minute video on Plastic Pollution 'What Are Microplastics And How Are They Harming Our Oceans?'. Microplastics form when bigger bits of plastic break up into smaller bits. They can even break off our clothes when we wash them. You probably have some microbeads at home right now in your scrubs or shampoos. There are about 300,000 of them in the average bottle of face scrub. Even some toothpastes have plastic microbeads in them too. Microplastics are becoming a really big problem, especially in our rivers and oceans. Looking at plastic in the environment, over 85% of that is microplastic. That's really bad news especially for marine animals because those little plastic pieces look a lot like food to them. That plastic can get stuck in their stomach making it harder for them to digest food. Another big problem is that plastic often has dangerous chemicals in it and they can seep into the animal's body. This not only causes issues for them, it can also be a real danger for the animals that eat them - including humans. Unlike other rubbish, microplastic is just too small to get filtered out in water treatment plants, and that means they just end up floating straight out to sea. So, many people say the best way to stop them is just to get rid of them altogether (sourced from the video). Also refer to the fact sheet on 'Microplastics: Small Plastic, Big Problem'.

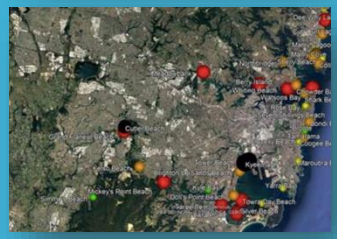
ACTIVITY 1: Microplastics at school?

The students from Loftus Public School conducted an audit of the school stormwater drains to see what is contributing to stormwater pollution from their school grounds. From the initial inspection of some of the drains, the students found that most of the pollutants were organic based leaves, sticks and soil. There was however an alarming find in the drain below a playground with Softfall underneath it. They found tiny particles of the rubber Softfall in the sediment collected in there which would end up in the local creeks. They now aim to come up with a solution to fix this stormwater contaminant leaving their school grounds. What is in your school drains? How can you help reduce the contaminants you found?



ACTIVITY 2: AUSMAP - Microplastics in the Georges River

AUSMAP is an ambitious coalition of school students, environment groups, universities and educators gathering critical new data about microplastic in our waterways. Using the data collected by the network of citizen scientists and researchers, AUSMAP is creating vivid maps of microplastic pollution hotspots around Australia. This program engages students in citizen science, to connect them to the natural world and to inspire change for a sustainable future. Some of the initial AUSMAP results for the Georges River catchment, that can be seen on the current results map, include Grand Flaneur Beach as being 'High' and Kelso Beach "moderate'. Watch as Georges Riverkeeper takes samples for AUSMAP. Teachers at the Georges River Environmental Education Centre are trained in using AUSMAP methodology and have an AUSMAP kit they can help schools use (video).



ACTIVITY 3: Microplastics Animation

Students from St Georges Girls High School celebrate a 'Green Day' each year and the teachers from Georges River Environmental Education Centre deliver a 2-hour workshop on how to create stop motion animations. The students during this time create a one-minute animation on microplastics and what students can do to help solve the problem. They then showcase their animations at their concluding assembly.

The stimulus video shown to these students before they started to animate was 'What Are Microplastics And How Are They Harming Our Oceans? Plastic Pollution'. The teachers at Field of Mars Environmental Education Centre have developed a free Apple iTunes U Course titled 'Movie Bugs Animation' that guides on how to use iStopmotion.

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Adaptations of Living Things

Scientific Water Testing

Waterbug Survey (macroinvertebrate) Field Trip

Module 9

Water...WOW! Module

Scientific Water Testing

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Living World

Adaptations of living things

Module 9

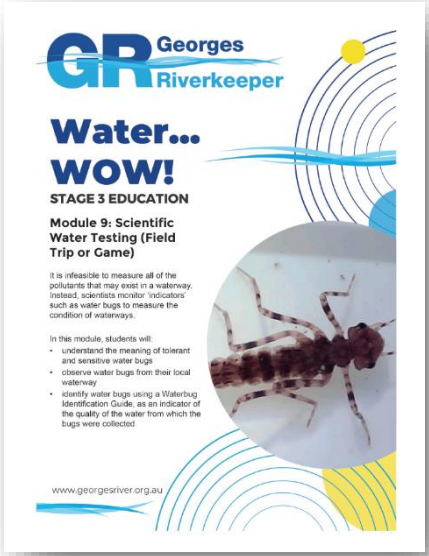
This resource supports the Georges Riverkeeper Stage 3 Education Module 9: Scientific Water Testing

Outcome: examines how the environment affects the growth, survival and adaptation of living things **ST3-4LW-S**

Key Inquiry Question: How do the structural features of living things support survival?

Learning Intentions: I can identify adaptations in living things

Success Criteria: I can describe some structural and behavioural adaptations in freshwater macroinvertebrates.



Overview:

Georges Riverkeeper's River Health monitoring of freshwater sites not only involves measuring water quality but also collecting waterbugs.

The waterbugs (freshwater macroinvertebrates) are very useful for determining the condition of the waterway from which they were collected. This is because waterbugs occur everywhere, they are relatively easy to catch, they are very diverse and different types of waterbug vary in their sensitivity to pollutants and other disturbances owing to human activities impacting waterways. That is, some waterbugs are very sensitive and others are far more tolerant of impacts to waterways. Highly impacted waterways will only have tolerant waterbugs, which differs from the occurrence of both sensitive and tolerant waterbugs in unimpacted streams. Information source

Yana'o Kai'eemagh' Walking on Georges River Country

Shannon Foster is a D'harawal Guriwal woman from Sydney with family from La Perouse and the Georges River. She is a Sydney Dharawal knowledge keeper and an artist who shares stories and weaving techniques from the Sydney Saltwater Country that have been passed down through her family over thousands of years. Watch Shannon's latest video recorded to celebrate National Reconciliation Week in 2020 and explore the history of the Georges River with her.

National Reconciliation Week 2020 is an opportunity for us all to consider the role we play when it comes to strengthening the respect between the wider Australian community and Aboriginal and Torres Strait Islander people. National Reconciliation Week (NRW) is a time for all Australians to learn about our shared histories, cultures, and achievements, and to explore how each of us can contribute to achieving reconciliation in Australia. Reconciliation must live in the hearts, minds and actions of all Australians as we move forward, creating a nation strengthened by respectful relationships between the wider Australian community, and Aboriginal and Torres Strait Islander peoples. Visit the Reconciliation Australia website for more information.

Adaptations of living things

Scientific water testing and macroinvertebrate sampling

Module 9

How do macroinvertebrates determine river health?

Waterbugs, or freshwater macroinvertebrates, are small creatures that live in freshwater for either all or some of their lives. By looking at the type and number of water bugs in our waterways, we can tell how healthy the waterway is. Dr. David Reid from Georges Riverkeeper shows how to do a 'live pick' of waterbugs from a water sample in this video. Information source

The summary of all the macroinvertebrate samples the Georges Riverkeeper collects is then documented in the Georges River Report Card which shows the river health grades across the catchment.

ACTIVITY 1: School citizen science programs

This video looks at a student citizen science project by Office of Environment and Heritage to monitor macroinvertebrates and water quality in Warrumbungle National Park. The goal of this project was to introduce local school students to the concept of citizen science.

Another new program is the National Waterbug Blitz. The National Waterbug Blitz is Australiaôs first nationwide waterway monitoring event. Each year, Australians are encouraged to become ócitizen scientistsô and investigate how healthy their local waterways and wetlands are, simply by exploring and identifying what waterbugs they contain. Find out how to get involved, as anyone can participate.

ACTIVITY 2: Macroinvertebrate adaptations

Macroinvertebrates have physical adaptations suited to living in specific aquatic environments. Creatures that live in fast-flowing water, like stoneflies and mayflies, often have claws or hooks for holding on to rocky substrates. Water boatmen live in slow-moving water so their legs are designed for swimming rather than holding on. The spiny-gilled mayfly has hairy legs to trap drifting food particles. Information source

Take a look at the amazing video of macroinvertebrate sorting from the 6:00 minute mark in this video. You will see macroinvertebrates óclose-upô Pause the video as you watch it to sketch some of the macroinvertebrates that are shown and record some adaptations you can identify from the video and photos.

ACTIVITY 3: Fieldwork for schools

The specialist teachers at the Georges River Environmental Education Centre conduct excursions and incursions for schools in the Georges River catchment. Georges River EEC is a NSW Department of Education school.

The programs they run are Science, Geography, Art or history focused and are aligned to the NSW Curriculum. The Centre is based at Chipping Norton Lake, and excursions are conducted from there or in your school grounds or a bushland area or creek near your school. Check out the Georges River EEC website, phone direct on 02 9755 3189, or email via georgesriv-e.school@det.nsw.edu.au

Georges Riverkeeper

Teacher Resource - TOPIC STARTER

SCIENCE

Stage 3 Material world

We use water daily in our homes, schools, businesses and community.

We can all use water more efficiently through different behaviours, technologies and systems.

Module 10

Water...WOW! Module

Water Solutions

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

SCIENCE Stage 3 Material world

We use water daily in our homes, schools, businesses and community

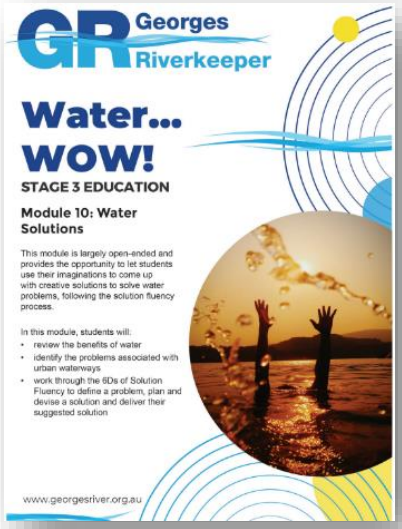
Module 10

This resource supports the Georges Riverkeeper Stage 3 Education Module 10: Water Solutions

Outcome: Plans and uses materials, tools and equipment to develop solutions for a need or opportunity. ST3-2DP-T

Focus Question: This module is largely open-ended and provides the opportunity to let students use their imaginations to come up with creative solutions to solve water problems, following the solution fluency process.

Learning Intentions: I can identify problems associated with waterways and the urban water cycle. I can work through the 6Ds of Solution Fluency to define a problem, plan and devise a solution and deliver the suggested solution.



Success Criteria: I can identify a water problem at home or school. I can use the 6Ds to create a solution to a local water issue. I created a digital nature poster.

Overview: Water is at the core of the UN Sustainable Development Goals Number 6 Clean Water and Sanitisation and is critical for socio-economic development, energy and food production, healthy ecosystems and for human survival itself. As the global population grows, there is an increasing need to balance all of the competing demands on water resources so that communities have enough for their needs. At the human level, water cannot be seen in isolation from sanitation. Together, they are vital for reducing the global burden of disease and improving the health, education and economic productivity of populations (source).

The 6Ds of solution Fluency

The 6Ds of Solution Fluency are an essential system for building problem-solving prowess and strong critical thinking capacity. These 6Ds are Define, Discover, Dream, Design, Deliver, and Debrief.

1. Define: What is the problem that we face? (defining the problem or challenge)
2. Discover: What's causing the problem, and why do we need to solve it? (investigate and research the background of the problem)
3. Dream: What does the ideal solution look like? (consider the problem and develop a solution to it)
4. Design: How will we create our solution? (plan the initial framework for the solution)
5. Deliver: What will the production process look like? (the actual development stage of the task)
6. Debrief: Did the solution suit the purpose and the audience? (reflection on learning process and relevance of content, processes, skills or techniques) (source)

The importance of water in Sydney's future

Cities like Sydney must provide exceptional urban places to attract and sustain investment, and support productive, vibrant communities. A water sensitive approach to urban water planning and management is emerging as global best practice.

Information and Photo source.

Water as a resource and Creating Solutions

We can all use water more efficiently through different behaviours, technologies and systems.

Georges Riverkeeper

Reducing pollution, water as a resource

Pollution prevention is a shared responsibility and there are regulations in place to help prevent pollution from entering the waterways. Have a look at this Georges Riverkeeper fact sheet to find out more about what is being done.

Water sensitive urban design is also an important part of understanding and planning for water in our community. Watch this short Vimeo Water sensitive urban design and consider ways that you could include these designs at your home, school or in the community.

Photo source.

ACTIVITY 1: Make a list of the problems associated with water in your school.

Did you know that schools in greater Sydney use about 7,790 million litres of water a year? Water at school is used for things like: drinking water from bubblers, preparing food in the canteen and kitchens, washing hands, watering the garden and flushing toilets.

Not all uses for water are problems. However, simple steps can be taken to save water and reduce water wastage. (source)

ACTIVITY 2: Choose ONE problem from Activity 1 undertake a planning and design process to find a solution to the process.

Using the 6Ds of Solution Fluency (Define, Discover, Dream, Design, Deliver, and Debrief: do a web search for more information and find that which best suits your class) students undertake a planning and designing process to find a solution to their identified problem.

Photo source.

View the video Poop and Paddle: An Eco-Friendly Floating Toilet to stimulate the thinking process of designing a solution to a problem.

ACTIVITY 3: Make a Digital Nature Poster

Students are tasked with creating awareness of water use and water saving within their school, homes or community.

Firstly, take a photo of nature in the area that you want to increase awareness of. Then, come up with a slogan or caption that will get your point across. Finally, print and place your poster up for all to see. Can you be a social influencer?

Georges Riverkeeper

www.georgesriver.org.au

Learning about our river **Water...WOW!** Modules

These are free water education resources for teachers and students about water in the Georges River catchment in South Sydney, and more generally, in Australia. These education modules have been prepared for Stage 3 in primary schools.

They cover facts for kids about drinking water, water uses, the water cycle, water pollution, water conservation, rainfall, drought, floods, aquatic food webs, and how to measure water conditions using waterbugs, plus much more.

www.georgesriver.org.au/learn-about-the-river/schools

There are many different stakeholders and landowners in the Georges River Catchment who all have a responsibility to manage their land in a way that ensures there is a minimal impact on the river and its ecosystems.

Georges Riverkeeper's Members:

Bayside Council – Serving Our Community

Campbelltown

Canterbury Bankstown

FairfieldCity – Celebrating diversity

Georges River Council

Liverpool City Council

Sutherland Shire Council

Wollondilly Shire Council

Georges Riverkeeper's Partners:

NSW Government – Justice

National Parks & Wildlife Service

Georges Riverkeeper acknowledges the Traditional Owners and Custodians of the Georges River, the Kamegal, Bedigal, Cabrogal, Cannemegal, Gweagal and Norongerral people of the Eora, Dharug and Dharawal nations and we pay our respects to their Elders past, present and future.

These modules have been prepared in association with

GEORGES RIVER ENVIRONMENTAL EDUCATION CENTRE

www.georgesriv-e.schools.nsw.gov.au