

# water

## in Rural Communities

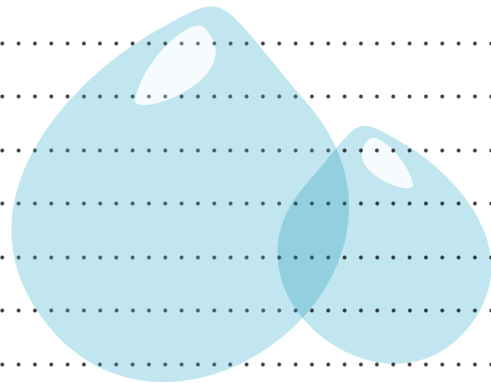
Education Resource





# Contents

Welcome to Enviro-Stories .....	3
Cultural importance of water .....	4
Water is a precious resource .....	6
Where the water flows .....	10
When the water falls.....	11
Irrigation landscapes .....	12
Water use find-a-word.....	14
Full of life.....	15
Impacts on waterways .....	17
Watery food web .....	18
Friend or Foe? .....	20
Alien fish .....	21
You can be a citizen scientist .....	23
A healthy underwater home .....	24
Mammalian habitat .....	25
Riparian Rapture .....	26
A Watery World .....	27
Common Water Plants .....	28
Water Bug Collection .....	29
Make Your Own Water Bug Net .....	31
Useful Websites .....	32



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# Welcome to Enviro-Stories

Enviro-Stories is all about engaging your students in learning all about the program theme and then applying their knowledge into a literacy program that is curriculum aligned. This education resource has been created to inspire learning about water in rural communities.

## *The types of stories we are looking for!*

The Enviro-Stories theme is “Water in Rural Communities”. We are looking for students to use their imagination to write and illustrate stories about how we use water on farms and in rural towns, conserving water, impacts from floods or droughts and how important water is to the survival of our plants and animals. Stories can be from a human, plant or animal perspective or about events that occur on farms and in rural communities.

Here are some ideas to get you started on the types of stories we’re looking for:

- Water uses
- How to save water
- Irrigation
- Where farm water comes from
- Our catchment
- Farm water
- Urban water
- Riparian zones
- Fishy pests
- Water gives life
- Drought
- Flood
- Rivers, creeks, lakes
- Murray-Darling Basin
- Wetlands
- Who lives in the water
- Importance of water to farms
- Water for stock
- Water for crops
- The water cycle



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Enviro-Stories

water

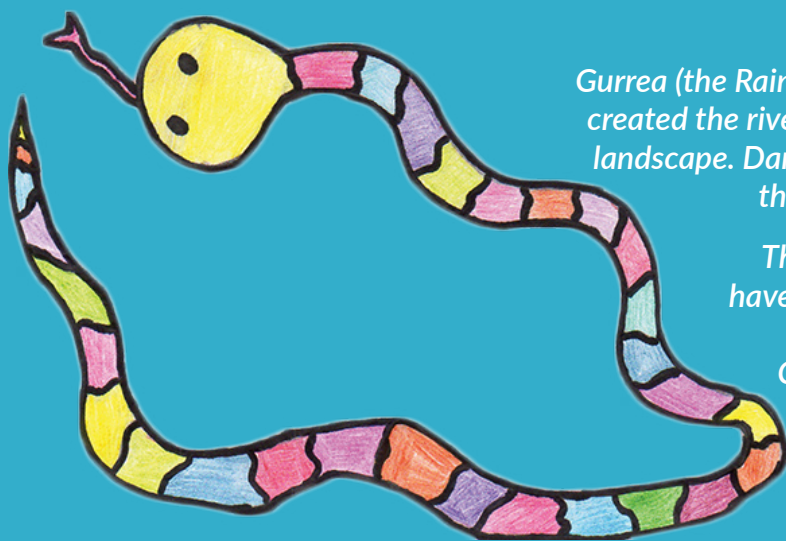
# Cultural importance of water

Water is vital to all living things and the knowledge of how to find water in harsh environments has been handed down through Aboriginal families for generations. Knowing where to find water is reflected in how to respect and use water wisely so as not to upset the ancestors or Dreaming creators, such as the Rainbow Serpent.

There are many Aboriginal representations of the **RAINBOW SERPENT** across Australia.

**WATCH** this version of the Rainbow Serpent, Goorialla, as read by students from Norris Road State School (3:22) [youtu.be/Ykw0SuRaJXs](https://youtu.be/Ykw0SuRaJXs)

**READ** this story from the Gomeroi people in the Pilliga and the creation of Dandry Gorge.



## Creation of Dandry Gorge

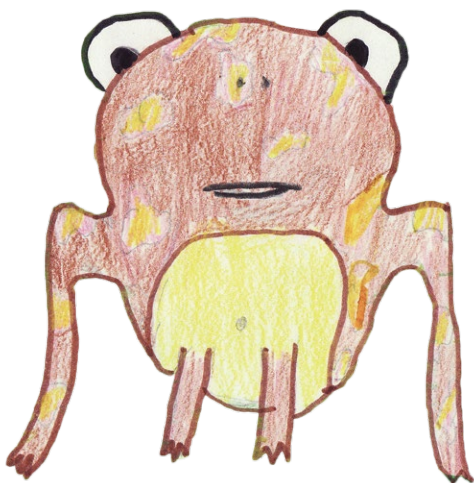
*Gurrea (the Rainbow Serpent) is one of our great creators. Gurrea created the rivers, lakes and the creeks as he moved through the landscape. Dandry Gorge is one of the features in the landscape that was created by Gurrea back in the Dreamtime.*

*There are many water springs in Dandry Creek that have sustained Aboriginal people for many thousands of years. Where you see water springs in Dandry Creek that is where Gurrea has gone underground and resurfaced making the next water spring.*

SOURCE: DANDY GORGE, SCULPTURES IN THE SCRUB INTERPRETIVE SIGN

Another Dreaming story is that of the **RAIN MAKERS**.

**VIEW** the artwork that represents Water Dreaming at the Japingka Gallery in Western Australia. The description on this page include a Warlpiri Water Dreaming story about the rain makers. [www.japingka.com.au/articles/water-dreaming/](http://www.japingka.com.au/articles/water-dreaming/)



**TIDDALICK THE FROG** is a Dreaming story about the great flood and how you shouldn't be greedy.

Tiddalick the frog drank all the water in the lakes and river and streams. He was so greedy that there was no water left for the other animals. They were very thirsty as they need water to survive. It wasn't until Tiddalick is made to laugh that water comes spilling out of his giant mouth and fills all the waterholes.

**WATCH** this short video of the Tiddalick Dreaming story. [youtu.be/0y3Ta5xcKV4](https://youtu.be/0y3Ta5xcKV4)





# Brewarrina Aboriginal Fish Traps (Baiaime's Ngunnhu)

NEW SOUTH WALES



Long before Europeans came to Australia, Aboriginal communities were applying advanced knowledge of engineering, physics, water ecology and animal migration to catch large numbers of fish in traps like the Brewarrina Aboriginal Fish Traps.

The significance of these early Aboriginal technologies that demonstrate the sophisticated understanding by Aboriginal people of the land, and its natural resources, are steeped in legend.

The story of the Brewarrina Aboriginal Fish Traps, known as the 'Ngunnhu' to the local Ngemba people, shows how an ancestral creation being designed and created an important fishing venture that supported many Aboriginal communities in the Brewarrina region in north-west New South Wales.

According to Aboriginal history, the Ngemba people were facing famine after a major drought had dried the river. Baiaime, a creation being who saw their plight, designed a gift for the Ngemba—an intricate series of fish traps in the dry river bed.

Baiaime produced the design for the Ngunnhu by casting his net over the river course. His two sons built the fish traps to Baiaime's design.

Baiaime then showed the old men of the Ngemba how to call the rain through dance and song. Days of rain followed and filled the river course, flooding Baiaime's net and bringing with it thousands of fish. The old men rushed to block the entry of the stone traps, herding fish through the pens.



Baiaime instructed that, although the Ngemba people were to be custodians of the fishery, maintenance and use of the traps should be shared with other tribes in the area.

Over time, the Ngemba people studied fish migration in relation to season and river flows to apply innovative new methods of working the fish traps more efficiently, and to ensure that the river was not overfished.

Baiaime wanted the other tribes in the region, including the Morowari, Paarkinji, Weilwan, Barabinja, Ualarai and Kamilaroi to use the Ngunnhu.

He allocated particular traps to each family group and made them responsible under Aboriginal law for their use and maintenance. Neighbouring tribes were invited to the fish traps to join in great corroborees, initiation ceremonies, and meetings for trade and barter.

The Ngunnhu was, and continues to be, a significant meeting place to Aboriginal people with connections to the area.

National Heritage List: 3 June 2005

# Water is a precious resource

Get a glass of water and take a good long look at it. **Guess how old you think the water is?** Discuss this with a friend. You'll find out the answer soon.

## A change in state

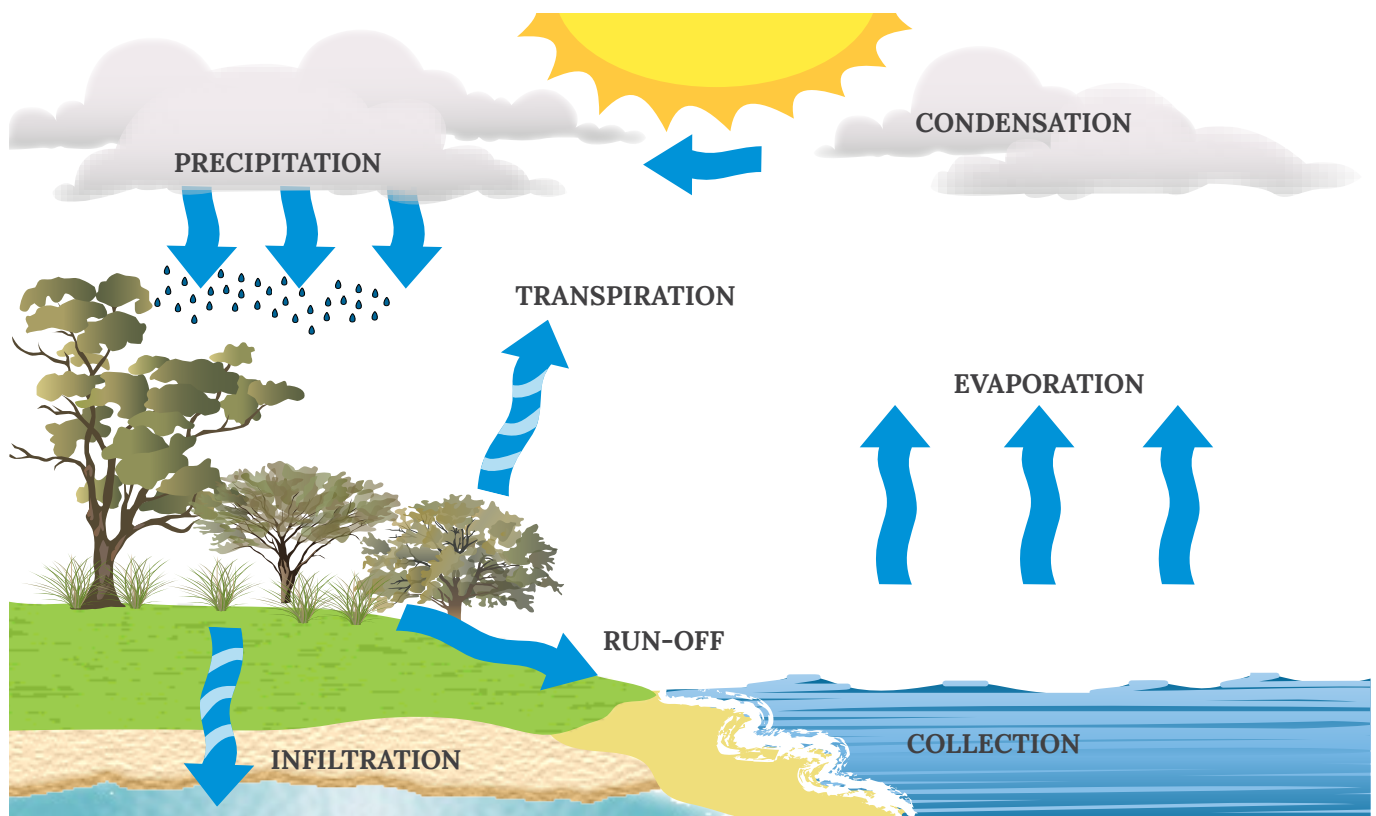
Water can be found in three different states of matter:

**LIQUID**  
rain and rivers

**SOLID**  
ice and snow

**GAS**  
steam (water vapour)

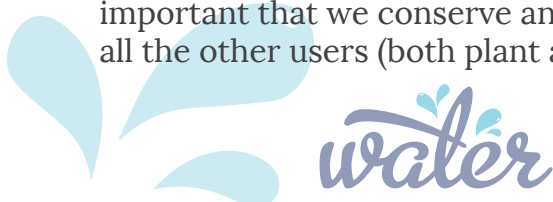
The journey that water takes as it changes in state, travels to new locations and is used, is called the **WATER CYCLE**. Water on our planet travels through the water cycle continuously. The water keeps moving and changing state as it repeats the cycle millions of times over.



## An ancient resource

Did you know that the water we drink today could have come from lakes in Africa? The heat from the sun causes water to evaporate and wind currents carry the water across the Indian Ocean. The water vapour condenses in our clouds before it falls as rain and we drink it. Some water travels underground or is frozen in ice and snow for millions of years before it continues its journey.

The answer to your question is this...there is only a limited amount of water on the planet, so the water we see today has been cycling around since Earth was formed. This is why it is important that we conserve and look after our water sources, not only for us, but also for all the other users (both plant and animal) that rely on water for survival.





# Water is a precious resource

## Water at home

Water is one of the most precious natural resources to rural areas. Townships and farms need water to flourish and survive. This makes water extremely valuable to all rural communities especially in Australia's arid climate where long periods without rain (droughts) often occur.

Water can come from a number of different sources.



### Surface Water

This is the water you can see. Surface water comes from rainfall that collects on the surface of the ground becoming runoff. This runoff drains to lower points to form waterways, such as creeks, rivers, lakes and dams, that make up our river catchments. For our farms to thrive we need to deliver this water to farms through channels and pipes.

### Groundwater

This is the water that seeps into the ground and collects in spaces within rocks. The water comes to the surface in natural springs and seeps, or can be brought to the surface using wells and bores. Groundwater makes up natural underground waterways often referred to as aquifers.

### Rainwater Harvest

This is the water that we can collect directly from rainfall. Rain that falls on structures like houses and sheds can be collected and stored in tanks, dams and ponds. The roofs of these structures act like mini catchments collecting rain and draining it into guttering and pipes that can be directed into storage facilities like rainwater tanks.

### Town Water

This water is supplied to councils by local water authorities. The councils store and treat the water before delivering it by pipelines to the homes and businesses in the town areas.

### Reuse Water

This involves capturing water that has been previously used and reusing it. This water can come from any number of sources and can be treated with filters, chemicals and ultra-violet (UV) light to ensure it is safe for use in homes, factories, farms, parks or gardens.

## Using water on the farm

Water is one of the most important natural resources to farming communities. Everything relies on water to survive so it is essential that we try to conserve and protect our water resources. Water is used for many different purposes on farms. Below are some of the main ways in which our farms use water:

### Domestic Water

Domestic water includes all water used by people for drinking, toilets, washing machines, sinks, bathrooms, gardens, pets and anything to do with their households.

### Stock Water

This water is used for the sustenance of farm animals. All farm animals need access to drinking water to survive.

The amount they drink can depend on their food sources. Stock eating dry foods (such as hay) will need to drink almost twice as much as those eating rich wet grasses. Other influences of water consumption include warmer weather, pregnancy and milk production.

### Irrigation Water

This water is used for the irrigation of broad acre crops such as cotton, wheat and rice and horticultural crops such as fruit and vegetables and fodder crops such as lucerne hay and pastures. All these irrigated products contribute greatly to the economy.

Competition for water resources means that sustainable and efficient irrigation is becoming extremely important. The development of new water saving technology is playing a major role in helping farmers be more efficient with their water use.

### Recycled Water

This water can come from rain or irrigation runoff on farm paddocks. The water drains to a dam on the farm and then is recirculated back for use on farm crops.

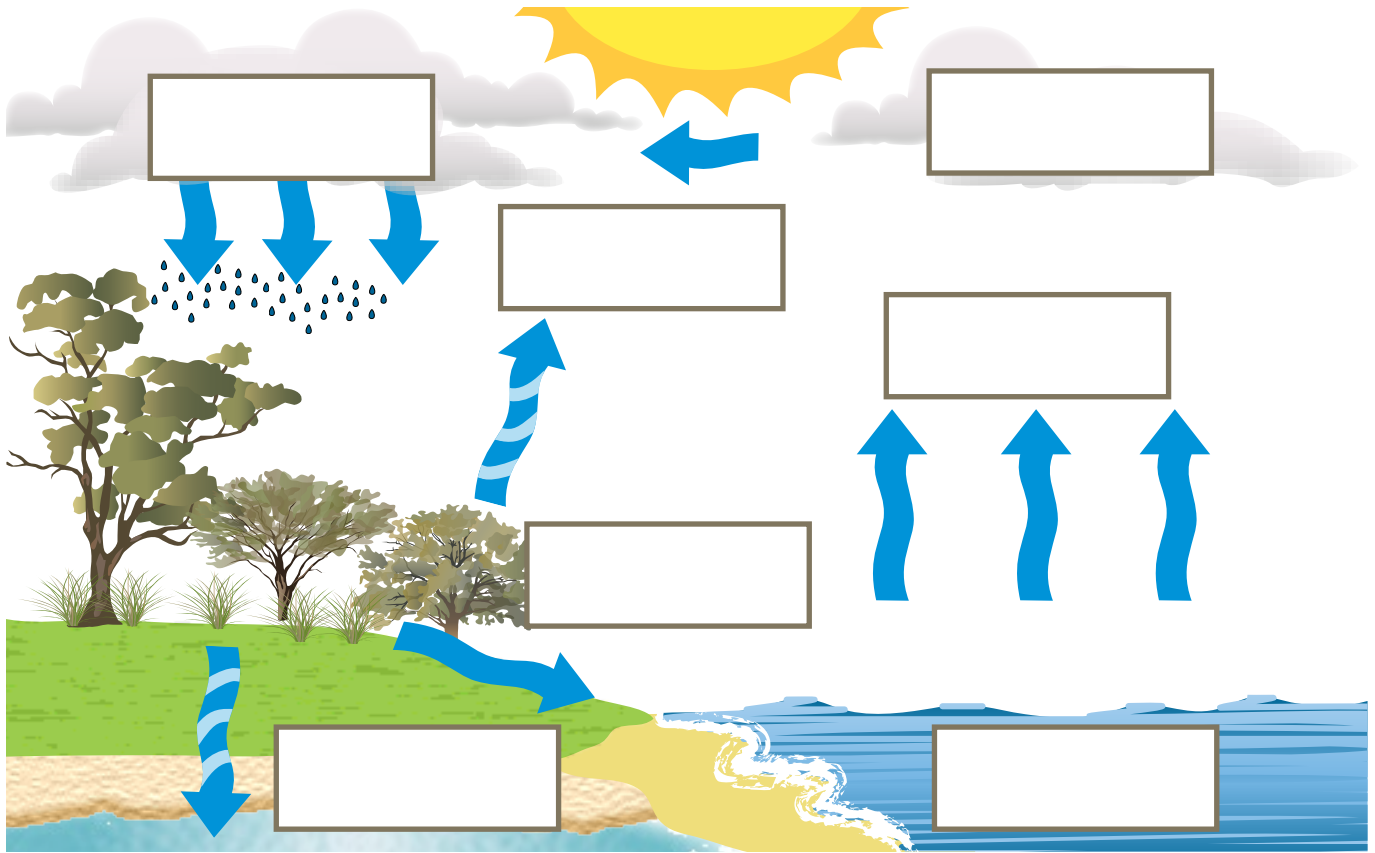


PHOTO: CENTRE PIVOT LATERAL  
MOVE IRRIGATION (T. FARRELL)



# Water is a precious resource

1. Fill in the blanks on the water cycle.



2. How is water delivered to farms?

.....  
 .....

3. What are the underground waterways called?

.....

4. Explain how a water tank collects rainwater

.....  
 .....  
 .....  
 .....

5. Name four uses for domestic water

.....  
 .....  
 .....  
 .....

6. List four food crops grown in your region.

.....  
 .....  
 .....  
 .....

# Where the water flows

## What is a catchment?

A catchment describes any surface where water falls and drains to an end point. That means that everywhere on Earth is located within a catchment.

A catchment can be small like the roof of a house, or it can be huge like the Murray-Darling Basin.

Whatever we do in a catchment affects the water that flows through it. For example, if a town pollutes its river water then other water users downstream will be using that same polluted water. This is not healthy for our wildlife, our agriculture or our own health.

To look after our catchments we need to be careful of how we look after our land and everything it supports. A healthy landscape gives us healthy and productive farms, wildlife that flourishes and happy communities.

## Classroom Activities

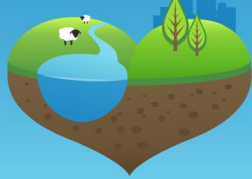
### Murray-Darling Basin

These education resources are for teachers and students learning about the Murray-Darling Basin.

[www.mdba.gov.au/education](http://www.mdba.gov.au/education)



### Catchment Detox



### Catchment Detox

See if you successfully manage a river catchment and create a sustainable and thriving economy.

[www.catchmentdetox.net.au](http://www.catchmentdetox.net.au)

### Murder Under the Microscope

Murder under the Microscope hosts an interactive mystery game for students in Years 5 to 10.

[www.microscope.edu.au](http://www.microscope.edu.au)





# When the water falls

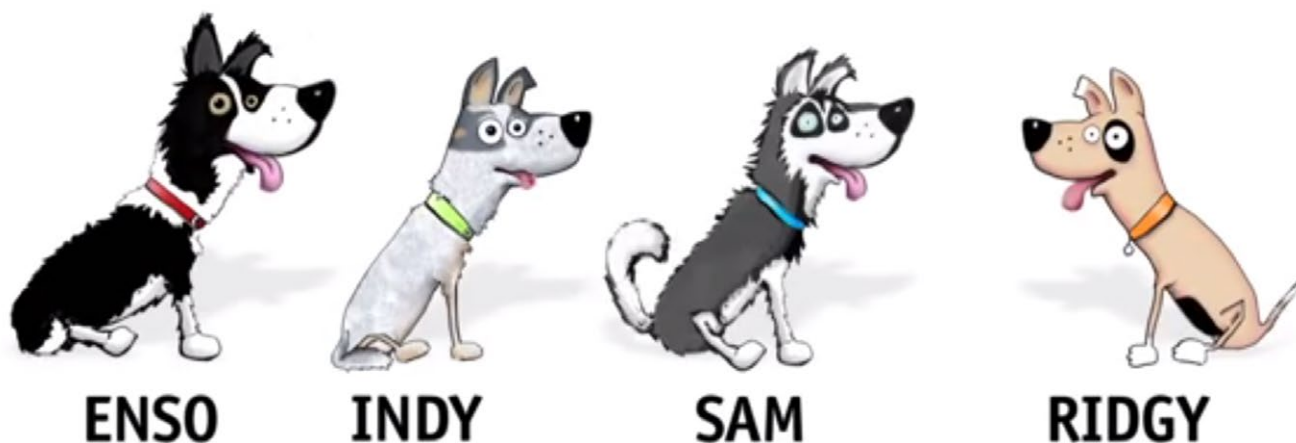
Floods and droughts are well known extreme climatic events in Australia and they can have serious impacts in rural communities. Chances are you have experienced both floods and droughts. These events are triggered by changes in our atmosphere and oceans. You may have heard of the terms El Niño and La Niña when talking with your family or from the media. These are two big weather patterns that helps us understand if we're going to be in a long drought or have more intense rain events.

For more information about some of the weather patterns that affect inland NSW, watch the Climatedogs animation series.

## Climatedogs

The NSW Climatedog animation series uses humorous animations of sheep dogs to explain complex atmospheric phenomena to farmers. Each of these dogs represents the main drivers of climate variability in NSW.

[www.dpi.nsw.gov.au/content/agriculture/resources/climate-and-weather/variability/climatedogs](http://www.dpi.nsw.gov.au/content/agriculture/resources/climate-and-weather/variability/climatedogs)



'Ridgy' otherwise known as the **Subtropical Ridge** is the lead dog of the pack.

'Enso' represents the **El Niño Southern Oscillation** phenomena.

'Indy' represents the **Indian Ocean Dipole**.

'Sam' represents the **Southern Annular Mode**.

'Eastie' the **East Coast Low** phenomena.

## Climate Change

There is lots of information about how we are impacting our climate and how we can make a difference at home, in our community or on the farm. A good place to start is [coolaustralia.org](http://coolaustralia.org) where they have lots of videos, photos, infographics and fact sheets to help you learn more about climate change and what actions you can take.



# Irrigation landscapes - FAQ

## What is dryland farming?

Dryland farming involves crops and pastures that rely entirely on the natural rainfall that occurs in an area.

## What is irrigation?

Irrigation involves the artificial supply of water to aid in the growth of crops and pastures.

## Why do farmers need irrigation?

Australia is one of the driest places on earth. To make use of farmland and grow a variety of crops and pastures we need to be able to water them consistently, even during times when there is no rain.

## Where does irrigation water come from?

Irrigation water comes from rainfall that collects in either natural waterways like rivers, streams, creeks, aquifers (underground water) and lakes or artificial water storage like tanks, dams, ponds and channels.

## How does the irrigation water get to the crops and pastures?

Water is diverted from the water source, such as rivers or aquifers, onto the farm where it is delivered to the field via a network of channels or pipes. It is then applied to crop via irrigation pipes or sprinklers.

## What happens to water once it has been used for irrigation?

Water on irrigated crops is reticulated which means it stays on farm reducing any contamination of natural waterways.

## Can farmers use as much water as they want?

Water is a very precious resource throughout rural areas. Therefore it is important that the water is shared between the community. Water licences are required throughout New South Wales and Queensland that determine the amount of irrigation water that farmers are allowed to use on their farms.

Got more questions? Contact CottonInfo  
[www.cottoninfo.com.au/contact-us](http://www.cottoninfo.com.au/contact-us)

PHOTO CREDIT: J. MONTGOMERY

## *Eb and Flo: A long way to go*

This video tells the story of how water travels down the Murrumbidgee River from the Snowy Mountains to the Murrumbidgee Irrigation Area.

[youtu.be/VGW44cCrICg](https://youtu.be/VGW44cCrICg)





# Irrigation landscapes - terminology

## Water use efficiency

Water Use Efficiency (WUE) is the relationship between production (such as bales of cotton) and the amount of water used to grow the crop. WUE is also used to describe how efficient water is delivered to the crops. Reducing water losses while maximising crop yields will increase WUE, improving total farm profitability. The bigger your WUE, the more efficient you are at using your water to grow your crop.



## Water budget

A water budget is used to work out how to use the available water on the farm. Your water budget can help you determine the crop type and the area to be planted at the beginning of the season. A water budget can change rapidly and is dependant on the weather.

## Irrigation system design

Irrigation farmers use different irrigation systems to maximise WUE depending on crop type, soils, topography and water supply. These systems include **Furrow Irrigation** (suited to cracking clay cotton soils), **Centre Pivot Lateral Move** (can apply small amounts of water each time), **Subsurface Drip Irrigation** (costly, but irrigation efficiency can be very high) and **Bankless Channel** designs (all furrows are irrigated at once, so doesn't require as much labour to run the system).

## Water storage

Water storages are large dam-like structures that store water for use on irrigation farms. Evaporation losses from on-farm storages can be significant so farmers are now re-designing storages to reduce evaporation and seepage losses and to help improve WUE. Water storages can be important sites for native wildlife. Farmers can use tools like the Birds on Cotton Farms App to help identify birds and look after their water storage bird habitat. [www.cottoninfo.com.au/birds-cotton-farms-app](http://www.cottoninfo.com.au/birds-cotton-farms-app)



PHOTO: STARTING A SYPHON FOR FURROW IRRIGATION (CRDC)

# Water use find-a-word

E	E	P	B	L	P	X	S	S	W	W	C	Z	I	B	C	L	Y	D	R
P	C	K	T	O	I	U	C	I	Y	N	H	N	L	L	O	C	E	E	E
R	C	R	W	R	R	V	L	H	O	P	F	J	I	T	N	F	R	L	H
C	E	V	U	F	A	D	E	I	D	I	H	Q	K	E	D	A	Y	C	T
A	J	T	A	O	L	N	T	S	L	S	U	O	I	C	E	R	P	Y	A
T	H	C	A	I	S	C	S	T	T	I	O	C	N	N	N	M	R	C	E
C	E	A	F	W	E	E	R	P	D	O	I	L	G	H	S	E	N	E	W
H	I	E	B	L	D	A	R	N	I	F	C	A	I	X	A	R	O	R	U
M	D	M	L	I	T	N	A	Z	F	R	S	K	N	D	T	R	I	C	N
E	V	O	E	I	T	L	U	E	D	W	A	J	A	V	I	J	T	R	W
N	C	A	O	T	Y	A	E	O	N	O	I	T	A	R	O	P	A	V	E
T	B	N	E	R	A	S	T	O	R	A	G	E	I	Z	N	A	G	N	C
F	V	T	D	T	U	M	M	O	I	G	Z	N	T	O	A	N	I	O	R
J	B	E	P	R	E	C	I	P	I	T	A	T	I	O	N	C	R	T	O
B	T	S	E	V	R	A	H	L	F	U	R	R	O	W	S	I	R	T	P
Y	Y	T	F	F	O	N	U	R	C	Y	C	L	E	P	U	E	I	O	S
X	A	U	Z	V	G	P	L	A	N	D	S	C	A	P	E	N	G	C	E
W	A	D	R	F	F	Z	Y	I	O	A	B	P	C	R	D	T	C	N	Z

## Find the Water Use Words

- ☐ ancient
- ☐ catchment
- ☐ climate
- ☐ collection
- ☐ condensation
- ☐ cotton
- ☐ crops
- ☐ cycle
- ☐ dryland
- ☐ evaporation
- ☐ farmer

- ☐ furrow
- ☐ gas
- ☐ groundwater
- ☐ habitat
- ☐ harvest
- ☐ infiltration
- ☐ Irrigation
- ☐ landscape
- ☐ liquid
- ☐ livestock
- ☐ precious
- ☐ precipitation

- ☐ recycled
- ☐ resource
- ☐ runoff
- ☐ solid
- ☐ storage
- ☐ surface
- ☐ syphon
- ☐ transpiration
- ☐ water
- ☐ water use efficiency
- ☐ weather
- ☐ wildlife



# Full of life

Everywhere on our planet there is life. From the polar-ice caps and deepest oceans to the highest mountain peaks, life has found a way to exist. In fact, on Earth, there are so many different living things that we are yet to discover and identify them all.

**BIODIVERSITY** (biological diversity) is a term that is used to describe the variety of living things on Earth. The biodiversity of our planet encompasses all life from the smallest microorganism to the largest mammal.

There are considered to be three basic levels of Biodiversity:

1. The number and kinds of species.
2. The Earth's ecosystems (habitats); its savannas, rainforests, oceans, forests, plains, marshes, deserts and all the other environments.
3. The genetic diversity; all the different genetic variations between species.

The biodiversity of our inland waterways, dams and wetlands is extremely important for us to look after. Humans have been the overwhelming cause of the destruction and alteration of the natural ecosystems of creatures we share the planet with. We have a responsibility to try and protect and preserve these environments for future generations to enjoy.

## Habitat for biodiversity

The term habitat describes the environment in which an organism lives. When we look at an organism's habitat we look at shelter, food and water. An environment that is "biodiverse" provides habitat for the many different plants and animals that live there.

Looking after the health of our environment helps to:

- maintain a balance in water tables for productive agriculture,
- allow clean water flows (locally and regionally),
- provide clean air,
- increase soil health,
- support functioning ecosystems, and
- provide a habitat for wildlife.





# Inland wetlands

Wetlands, whether natural or man-made, play an important role in the environment. Wetlands...

- filter nutrients and rubbish out of the water. This is why they are used to hold stormwater run-off in many urban areas.
- slow the water flow down to allow fine sediments to settle. This helps to reduce erosion along stream banks.
- protect biodiversity and provide homes to a large variety of animals including birds, insects, frogs, reptiles, small mammals and fish.



## Significant inland wetlands

Some of our most significant inland wetlands are found on the map below. These wetlands may not hold water all the time, but when they do they are important breeding ground for migratory birds and other animals. They also have strong cultural importance for the local Aboriginal people. These significant factors have contributed to some of these wetlands being protected under the Ramsar Convention for Wetlands of International Importance.

- |                         |                                  |
|-------------------------|----------------------------------|
| 1. Currawinya Lakes     | 5. Fivebough and Tuckerbil Swamp |
| 2. Lake Pinaroo         | 6. Macquarie Marshes             |
| 3. Paroo River Wetlands | 7. Narran Lake                   |
| 4. Menindee Lakes       | 8. Gwydir Wetlands               |



# Impacts on waterways

## Background

This is an *observation* and *inference* activity. You must *observe* the various users of the wetland. These can be humans, animals and plants. From these observations you need to try and *infer* what impact they may have on the wetland. This may be good or bad.

**To infer means to suggest an answer.**

**Example 1:** Lots of algae in the water **infers** that the water is not very healthy.

**Example 2:** A farmer plants hundreds of trees, shrubs and grasses along a waterway, this **infers** that these plants will improve the health of the waterway.

## Your task

There are many creatures that use the wetland. They include plants, wildlife and humans. Knowing your users helps you to look after your wetland better.

Have a look at your local wetland or waterway (on a field trip or use photographs), identify the users and find out what impacts they might have on the wetland. These impacts can be good or bad. Write these observations and why they are good or bad impact in the table below. Discuss your answers with the class.

Plants	Bad Impact	Good Impact
Wildlife	Bad Impact	Good Impact
Humans	Bad Impact	Good Impact

# Watery food web

A **FOOD CHAIN** is a 'chain' of organisms, through which energy is transferred. Each organism in the chain feeds on and obtains energy from the one preceding it. We can combine multiple chains to create a **FOOD WEB**.

A food chain always starts with a **PRODUCER**. They produce the first level of energy in the chain. These are usually always plants.

*Energy is always shown in a food chain or food web as a one-directional arrow.*

**PRIMARY CONSUMERS** are generally the vegetarians (herbivores) of the animal world. These animals eat the producers and get energy from them. Just like when we eat an apple or banana; it gives us energy.

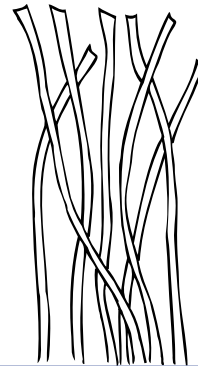
*Animals that can be both primary and secondary consumers are called omnivores.*

The next level are the **SECONDARY CONSUMERS**. These are generally the carnivores as they eat other animals. They get lots of energy from eating the primary consumers.

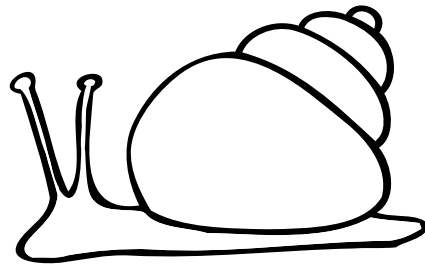
*There can be higher levels of consumers, and this depends on how complicated your food chain is.*

Lastly, we have **DECOMPOSERS**. These are the bacteria, fungi and insects that break down dead organic material (plants or animals) and return that energy back to the soil for producers to use.

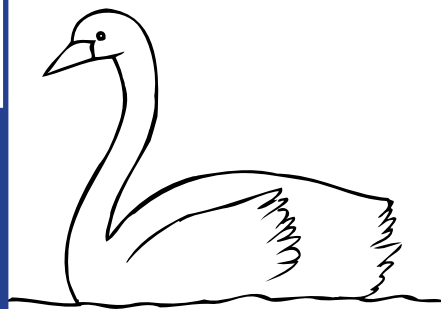
## Producers



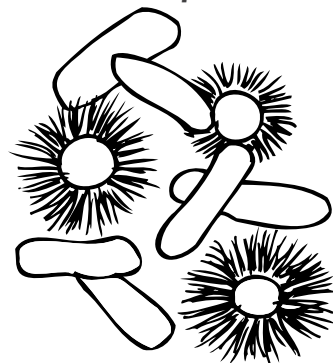
## Primary Consumers



## Secondary Consumers



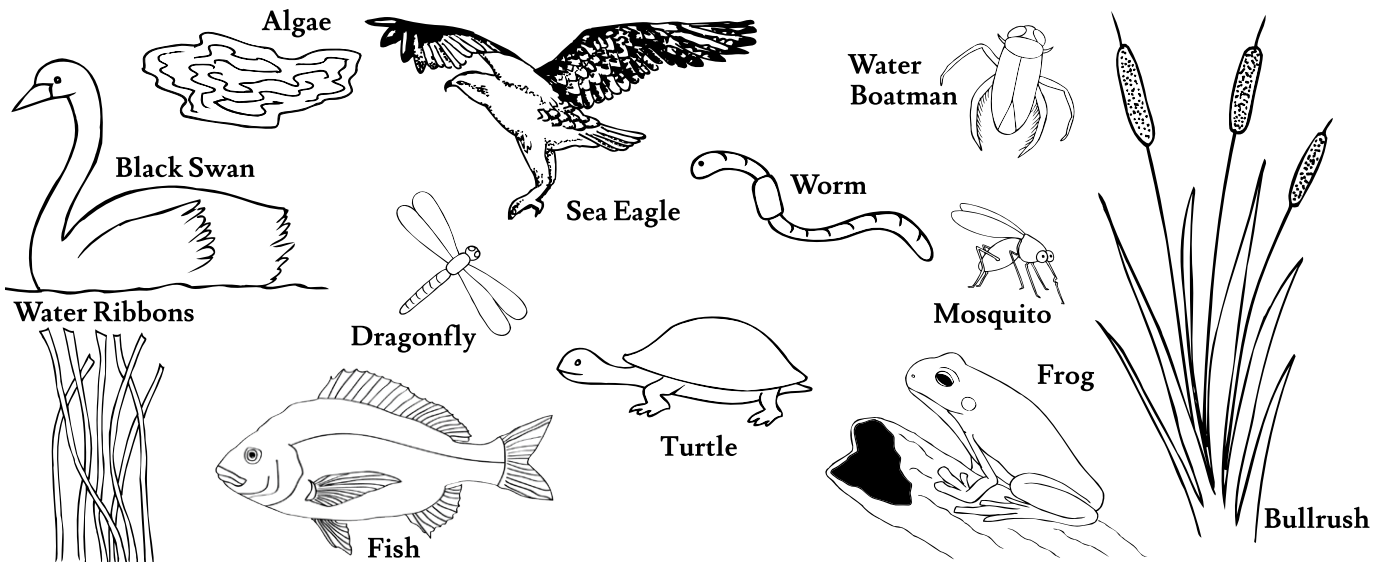
## Decomposers





# Watery food web

Using the images below, write the names of the plants and animals into their correct category. See how many food chains can you make using arrows to show who eats what. After you have finished creating your food chains, answer the questions provided.



## Secondary Consumers

1. Can you find any Tertiary Consumers (they eat the Secondary Consumers)? If so, what are they?

## Primary Consumers

2. Are there any animals that can fit in both the Primary and Secondary Consumer categories? If so, what are they?

## Producers

3. Can any of these be a Decomposer? If so, what are they?

# Friend or Foe?

Invasive weeds are among the most serious threats to Australia's natural environment and primary production industries. They displace native species, contribute significantly to land degradation, and reduce farm and forest productivity. Australia spends considerable time and money each year in combating weed problems and protecting ecosystems and primary production on private and public land.

When down at your local creek, or in your school grounds, students should try to identify weed species. Use relevant plant identification guides like:

[www.weeds.org.au/weedident.htm](http://www.weeds.org.au/weedident.htm)

[www.cottoninfo.com.au/publications/weedpak-weed-id-guide](http://www.cottoninfo.com.au/publications/weedpak-weed-id-guide)

Contact your local Council weeds officer and invite them to talk to your class about what weeds may be threatening your local creek, how this impacts our use of the creek and the impact on the animals that live there.

## ***FACTS: What is a weed?***

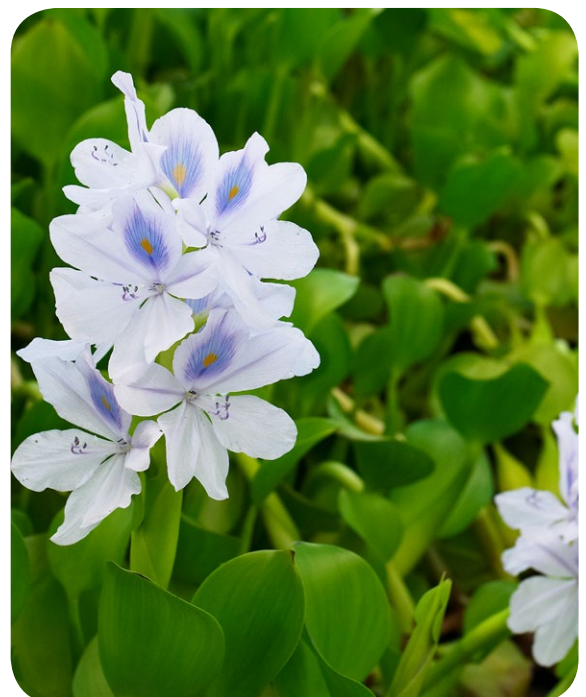
A weed is any plant that is growing where it is not wanted, often out-competing native species. Weeds are also known as invasive plants. Many plants introduced into Australia in the last 200 years are now weeds.

Weeds typically produce large numbers of seeds, assisting their spread. They are often excellent at surviving and reproducing in disturbed environments and are commonly the first species to colonise and dominate in these conditions.

A weed can be an exotic species or a native species that colonises and persists in an ecosystem in which it did not previously exist. Weeds can inhabit all environments; from our towns and cities through to our oceans, deserts and alpine areas.

Some weeds are of particular concern and, as a result, have been listed for priority management or in legislation.

Throughout Australia, weeds are spreading faster than they can be controlled and management of them is consuming an enormous amount of resources. Climate change poses an additional challenge to our ability to manage weeds.



**PHOTO: Water Hyacinth**

Water Hyacinth is an invasive weed that is a national threat to wetlands and waterways.

[weeds.dpi.nsw.gov.au/Weeds/Details/145](http://weeds.dpi.nsw.gov.au/Weeds/Details/145)

# Alien fish

## *Variety of Fish*

There are five main alien fish found in inland waterways. They include:

- European carp
- Redfin perch
- Eastern gambusia
- Oriental weatherloach
- Goldfish



PICTURE: EUROPEAN CARP, PAT TULLY  
© STATE OF NEW SOUTH WALES THROUGH  
NSW DEPARTMENT OF INDUSTRY

## *Problems they cause*

Since European settlement, many non-native fish have been accidentally or deliberately introduced into Australian waterways and have become pests. Some of the problems they cause include:

- altering or degrading the natural environment,
- feeding on or destroying native plants,
- preying on invertebrates, native fish and their eggs,
- competing with native species for food, habitat or spawning grounds.

## *Control methods*

There are a range of methods that can be used to stop the spread.

- Don't transfer fish between waterways.
- Don't return pest fish to the water.
- Prevent unwanted hitchhikers on boats.
- Don't dump unwanted pet fish!
- Prevent accidental escape from open fish ponds.
- Report alien fish sightings to the NSW DPI's Aquatic Biosecurity Unit on 02 4916 3877



# Alien fish

Unfortunately there is a growing number of alien fish in our freshwater creeks, rivers and wetlands that are causing lots of problems to native fish. See if you can sort out which fish is native, and which is an alien. Once you've sorted the list, research three quick facts about each fish. For help finding fishy facts go to [bitly.com/dpi-fishes](https://bitly.com/dpi-fishes)

*Murray cod*

.....

.....

.....

*Carp gudgeon*

.....

.....

.....

*Bony bream*

.....

.....

.....

*Carp*

.....

.....

.....

*Goldfish*

.....

.....

.....

*Golden perch*

.....

.....

.....

*Redfin perch*

.....

.....

.....

*Eastern gambusia*

.....

.....

.....

*Trout cod*

.....

.....

.....

*Oriental weatherloach*

.....

.....

.....

ALIEN

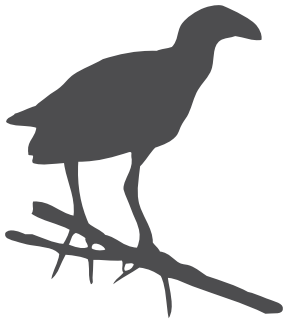
NATIVE



# You can be a citizen scientist

A citizen scientist records animal sightings and sends their results to another scientist. Using the following list, correctly identify the silhouettes below. Use the Internet or a bird identification book if you need help. If you go on a trip near a waterway, record any sightings of your waterbirds.

Swan | Cormorant | Pelican | Eagle | Swamp hen | Duck



Species: .....

Where: .....

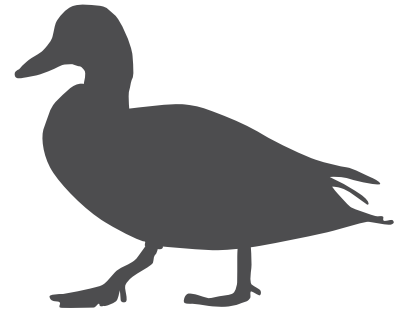
Date: .....



Species: .....

Where: .....

Date: .....



Species: .....

Where: .....

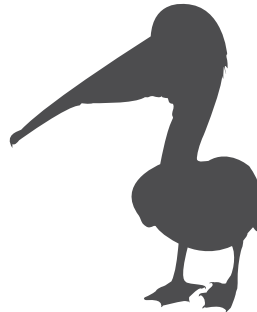
Date: .....



Species: .....

Where: .....

Date: .....



Species: .....

Where: .....

Date: .....



Species: .....

Where: .....

Date: .....



## Birds on Cotton Farms app

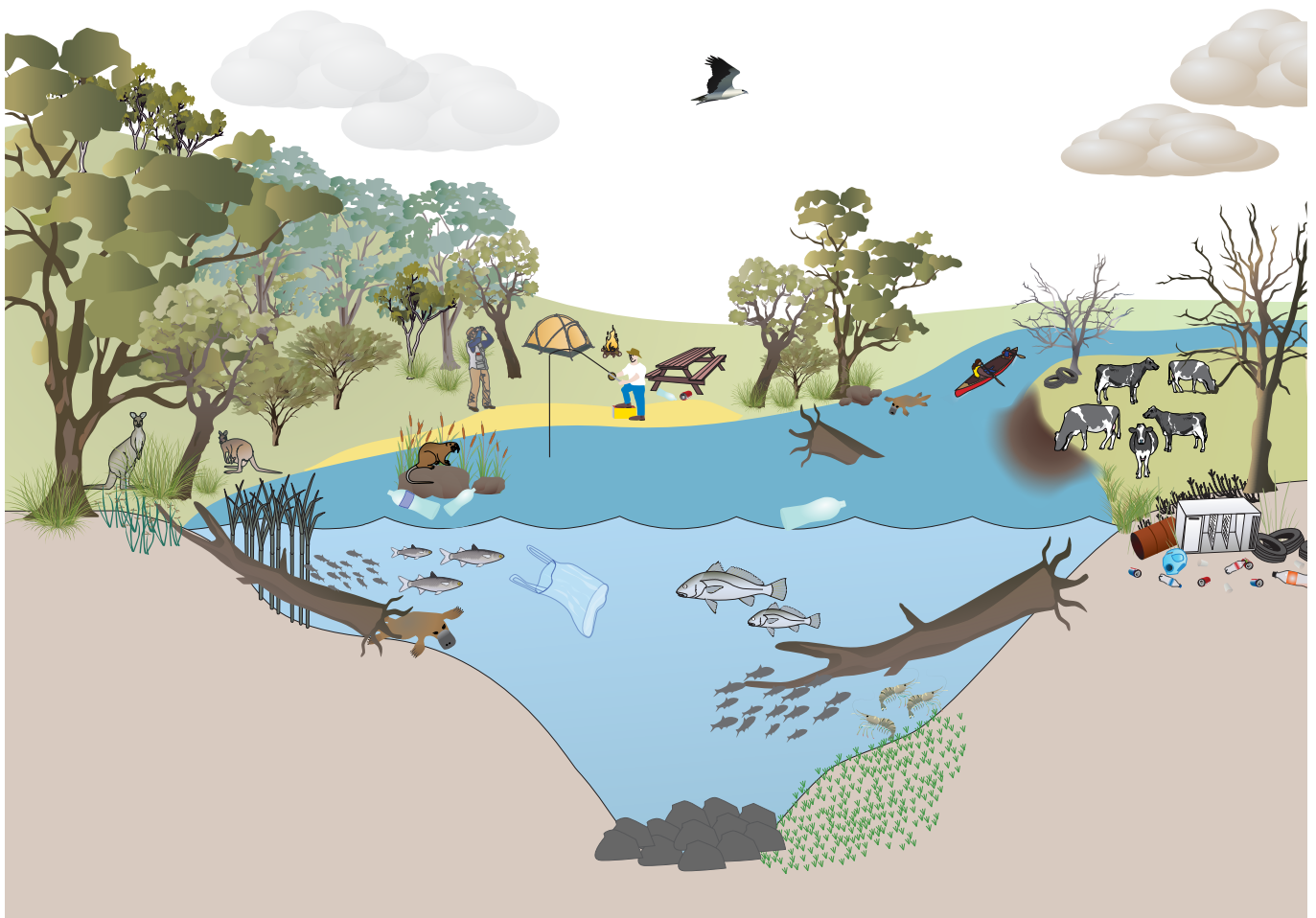
To help identify more birds in inland waterways why not download the **Birds on Cotton Farms app**. The app can be used as a monitoring tool, which will help you monitor the diversity and abundance of birds that can be found on their farms and in surrounding landscapes. It also includes bird call sounds, to make the process of identifying birds that much easier.

[www.cottoninfo.com.au/birds-cotton-farms-app](http://www.cottoninfo.com.au/birds-cotton-farms-app)

# A healthy underwater home

Below is a diagram of a river ecosystem that is being used by the local wildlife, for agriculture and tourism. Look closely at the diagram and answer the following questions.

1. How many human impacts can you find? .....
2. What is happening to the water near the dairy cows? .....
3. How do you think this could be prevented? .....
4. How many fish habitat elements can you find? .....
5. Why should we leave dead trees on land or in the water? .....
6. What should we do to look after our rivers and lakes if we go camping, fishing, bike riding, boating or picnicking along our waterways? .....





# Mammalian habitat

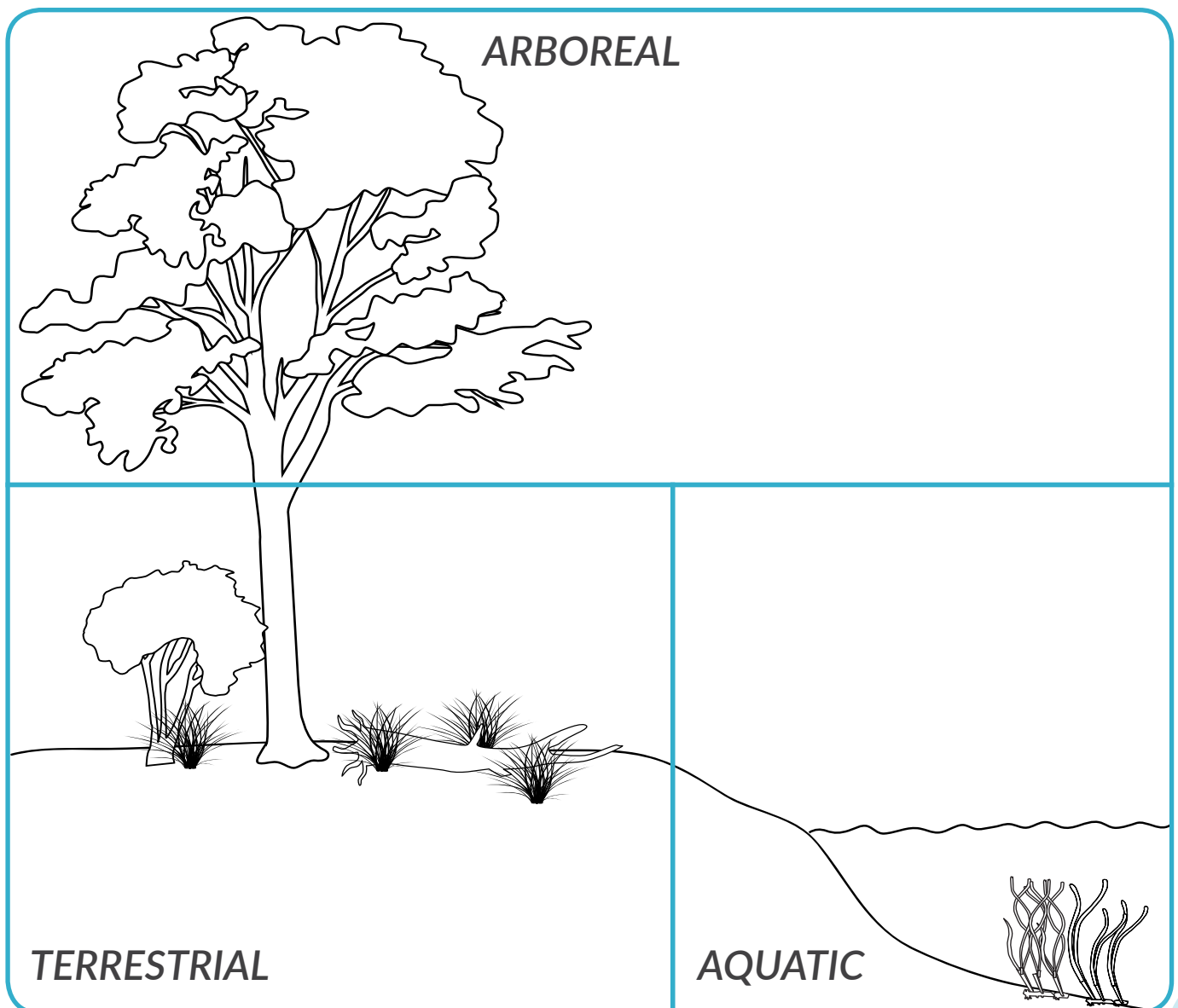
Mammals are a family of animals that are warm blooded, grow hair, have a backbone, breathe air and produce milk to feed young. Mammals live in a variety of habitats. A habitat is where an animal lives, eats, breeds and spends lots of time. Some live in rainforests, others in grasslands and some live in rivers or oceans.

At a broader scale, we can say that mammals are either **AQUATIC** (live mainly in the water), **TERRESTRIAL** (live mainly on the land) or **ARBOREAL** (live mainly in trees).

Sort out the following mammals into their preferred habitat category.

**Kangaroo, Micro-bat, Koala, Feral Cat, Water Rat, Echidna, Possum, Wallaby, Sugar Glider, Cows, Spotted-tailed Quoll, Greater Bilby, Pigs, Flying-fox, Wombat, Platypus**

Choose one mammal from each category, research it and report back to the class. Include its name, if it is native or introduced, its conservation status (threatened or common), where it lives, what it eats and its predators.



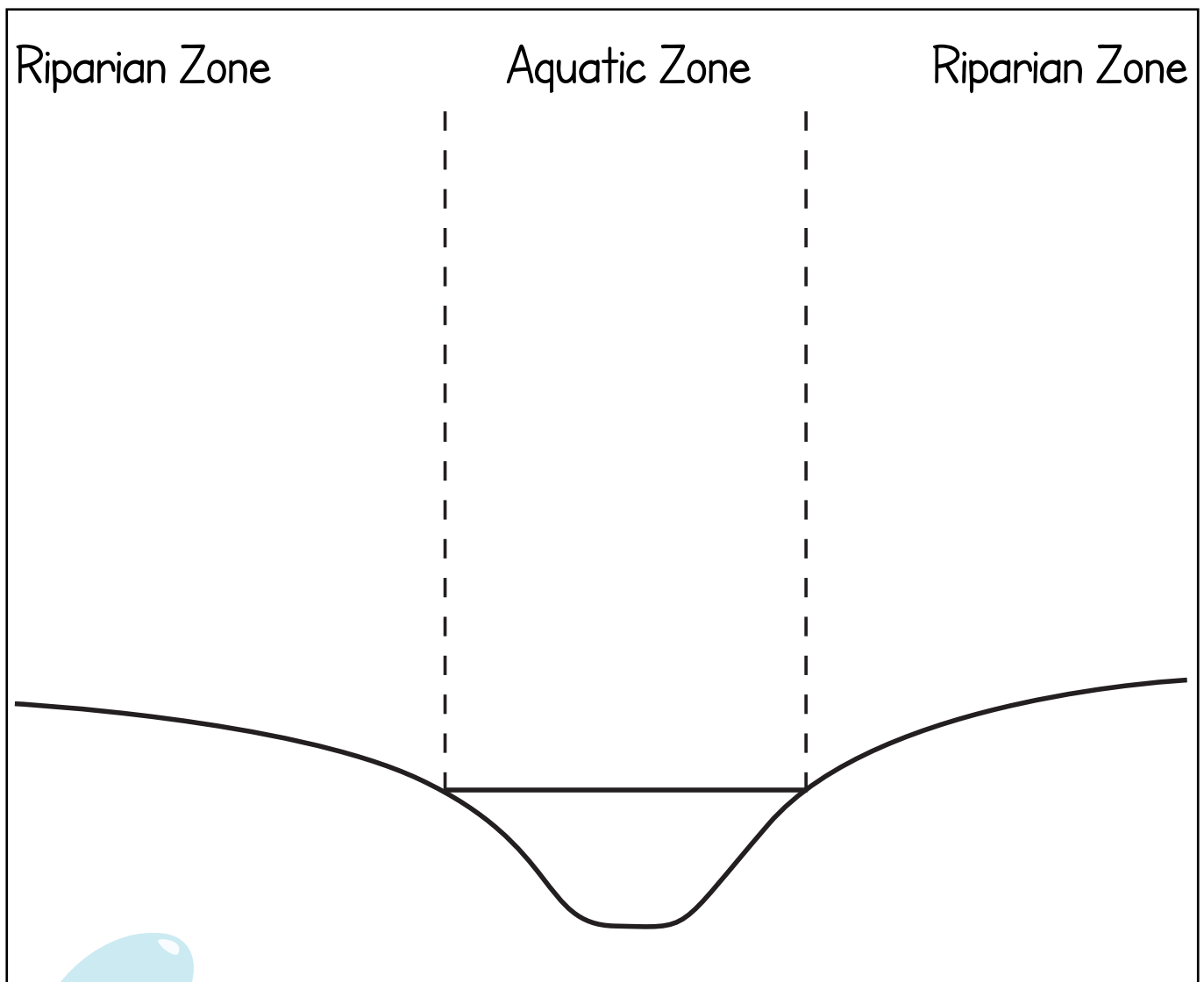
# Riparian Rapture

The riparian zone of a waterway is any land that is connected to or directly influences a body of water. It includes:

- the land immediately next to creeks and rivers;
- gullies and dips which sometimes run with water; and
- wetlands and river floodplains which interact with the river in times of flood.

Riparian zones have highly productive soil. In the past they have been heavily cleared and used intensively for agriculture, grazing and irrigation. They play an important role in the life cycle of many native animals and plants, provides wildlife corridors as well as being a refuge for animals in times of drought or fire. Riparian land is also very fragile and is part of a vital link for catchment processes, so conserving the riparian zone is imperative.

**Visit a local water body, a creek river or dam, and sketch a cross section of the riparian zone. Label any interesting features you see.**



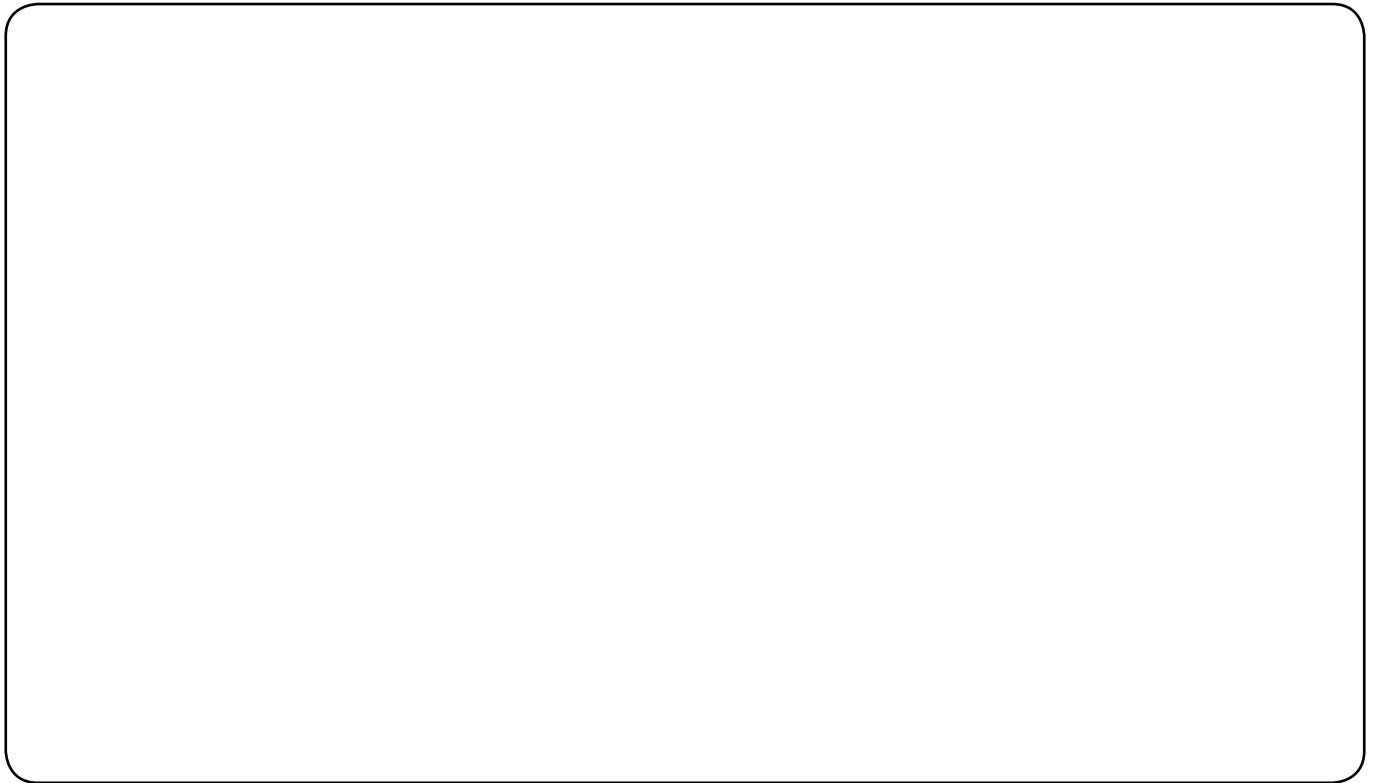
# A Watery World

## *What can you find in the water?*

Aquatic life is an important element of any water body. Water plants provide food, shelter and protection against predators for aquatic animals.

Use the Water Plant Identification Sheet to help you work out what plants you have at your local water body. Draw that plant in the box provided.

Find out what animals might use this water plant and create a poster for the classroom.



My water plant lives:

- ☐ On top of the water
- ☐ Under the water
- ☐ On the waters edge

My plant is:

- ☐ tall
- ☐ flat

My plant can float.

- ☐ Yes
- ☐ No

My plant is called:

.....

Name an animal that might use my water plant for food or shelter:

.....





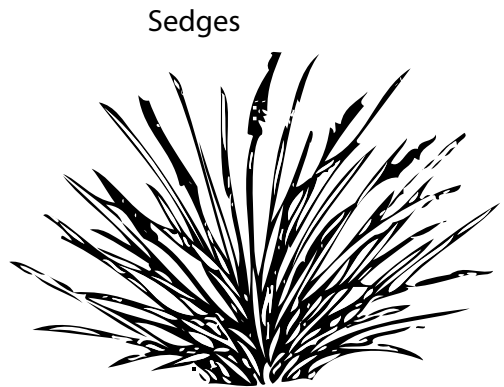
# Common Water Plants



Ferny  
Azolla



Ribbonweed



Sedges

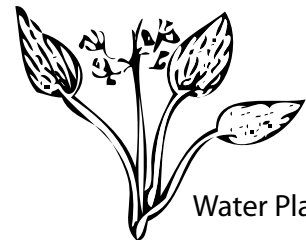
Duckweed



Smartweed

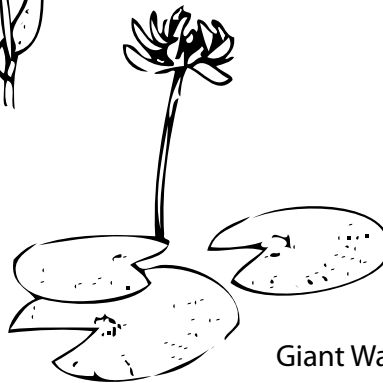


Water Couch



Water Plantain

Water Ribbons



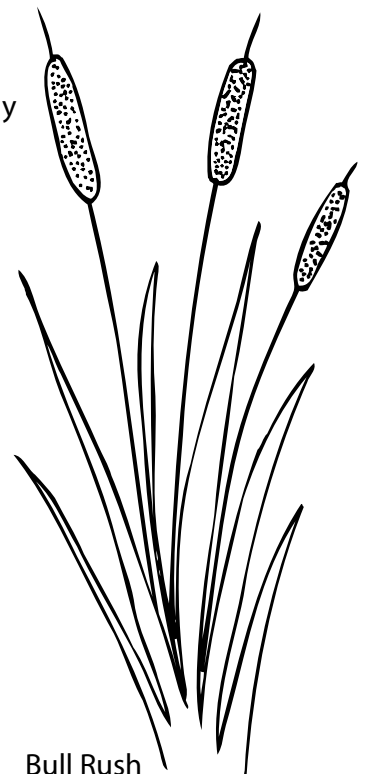
Giant Water Lily



Common Rush



Common Reed



Bull Rush

# Water Bug Collection

## About Water Bugs

When looking at water quality there are two approaches you can take. One approach is to take scientific readings and the other approach is to take a close look at the animals that live in the water.

Macro-invertebrates, or water bugs, provide us with an indication of the pollution levels in a waterway. These water bugs are classified into 4 groups:

- Very Sensitive
- Sensitive
- Tolerant
- Very Tolerant

As their names suggest, the water bugs that are categorised into these groups are either sensitive or tolerant to pollution, or changes in water quality.

## Activity

The first step in this activity is to have your students make a simple water bug net (see following pages). The other materials you will need include buckets, white tote trays (or something similar, preferably white), plastic spoons, white ice cube trays, magnifying glasses and water bug identification sheets.

When down at your waterway have students take their long handled nets and scoop around in the water making sure to scoop around the surface, middle and bottom of the water column. Have students wash out their nets into a bucket half filled with water. Once a suitable sample has been collected, take the bucket away from the waterway where you can begin identifying your water bug catch.

Pour some of the water and water bug sample out into your tote trays - only 1-2cm deep is required. Using the spoons, students 'fish' out individual water bugs and place them into individual cubes of the ice cube trays for closer inspection - include a spoon full of water so the animals stay submerged. Using magnifying glasses and water bug identification sheets, try to identify as many water bugs as possible. This takes a keen eye to distinguish some of the finer details of the invertebrates.

Each student, or group of students, should count up how many of each type of water bug they have in their sample and indicate this on their worksheet. There will always be very tolerant bugs in a water sample, so large numbers of these does not indicate a healthy system. What you are looking for are large numbers of sensitive and very sensitive water bugs, preferably with a variety of species. If the water quality was not healthy, then these species would not survive.

Download the **Water Bug Identification Sheet** from:  
[australianmuseum.net.au/document/streamwatch-water-bug-guide](http://australianmuseum.net.au/document/streamwatch-water-bug-guide)



# Water Bug Collection

Catch and collect as many water bugs (macro-invertebrates) as you can.

**Tally your results below.**

The more sensitive bugs you find, the healthier and cleaner the water is. No sensitive bugs indicates that the water is not very healthy.

Very Sensitive Bugs	
Stonefly Nymph	
Mayfly Nymph	
Sensitive Bugs	
Alderfly Nymph	
Caddisfly Nymph	
Water Mite	
Tolerant Bugs	
Beetle Larvae	
Water Strider	
Dragonfly Nymph	
Yabby/Craybob	
Whirligig Beetle	
Damselfly Nymph	
Fly Larvae	
Mussel	
Sandhopper	

Shrimp	
Midge Larvae	
Nematode	
Water Scorpion	
Very Tolerant Bugs	
Diving Beetle	
Flatworm	
Slater	
Worm	
Hydra	
Waterboatman	
Water Treader	
Backswimmer	
Bloodworm	
Snail	
Leech	
Mosquito Larvae	

**Sensitive Bugs Found:** .....

**Tolerant Bugs Found:** .....





# Make Your Own Water Bug Net

## What you need

- wire coat hanger
- needle and thread
- pantyhose/stocking
- string or tape
- a stick or rod

## Instructions

Bend the coat hanger so that it is almost square.

Cut the legs off the pantyhose half way.

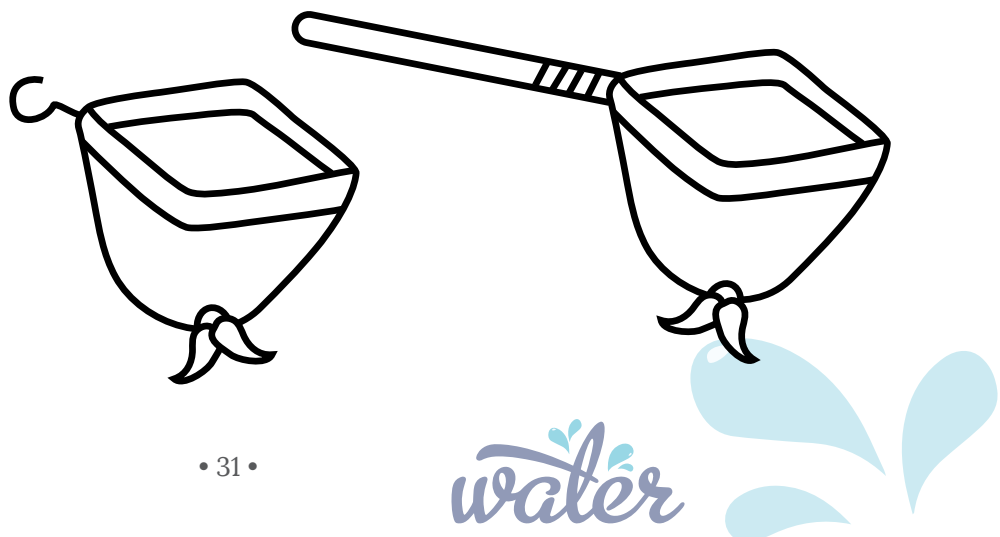
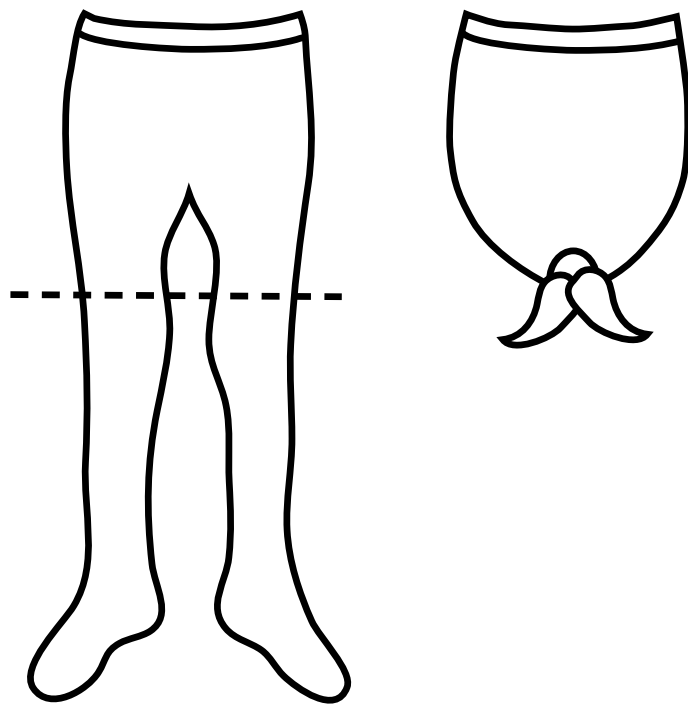
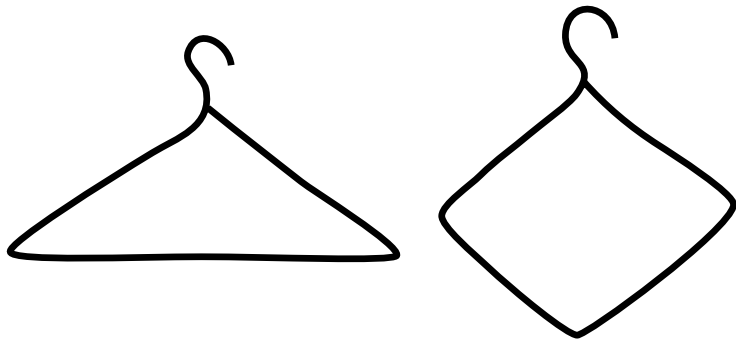
Tie the legs together to form a basket. You may need to trim some more off the legs.

Place the pantyhose through the coat hanger and fold the waist band of the pantyhose over the coat hanger to form a hem. It is important to fold the pantyhose so that the hem is outside the net. This will prevent water animals from becoming lodged in the hem.

Sew the hem to hold the coat hanger firmly in place.

Attach the coat-hanger to the stick or rod using string or tape.

Now that you have made your own dip net, remember to bring it on your field trip!



# Useful Websites

## **Enviro-Stories Library**

[library.envirostories.com.au](http://library.envirostories.com.au)

## **CottonInfo**

[www.cottoninfo.com.au](http://www.cottoninfo.com.au)

## **PrimeZone**

[www.primezone.edu.au](http://www.primezone.edu.au)

## **LandLearn NSW**

[www.landlearnnsw.org.au](http://www.landlearnnsw.org.au)

## **Cotton Australia's Cotton Classroom**

[cottonaustralia.com.au/cotton-classroom](http://cottonaustralia.com.au/cotton-classroom)

## **PestTales**

[www.pestales.org.au/activities.htm](http://www.pestales.org.au/activities.htm)

## **Scootle**

[www.scootle.edu.au](http://www.scootle.edu.au)

## **Cool Australia**

[coolaustralia.org](http://coolaustralia.org)

## **Australian Water Toolkit**

[www.environment.nsw.gov.au/sustainableschools/teach/water.htm](http://www.environment.nsw.gov.au/sustainableschools/teach/water.htm)

## **Discover Water**

[www.discoverwater.org](http://www.discoverwater.org)

## **Australian Water Association - Teacher Resources**

[www.awa.asn.au/AWA\\_MBRR/Publications/Teacher\\_Resources/AWA\\_MBRR/Publications/Teacher\\_Resources/Teacher\\_Resources.aspx?hkey=91f1122b-4409-40da-9e3b-afb80981dbc0](http://www.awa.asn.au/AWA_MBRR/Publications/Teacher_Resources/AWA_MBRR/Publications/Teacher_Resources/Teacher_Resources.aspx?hkey=91f1122b-4409-40da-9e3b-afb80981dbc0)

## **AWA Water Educator's Toolkit**

[www.awa.asn.au/documents/AWA\\_Water\\_Educators\\_Toolkit\\_Final.pdf](http://www.awa.asn.au/documents/AWA_Water_Educators_Toolkit_Final.pdf)

## **Water on Earth - A Primary Schools Water Resource**

[www.globaleducation.edu.au/verve/\\_resources/gep\\_primary\\_water\\_resource\\_aug12\\_nsw.pdf](http://www.globaleducation.edu.au/verve/_resources/gep_primary_water_resource_aug12_nsw.pdf)

## **Disaster Resilience Education For Schools**

[schools.aemi.edu.au](http://schools.aemi.edu.au)

## **Energy and Water Saving Education Kit for Schools**

[www.wirraminna.org/sustainability-trailer/](http://www.wirraminna.org/sustainability-trailer/)

## **Pests in Irrigation Landscapes**

[www.wirraminna.org/pests-in-irrigation-landscapes/](http://www.wirraminna.org/pests-in-irrigation-landscapes/)

