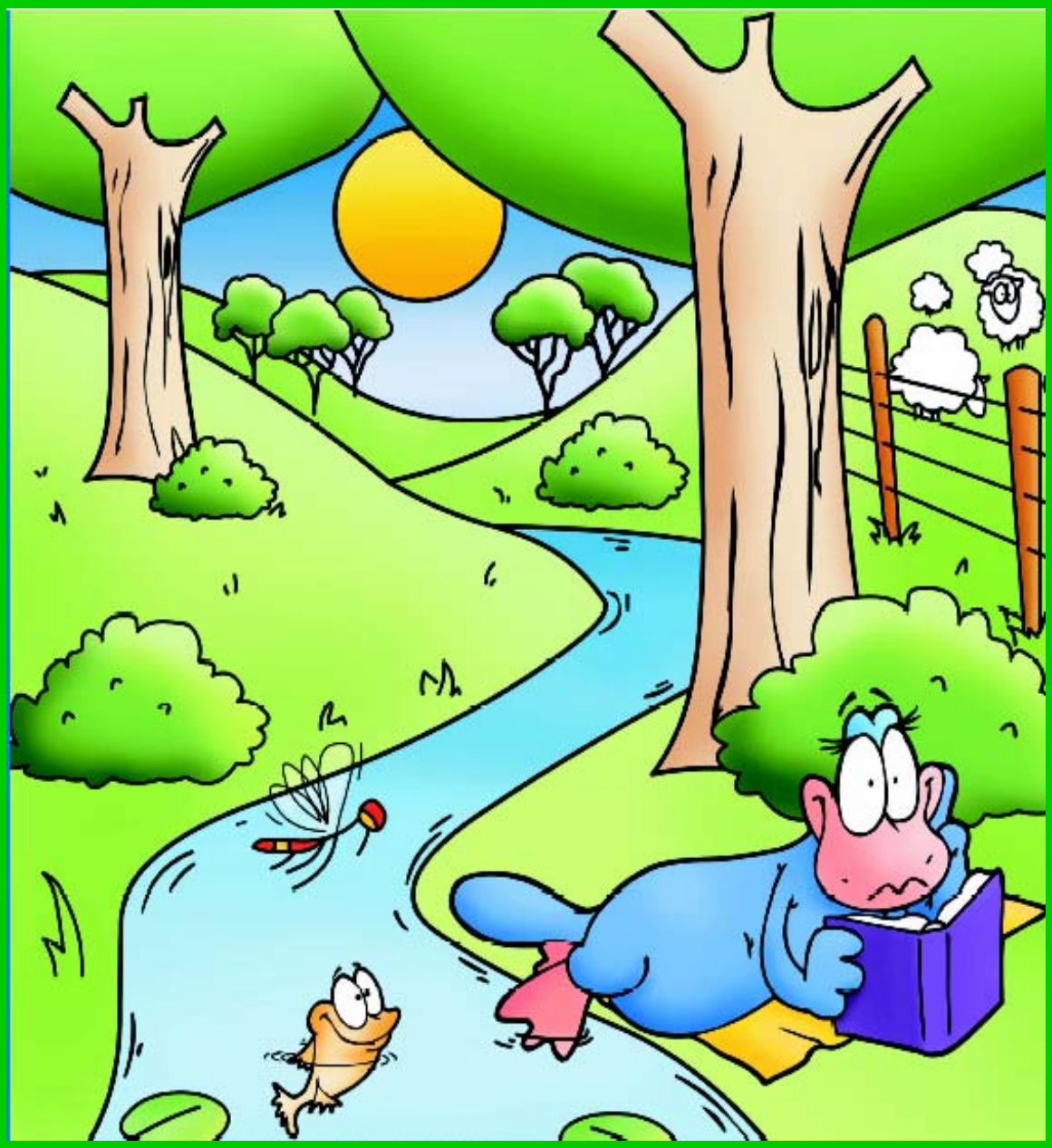
River Detectives

Student Resource Book



NORTH CENTRAL
Catchment Management Authority

WATERWATCH
North Central
Communities Caring for Catchments

River Detectives

North Central Catchment Management Authority's Waterwatch Schools program

River Detectives is a program designed to help school students learn about river health and water quality in relation to their local waterways in a hands on and meaningful sense. Upper primary and lower secondary students across the North Central catchment can participate in this eight month water quality monitoring program.

A range of water courses are monitored during the project ranging from rivers and creeks, groundwater, wetlands, irrigation channels and drains.

Students perform chemical and physical tests each month on water collected from their nominated waterbody. They can also participate in monthly activity that compliments their testing program and is linked to their curriculum.

North Central Waterwatch would like to acknowledge the following programs for their help and reproduction of materials in this package:

Goulburn Broken Waterwatch
Buloke Stormwater Program
Coliban Water
Waterwatch Victoria
North Central Catchment Management Authority

River Detectives is sponsored and supported by:

Contents & Monthly Activities

What is a catchment?

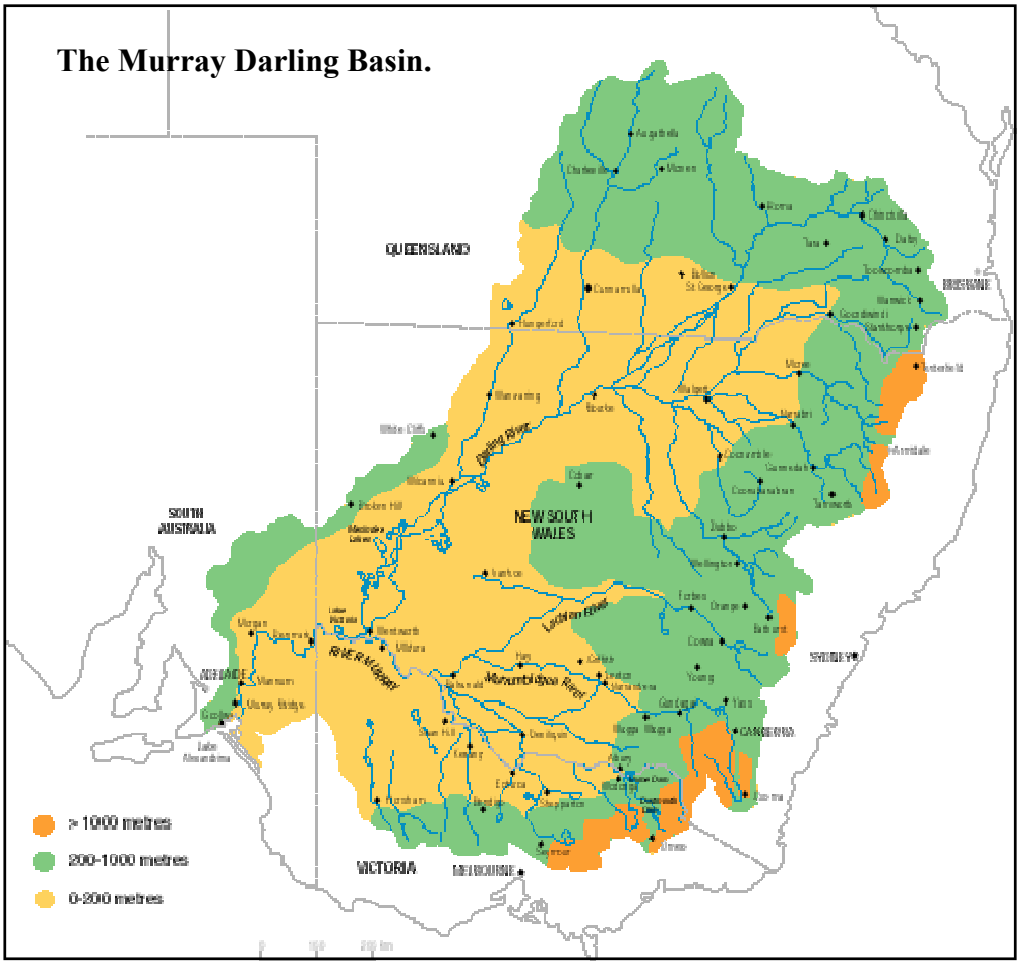
A catchment is an area of land, bound by hills or mountains from where all runoff water flows to the same low point. The low point could be a dam, a river or the mouth of a river where it enters the ocean. We all live in a catchment.

The North Central Catchment

You live in the North Central Catchment. The catchment starts in the upper catchment at the mountains near Creswick, Trentham, Woodend and the Pyrenees Ranges and ends at the Murray River between Echuca and Swan Hill or in terminal lakes. The North Central catchment is a large catchment that is made up of sub-catchments. These sub-catchments are bordered by low hills and ridges and are drained by smaller creeks.

The Murray Darling Basin

The North Central Catchment is a part of the Murray Darling Basin System. The system is made up of thousands of rivers, creeks, wetlands and towns extending from Queensland through New Soputh Wales to Victoria and South Australia. Almost all of the waterways join the Murray River and enter the sea at the Coorong in South Australia



The North Central Catchment
LAND USE

The land use in the upper catchment varies greatly to that of the lower catchment. In the upper catchment there are forests, small farms and towns. In the lower catchment there are towns, bigger farms, orchards, diary farms, and irrigation. What happens in one part of a catchment is likely to affect the health of the rest of the catchment.

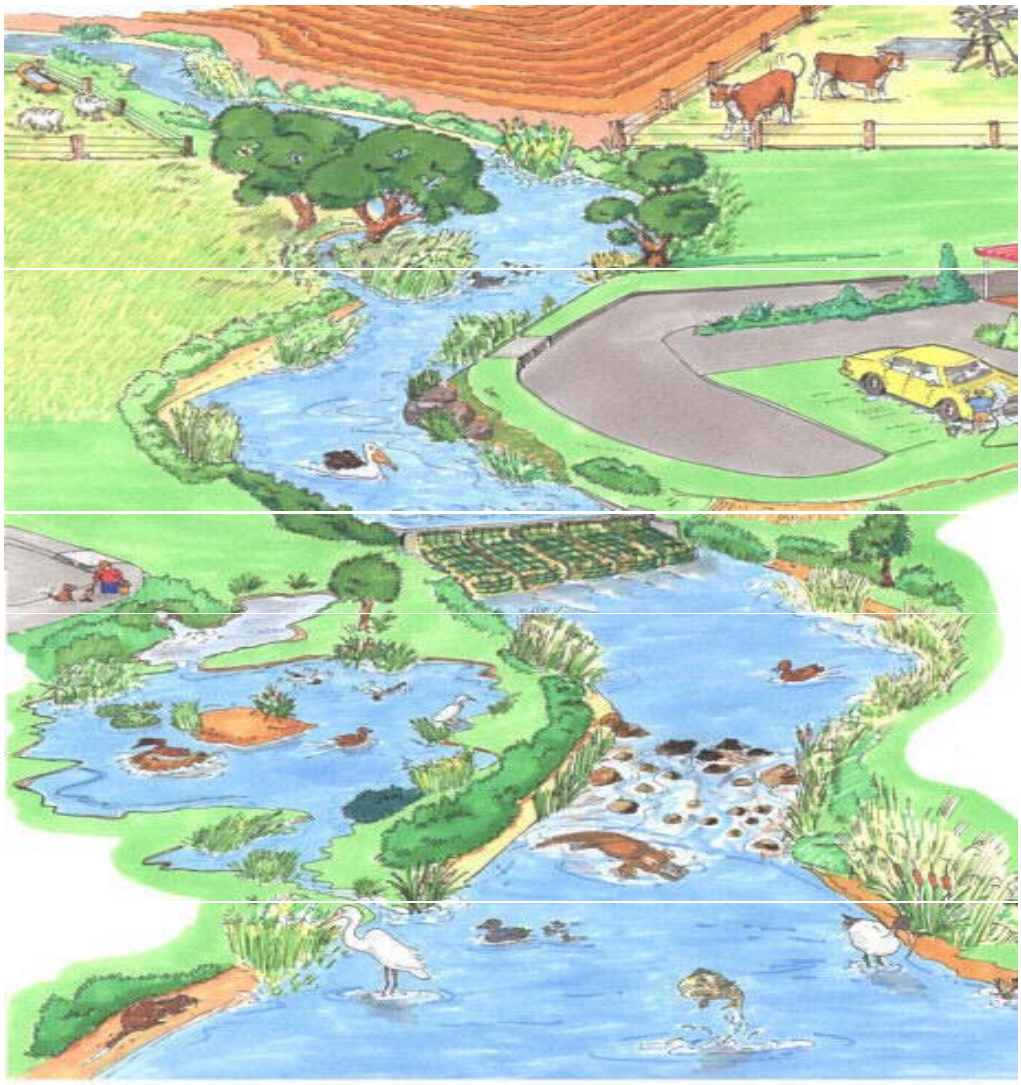
Investigation

What are some land uses around where you live?

Try to list them under the following headings

1. Recreation
2. Primary Production
3. Urban
4. Environment

Use the space below to record your research

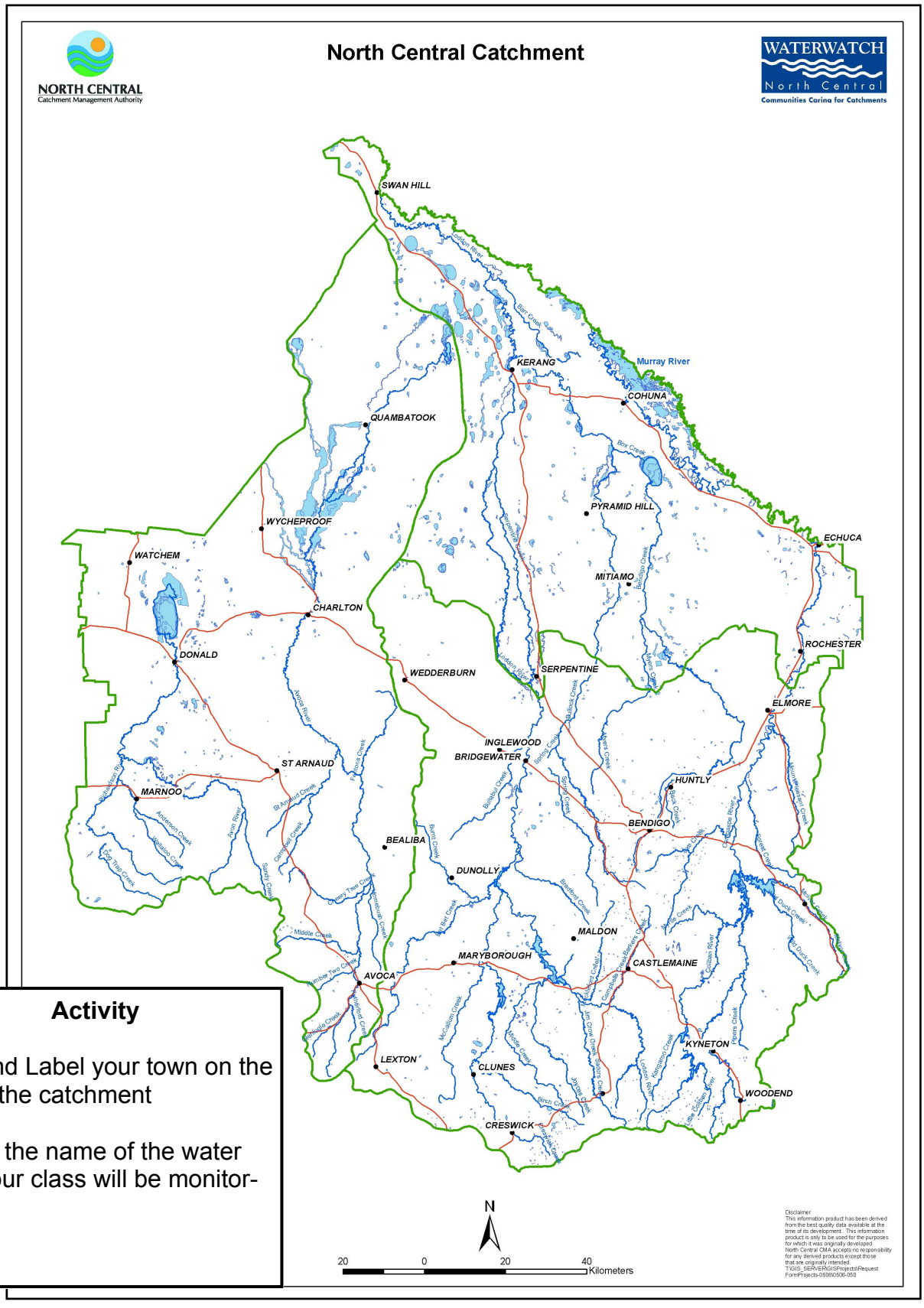


Picture courtesy of KESAB Patawalonga and Torrens Waterwatch SA

Recreation:
Primary Production:
Urban:
Environment:

The North Central Catchment

The North Central Catchment Management Authority region covers approximately three million hectares or 13 % of the State of Victoria. It extends from the Murray River in the north, to the central highlands in the south. The Mt Camel Range forms the eastern boundary of the region while the internally drained Avon-Richardson basin forms part of the western border. The region includes over 50 urban centres including Swan Hill, Echuca, Donald, St Arnaud, Bendigo, Castlemaine, Maryborough and Creswick



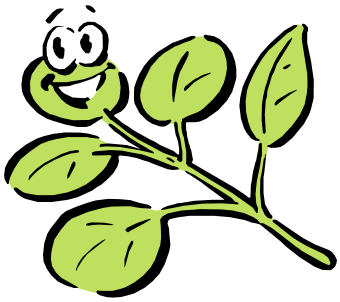
Activity

Mark and Label your town on the map of the catchment

What is the name of the water body your class will be monitoring?

What is a Habitat Survey?

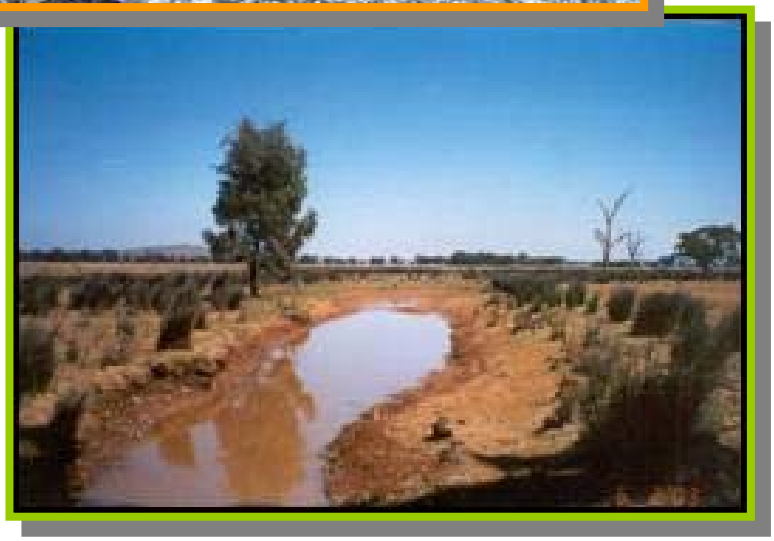
March



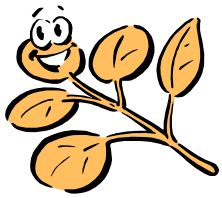
A habitat survey involves looking at the different areas around your waterway. The number and types of plants around a waterway is a good indicator of water quality and the health of the waterway. Native plants in and near a waterway and rocks and logs are important in your waterway as they provide habitat for native birds and other wildlife to live in.

Trees and plants on the bank and around the waterway reduce the amount of sediment that enters the water and therefore reduces erosion. When there are not many trees and plants near the waterway more sediments and nutrients enter the waterway. This degrades the water quality, which affects plants and animals living in the water.

This is a picture of a river with good habitat value. The water is clean and fast moving and there are rocks and logs in the river. There is thick shrub and overhanging tree cover along the bank, which provides a habitat for native birds, animals and insects.



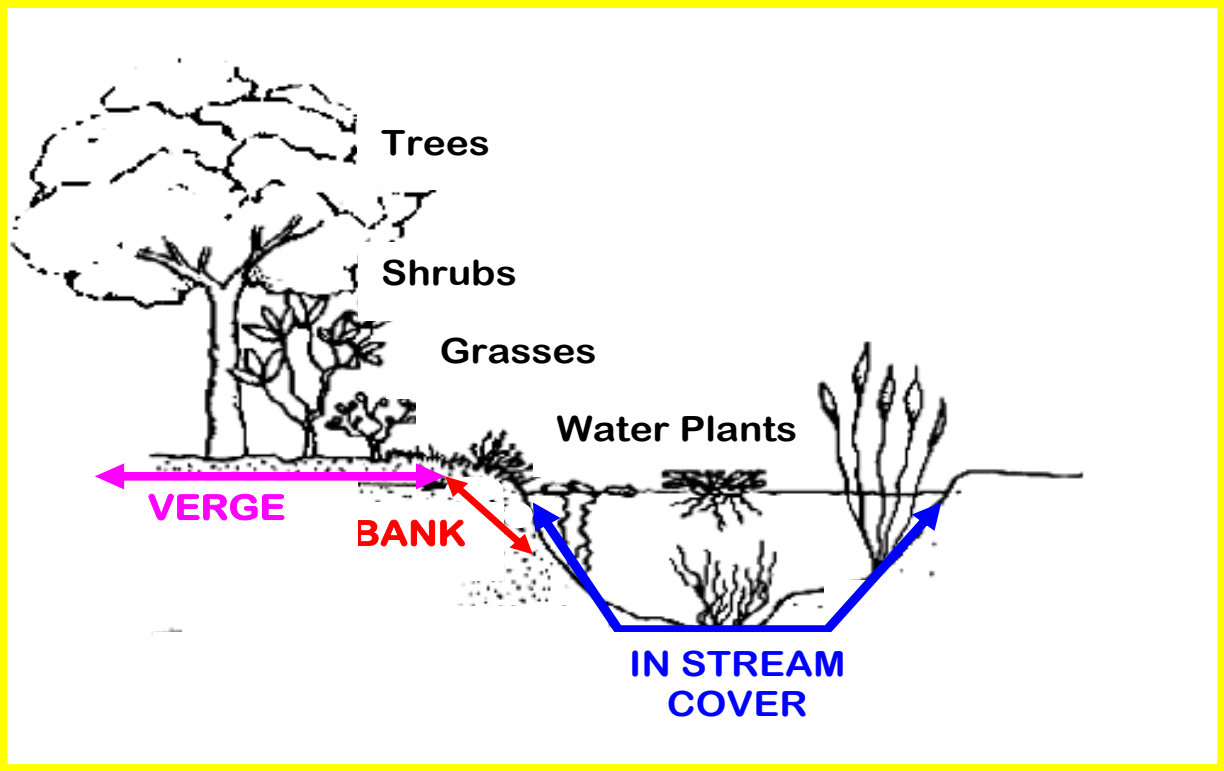
This is an example of a stream with poor habitat value. The stream banks are eroded, there is no in-stream habitat, there is no habitat beside the stream, the trees and plants that are present are not native.



Conducting a Habitat Survey

Step 1: Take two digital photographs of your monitoring site, as they are a good record for the future.
Photo 1. From the bank looking upstream (include surrounding plants)
Photo 2. From the bank looking downstream (include surrounding plants)

Step 2: Using the "Habitat Survey Record Sheet" record what the area around your monitoring site is like.



TREE AND PLANT COVER ON THE BANK		
Good (3)	**Okay (2)**	**Not so good (1)**
Lots of trees and native plants. No bare ground.	Some trees and native plants and some bare ground.	Not many trees and plants and a lot of bare ground

TREE AND PLANT COVER ON THE VERGE (Strip of land up to 30m from bank)		
Good (3)	**Okay (2)**	**Not so good (1)**
Lots of trees and native plants. Trees and plants continue from bank for more than 30m.	Some trees on both sides of the bank, or one side cleared and the other with lots of trees.	Not many trees or plants. Mostly introduced grass cover such as pasture, or no plant cover.

IN STREAM COVER (Plants, snags, rocks in the water)		
Good (3)	**Okay (2)**	**Not so good (1)**
Lots of snags, logs or rocks in the water with a large area of plants in and around the water.	Some snags and/or rocks in the water and some plants in and around the water.	No in stream cover. No snags, rocks or plants in or around the water. Site may have concrete on the bottom.

BANK EROSION		
Good (3)	**Okay (2)**	**Not so good (1)**
No erosion and bare banks. Banks have gentle slopes and lower banks are covered with grasses, reeds or shrubs.	Some erosion and bare spots on bank, and some plant cover.	Lots of erosion and bare banks. Little plant cover on the bank.

Habitat Survey Results Sheet

Step 2: Fill out the results sheet

Habitat Rating

Waterway Habitat	**Rating for your site**
Tree and plant cover on banks	
Tree and plant cover on the verge	
In-stream cover	
Bank erosion	
Total Rating Score	

Compare your waterway's total score with the range of scores below to find out the Habitat Rating for your monitoring site.

Rating	Scores
Excellent	11 - 12
Good	8 - 10
Okay	6 – 7
Not so good	4 – 5

What does that mean?

Excellent – The area around your monitoring site is in natural condition and forms a wonderful habitat for plants and animals to live in.

Good – The area around your monitoring site has a mix of native and other plants. It may have some bare ground or cleared areas but is still a good habitat for plants and animals.

Okay – The area around your monitoring site has been partly or completely cleared, and may have some bare ground and erosion present. This site has some suitable habitat for plants and animals.

Not so good – The area around your monitoring site is degraded and may have erosion problems. There is minimal habitat suitable for plants and animals.

Water Test Results For March

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Habitat Survey	
3. Photograph or Draw your site (see below)	
4. Design a sample pole (discuss with your teacher)	

Draw a picture or take a photo of your site and label i) the in stream area, ii) the bank, iii) the verge, iv) any trees, shrubs, grasses, and aquatic plants. Also try to identify things that should not be there, like weeds, litter or changes to the waterway made by humans.

April

Indigenous Australians

Indigenous People of the North Central region

The **Dja Dja Wurrung** Aboriginal occupied most of the Loddon catchment with the **Baraba Baraba** and **Wamba Wamba** Aboriginal people downstream of Kerang.

The **Dja Dja Wurrung** (also known as Jarra) people occupied the upper reaches of the Campaspe River from Woodend, Kyneton and Malmsbury and as far north as Bendigo. The Macedon Ranges marked the border between the Dja Dja Wurrung and the Wurrundjeri people. The **Bangerang** people inhabited the lower Campaspe at the Murray River Junction.

The original inhabitants of the Avoca catchment were the tribes of **Jajouweround** and **Wotabaluk** who occupied the lands between the Loddon and Avoca rivers across to Lake Buloke.
The **Dja Dja Wurrung** (Avon River) and the **Jardwadjali** (Richardson River) people were the original inhabitants of the Avon Richardson catchment area.

Ian Clark 1996 Reconstruction of language areas is based on information available at time of printing. Not suitable for use in Native Title and other land claims.

David Tournier

David Tournier has a simple but telling analogy for describing the effects of dams and weirs on rivers. "If you put a rubber band around your finger the blood flow is going to stop," he says. "That's what has happened to rivers."

A Koorie educator and Cultural Heritage Inspector, David knows the Kerang region of the Loddon River very well. The son of a Yorta Yorta man and a Ngarrinjirri woman, David was born in Deniliquin and spent a lot of time around Kerang.

"It was my stomping ground when I was younger," he recalls. He has fished there, played football for the Wandella Bombers and, more recently, worked in Kerang for seven years. In 2002 he was part of the Indigenous River Health Forum, run by Caring for Country Victoria and the North Central Catchment Management Authority. The forum sought Indigenous views on managing the waterways of the North-Central region, including the Loddon River.

He has partly surveyed the Kerang region of the Loddon, to establish its cultural significance to Indigenous people, in particular the Barapabarapa and the Yorta Yorta.

"There are at least 2000 registered sites of cultural significance in the area, and we know there are many more. There are scar trees, middens (cooking mounds) and some ring trees. During one survey along a 50 kilometre stretch just north of Kerang, we found 50 mounds, 60 scar trees and four or five ring trees."
David explains that a ring tree is a tree which has had two of its young branches joined together so that they grow into a ring. "The elders say that these trees indicate a woman's site."

David has taught younger Koories how to identify cultural sites along the river and has assisted landowners who think they may have found sites on their land. He talks of a farmer at Lake Kelly who discovered skeletal remains on his property and of a widower near Boort. "She was on land between the Loddon and Serpentine Creek that has very powerful cultural sites and was keen to protect those sites. When I first met her she had all the equipment she needed for fencing in the boot of her car.
"She is part of six generations of land-owners and so would have had her own cultural attachments to the area. It's great that people like her, and the Lake Kelly farmer, are doing things off their own bat and starting to respect the true custodians."

Over the years David has, of course, noted the state of the Loddon River and its catchment. While there are encouraging signs in some places, there is also evidence of neglect.

A favourite swimming hole of David's has been ruined by simple laziness. "When I was young I'd go swimming in the Lower Loddon River near the weir. It was nice and sandy, but now there's too much rubbish there, bottles and stuff."
Livestock in the river are a major problem. "Cattle are destroying the river, which includes cultural sites. Cattle and sheep and wild goats need to be kept out of the water."
David disputes the idea that the Loddon was always an ephemeral stream, one that naturally does not flow all year. "It must have had to flow 24/7. It's common sense, just as common sense tells you that your blood doesn't naturally dry up." He tells a story to back up his argument. "About 70 years ago a Mungo descendant and his son travelled regularly from their country near Balranald, New South Wales to Geelong, along the rivers. They were on men's business. The trip took about two weeks and would include travelling along the Darling, Edwards, Loddon and Campaspe rivers. Just past Geelong, at Portarlington, they met a whitefella and his son. The two young boys became lifelong friends and before he died the Aboriginal man passed on sacred artefacts to his friend.

"Twelve years ago the whitefella's son contacted me. He would have been in his late 70's or early 80's by then and was still living in Portarlington. He said he had some things for me. Those sacred artefacts are now in the Melbourne Museum, under lock and key."

David believes that alternative farming (such as harvesting the cumbungi reed), better watering systems on farms, fencing off the river and revegetation with native plants would all help the health of the Loddon.

ACTIVITY: DAVID TOURNIER TALKS ABOUT……

Who were David's parents and where was he born?:

What are some of the registered cultural sites David has found in the Loddon Region?

What is a ring tree?

Figure out how long in years the Lake Kelly farmer's family has been in the area. (This will be an estimate)

What are some of the things David recognises as effecting the health of the Loddon River?

By using the information on page 14 discover who the traditional owners of your area are. By finding out which major catchment your district is a part of you can figure out which aboriginal group lives/lived there.

Imagine you where the 'whitefella or his son' that meet the Mungo descendant and son who had travelled along the rivers. What questions would you ask them and what do you think there answers would be?

Water Test Results For April

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Complete the indigenous Australians activity	
3. Complete the Catchment Timeline activity (ask your teacher about this activity)	

May Saltwatch Week

Too much salt in soil and waterways isn't good for plants and animals that live in it. Plants and animals like us can't drink water that is too salty and plants can't grow in soil that is too salty. This is why salinity is one of the biggest threats to the environment in Victoria.

Each year in the second week in May we take a Salinity Snapshot. **Schools are asked to bring along a water sample from their local river, creek, stream, dam or bore to test for salinity.** These results are entered onto a statewide database to give us an idea about what is happening with salinity across the state. Visit www.vic.waterwatch.org.au and go to the Saltwatch page.

Now that your class are nearly expert water samplers your class will be able to help students in younger classes test the salinity levels in the water samples they have collected. You can tell them about salinity and what the salinity readings mean.

Your teacher has a class record sheet for you to fill out and send into us. Make sure you remember where you took your sample from (the best thing to do would be mark it on a map).

Use the table below to rate the water samples you have tested for salinity.

Water Salinity Ranges

Salinity reading	What this water is used for
Less than 800 EC (LOW SALINITY)	Good drinking water for people and animals
800 – 2,500 EC (MODERATE SALINITY)	People can drink this water but it starts to taste salty. This water is still suitable for animals
2,500 – 10,000 EC (HIGH SALINITY)	People should not drink this water. Only some animals can drink this water
Greater than 10,000 EC (VERY HIGH SALINITY)	Don't drink this water! This water is unsuitable for people and for most animals. At 50,000 EC the water has the same salinity as the sea!

Water Test Results For May

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your sight this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Saltwatch activities	
3. Create a crossword with all the words you have learned about waterways	

Frogs! Glorious Frogs!

June

This month we will be investigating frogs. What frogs live near you? How can you tell different types of frogs apart? Where are you most likely to find a frog? Why are frogs important? The answers to all these questions are hidden within a great website called “Frogs of Victoria”. All you need to do is log onto a couple of web sites and look around for some answers. If you can’t find the information you need, ask your teacher. Now let’s explore the world of frogs for a while!

Check out these great sites to find your answers: http://www.allaboutfrogs.org/ and http://frogs.org.au/frogs.

Lots of frogs spend some of their life in the water and some of their time on the land. There are a couple of parts of their live cycle that make living in the water pretty much a necessity! See if you can find out the major steps in frogs live cycle and if you would find them in the water or on the land

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Frogs are a very important part of our natural environment. Not only are they cool to look at and eat a lot of the bugs that we find irritating; they can also let us know when the water is getting too dirty. How do they do this? What things about frogs might make them sensitive to pollution in the water? Hint…what’s special about a frog’s skin?

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Dirty water isn’t the only thing that is hurting frogs around the world. What other things might impact on frog populations?

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What types of things can you tell about a frog just by looking at its feet?

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How many types of frogs are there in Victoria?

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How many types of frog live in your “Region”?

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How might you identify what frogs live in your local area without actually seeing them?

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Why do frogs “sing”?

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Pick your favourite local frog and find out the following things about it: what it looks like, were you might find it, what it sounds like and how big it is.

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What’s the weirdest frog you can find of the two sites? What makes it so weird?

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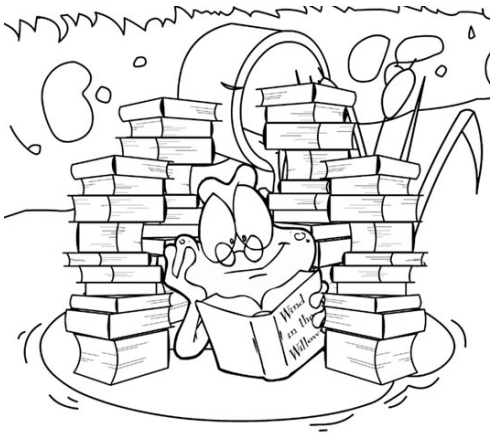


Water Test Results For June

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Complete Frogs, Glorious Frogs activity	
3. Find a partner and play 20 questions about something you learned	

Water Conservation
every drop counts

July

Many people say that water is more valuable than Gold!!
Water is a precious resource that we need to protect and preserve. Australia is the driest continent on earth, 70% of our land is arid! Our hot climate and low rainfall means that water is scarce.

A **clean and fresh water supply** is not just about what comes out of our taps. It is also about being careful with what you put down toilets, drains, basins and sinks. Things like rubbish, car washing water, leaves and grass that end up in street gutters, flow into the storm-water system. These items can cause serious damage to our rivers and streams.

Fresh water is essential for our existence as it allows us to produce food, manufacture goods and sustain our health. Everybody must do their bit to try not to waste water and together we can make a difference.

In the North Central region, average household water use is around 364,000 litres a year (that is a LOT of water!) and it is estimated that the average North Central household uses around 1000 litres of water daily (the equivalent to 6 and a half bath tubs a day!).

This month you will find out how to be water wise and do your bit to save water every day. Complete the River Detectives Water Audit to find out how much water you use in a single day and in a whole week. You might be surprised!

Where does your drinking water come from?

In the North Central catchments drinking water comes from local rivers and creeks. Some other regions store water in large dams called reservoirs before being pumped out. Some people have rainwater tanks that catch water when it rains and this water can then be used around the home. All water (except rainwater) needs to be treated before it comes out of your tap. The treatment processes make the water tastier and better for us to drink by filtering out any impurities and getting rid of any nasty bacteria/bugs in the water.

DID YOU KNOW

* Over 70% of the planet's surface is water, however **less than 1%** of that is **drinkable water**! The rest is locked up in polar ice caps and oceans. To put it another way- if 100 Litres represents the world's water, little more than half a tablespoon of it is fresh water available for our use!!!!

Water Audit

Record how many times a day you do the following activities. At the end of the week calculate how many litres of water you have used.

Activity	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	**Total**
Showering 100 Litres								
Bath 200 Litres								
Toilet 10 Litres								
Washing dishes 30 Litres								
Washing hands 5 Litres								
Brushing teeth 5 Litres tap running 1 Litre tap off								
Drinking Water ¼ Litre								
							Grand Weekly Total	

Water Test Results For July

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Conduct your Water Audit	
3. Complete a cross-word that a class-mate made in May	

August

- Environmental Flows -

Why Flow is Important in our Rivers?

Rivers are an important part of the catchment. Along their way different plants and animals depend on the river for habitat and food.

In some places, beautiful River Red Gums grow alongside. They drop their branches into the river and fish can shelter amongst them, hiding from the birds perched above. River Red Gums need high flows that cover the river bank every couple of years, wetting their roots to keep them alive and healthy.

Fish also need high flows during the time they want to migrate and spawn (breed). High flows at the right time of year let the fish know when to spawn and begin to swim upstream.

In bigger floods water spills over the banks and onto the plains, and fills the wetlands. Birds that live in big groups, like ibis and egrets, come from all around to make their nests in the rushes and large trees that flourish.

Sometimes the river stops running and all that's left are small pools. Aquatic bugs (invertebrates) and fish take refuge and wait for rain. Exotic or introduced species like carp, don't like it when this happens. But our native animals are tough and can survive periods of low flow, which naturally occur in the summer.

The native plants and animals that live in or near the rivers in Australia are adapted to the natural changes in the flow of the river. Without these changes in flow they cannot complete their lifecycles.

Using Our Rivers

Humans also use water from rivers. We use it everyday in our homes and farmers use it to water their crops. We pump it directly from the river and build dams and reservoirs to hold back and store the water for times when it is hot and dry.

When too much water is taken out of our rivers for use in our homes, towns or for farming, it reduces the amount of water flowing down the river. Where there are dams or reservoirs on our waterways, water is captured in winter when the river would have been running with lots of water and released in summer when it is hot and dry. This forces the river to have a lot of water in it during summer when it would have been naturally low.

These man-made changes have altered the way the water in rivers naturally goes up and down, and some of the plants and animals cannot survive. The fish do not breed, the plants do not set seed, wetlands suffer and introduced species flourish.

Role of Environmental Flows

Environmental flow is water that is released in a river to help the plants and animals survive and reproduce. In rivers that have dams we can release water, called environmental flows, to help the plants and animals. You must remember that the amount of water that is released will depend on the season, so it is as close to natural as possible.

During summer, when some rivers would have been dry very little environmental flows are released, but sometimes we do have big summer storms. This rainfall would have made the river flow for a short amount of time before drying out again. This is called a "fresh" because the water in the small pools is freshened up. We also deliver environmental flows to mimic summer rains.

In winter the river runs higher, but because we catch the water in dams it doesn't run as high. Environmental flows in winter help the river run higher and sometimes over the bank. This fills wetlands, helps fish migrate and River Red Gums flourish.

In rivers without dams, we have to be careful when we take water out of the river. If we take too much out in summer there will be nothing left for the plants and animals. Sometimes this is difficult because in summer more water is needed to keep farmers crops and cattle healthy, and our gardens at home, alive.

We all need to use water very carefully so there is enough to go around.

To find out more about environmental flows, lets think about how we all use water and what the river needs to stay healthy.

Water Test Results For August

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities		Complete
1.	Plot all of the parameters onto the water tests results graphs	
2.	Read the Environmental Flows page and answer the questions below	
3.	Play Environmental Flows Game (ask your teacher)	

Environmental Flow Questions

1. Why do we need our rivers to flow?

2. What types of things make rivers flow different to the way they used to?

3. What happens if they stop flowing they way they should?

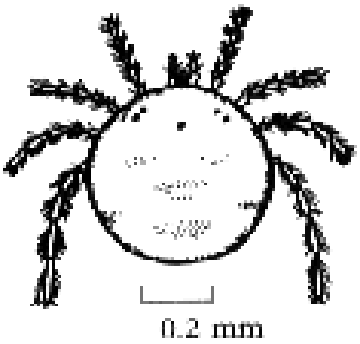
4. What can we do to help make a river flow the way it would naturally?

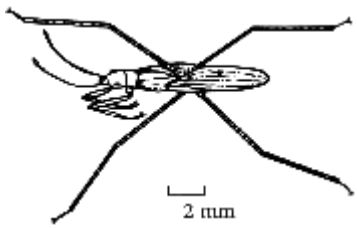
September

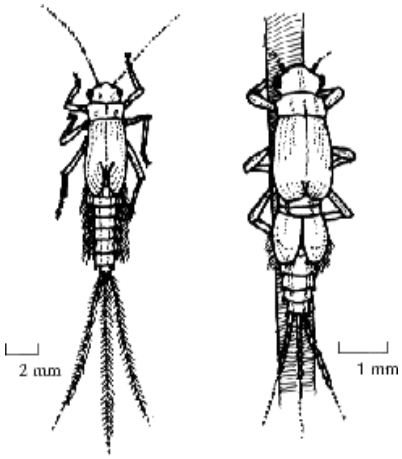
Rivers: a bugs playground!

There are lots of tiny aquatic bugs living in our waterways throughout the North Central region. Aquatic bugs can be found living amongst aquatic plants, in the bottom sediments as well as underneath rocks and stones on the stream bed. Some bugs are very clever and can walk on the surface of the water.

Have you seen any aquatic bugs while you have been sampling? This activity will help you find and identify some of the little critters.





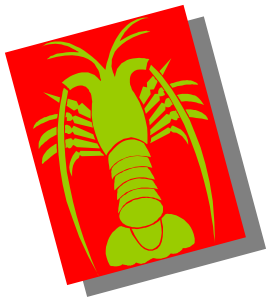


Aquatic bugs are also known as aquatic invertebrates. They are small animals without a backbone that live in water for part or all of their lifecycle. There are many different types of aquatic invertebrates living in our waterways and they can tell us a lot about the quality of the water. They also occupy a very important role within the food webs of our waterways, since most are eaten by bigger animals such as fish, frogs and birds.

When looking for aquatic invertebrates the best places to look are amongst the aquatic vegetation fringing the waterbody or in the bottom sediments. Most are very small, so you will have to look really closely.

Your teacher or Waterwatch Facilitator will help you catch and identify the bugs from your stream, then try and fill out the bug data sheet.

Water Beastie Results Sheet



1. Were there lots of aquatic invertebrates in your sample?

YES NO

2. How many different types of aquatic invertebrates did you find?

_____

3. List the top 5 aquatic invertebrates you found in highest abundances.

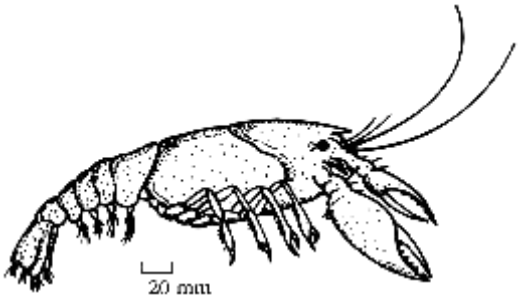
_____

_____

_____

_____

_____



4. Do you think your water is polluted?

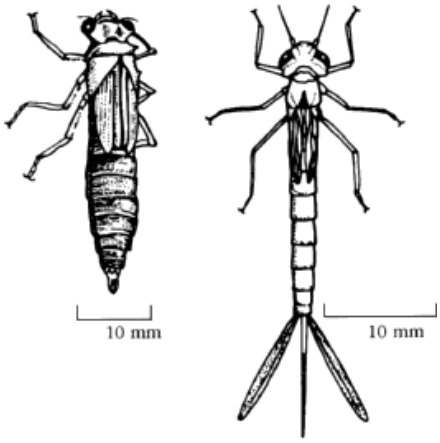
YES NO

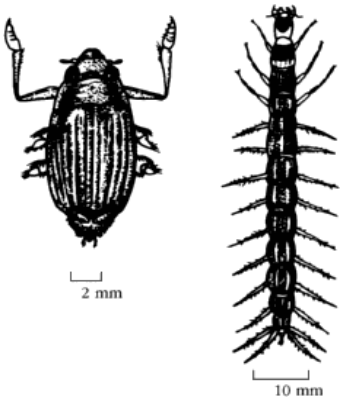
5. If the presence of many different types of aquatic invertebrates indicates that a waterway is healthy, would you consider your waterway to be healthy?

YES NO

6. Using aquatic invertebrates as indicators of health, how would you rate your waterway?

Excellent Good Okay Not so good





Water Test Results For September

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Complete the Water Beasties Data sheet	
3. Enter the Create a Critter contest (ask your teacher how)	

Beaks and Feet

October

Birds come in a variety of shapes and sizes and thus like to live in different habitats. Some birds live in trees, while others prefer shrubs and bushes closer to the ground. Some birds are brightly coloured while others blend into their surrounding environment, making them less visible to predators.

This month take a visit to your monitoring site and see how many different types of birds you can find. You will have to be very quiet so you don't scare them away. Look at the shape of the bird's beak and try to work out what their favourite food might be. Also take note of their feet and try to figure out where they live and why their feet look the way they do.

For more information about Bird Watching:

Contact your local Bird Observers Club, Landcare Group or Friends of a Wetland/Park Group to assist your class with their bird watching activities.

Visit the following websites:

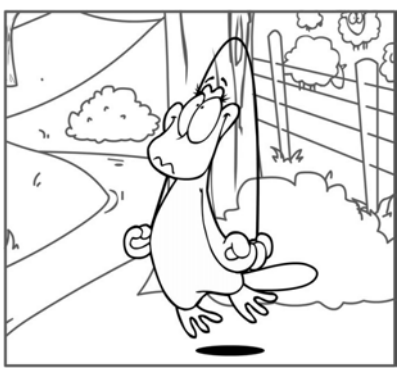
Hints for birding with children: http://home.vicnet.net.au/~osch/hintsfor.htm

Australian Online Bird Guide:
http://raysp.com/birds/guide.php3

Describe two of the birds you see at your wetland. Record the shape of their beak and feet and the reason why you think they need these features.

Bird description	Reason for features
Legs: ☐ long ☐ short	
Feet: ☐ wide ☐ webbed ☐strong ☐ big	
Beak: ☐ long ☐ curved ☐small ☐ strong ☐ unusual shape (describe)	
Sketch of Bird	

Bird description	Reason for features
Legs: ☐ long ☐ short	
Feet: ☐ wide ☐ webbed ☐ strong ☐ big	
Beak: ☐ long ☐ curved ☐ small ☐ strong ☐ unusual shape (describe)	
Sketch of Bird	



BIRD WATCH

Water is very important to bird life in the area. Waterbodies may not only supply drinking water for birds, but can also be where they feed, shelter and rear their young.

The presence of birds at a waterway can tell us about the quality of the water and other organisms likely to be found there.

(Adapted from the Ribbons of Blue Water Quality Monitoring Program for Primary Students).

1. Did you sight many birds at your waterway?

Yes No

2. How many different types of birds were sighted?

_____

3. Where were the birds sighted? E.g. reeds, edge, flying.

_____

_____

_____

4. Can you identify any of the birds? If so, write their names in the space provided below.

_____

_____

_____

_____

_____

_____

5. How does the bird life match with the habitat provided by the waterbody?

_____

_____

_____

_____

Water Test Results For October

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

If you visited your site this month what did you see? (e.g. animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Complete the Feathery Friends Data sheet	

Urban Stormwater

November

Rainwater falls onto a variety of surface types. These surfaces include roads, rooftops, shopping centre car parks, playgrounds, golf courses, parks, gardens and pavements. Some of these surfaces will absorb water (these are **permeable**); however many other surfaces cannot absorb water (these are **impermeable**). Rainwater falling onto impermeable surfaces (E.g. roofs and roads) is generally transported via a series of gutters, drains or pipes to a nearby creek or river. Any pollutants on these surfaces will also be collected by rainwater. For example, rainwater travelling along a road can collect oil, detergents, rubber, cigarette butts, dog droppings, plastic, grass and leaves. This pollution will then enter our waterways, untreated. Rainwater that runs off hard surfaces and enters waterways is called **STORMWATER**.

Stormwater does not include sewage, as this is diverted through a different pipe system for treatment. ***Stormwater*** is water **outside** our homes, whereas ***sewage*** is water that flows down the drains **inside** our homes.

How Does Pollution Affect Our Waterways?

Many types of materials contained within stormwater can have a negative effect on our waterways. Common pollutants include rubbish, oil, soil, fertilisers, animal droppings, leaves, grass, and detergents.

Organic matter (leaves / grass) can block up and choke the natural flow of waterways. This can cause a reduction in sunlight penetration that affects water temperature, which can distress plants and animals living there. As leaves break down and decompose in water they add an increased nutrient load into the waterway. This may lead to large algal blooms when conditions are favourable. The decomposing leaves also release tannins which can affect the quality and colour of the water.

Litter including cans, plastic bottles and bags look unappealing in our waterways and therefore impacts upon aesthetics. Litter can also threaten aquatic animals, reduce recreational uses, and potentially harm our health.

Sediments can smother organisms and plants that reside on the bottom of a waterway. Sediments also increase turbidity, therefore reducing the amount of light that can penetrate the water.

Fertilisers and animal droppings can increase the amount of nutrients in a waterway and promote excess algal growth. This can lead to toxic algal blooms and make the water unsafe for animals and humans to use.

Oils and grease are toxic to animals and plants that live in or near a waterway. Oil and grease slicks also look very unappealing and reduce recreational use.

LESS LITTER LUNCH CHALLENGE- RESULTS SHEET

School name _____

Waste Category	***Audit 1***			***Audit 2***		
	Weight of container	***Total weight*** (container and waste)	***Weight of waste***	***Weight of container***	***Total weight*** (container and waste)	***Weight of waste***
Recyclable						
Compost						
Rubbish for the tip						

1. Which waste category had the greatest weight in Audit 1?

_____

2. Which waste category had the greatest weight in Audit 2?

_____

3. Which waste category showed the greatest weight change between audit 1 and 2? Why do you think this happened?

_____

_____

4. How many students participated in the challenge?

_____

5. What was the average weight of 'rubbish for the tip' per student in audit 1 and 2 (divide 'rubbish for the tip' weight by the number of students who participated)?

1. _____ 2. _____

6. What was the difference between the two average weights for the 'rubbish for the tip' category? *(Make sure you indicate whether there was a positive or negative change).*

_____

Water Test Results For November

Monitoring site:	Date of water tests:

Physical Parameters

Water Temperature (°C)	
Air Temperature (°C)	
Turbidity (NTU)	
Rainfall in last 48 hours (mm)	

Chemical Parameters

Salinity/Electrical Conductivity	
Phosphorus (mg/L)	
pH	

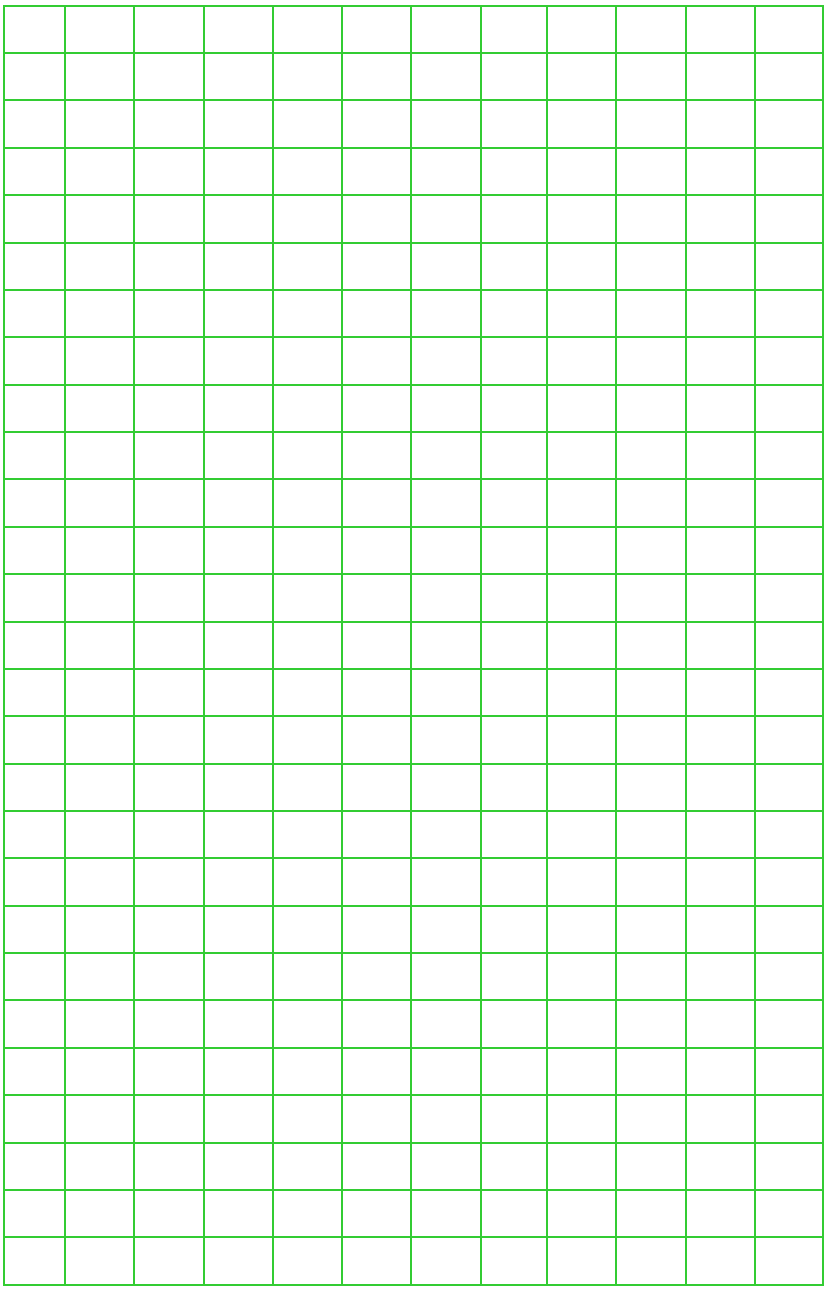
If you visited your site this month what did you see? (e.g. Animals, plants, changes in the river, smells, people, impacts)

This Months Activities	Complete
1. Plot all of the parameters onto the water tests results graphs	
2. Complete your Less Litter Lunch Challenge	
3. Answer the question below	

What are the types of land-uses around your sampling site? What effects might they have on water quality?

Water Test Graphs

Air and Water Temperature Degrees Celsius



Degrees Celsius

Month

Month	Water Temp (°C)	Air Temp (°C)
March		
April		
May		
June		
July		
August		
Septem-ber		
October		
November		
December		

Transfer your data to this table each month

Line Graphing

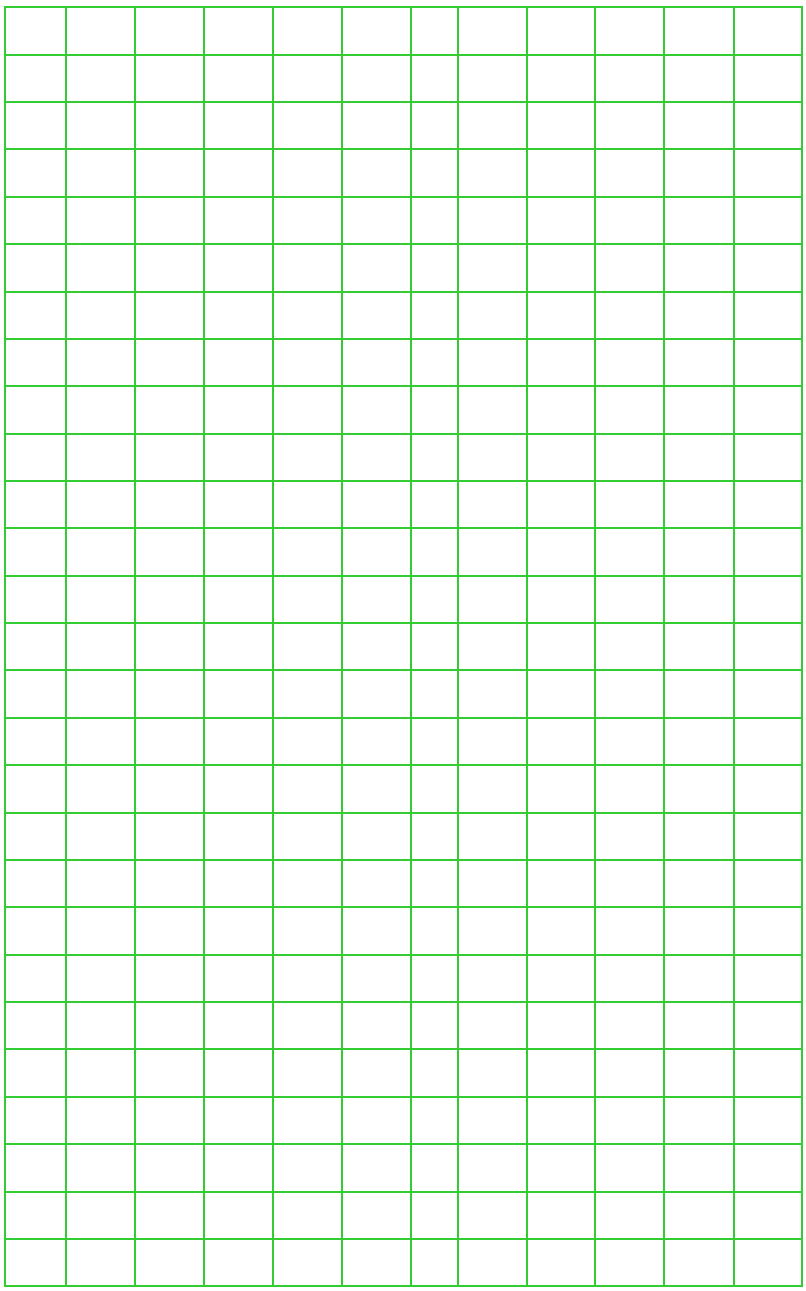
We will be using a linear graph to record air and water temperature variations over the year. This will give us a visual representation of the physical parameter of temperature.

Setting up your Graph — In your graph you will need to draw your Y axis with the expected temperature range and the X axis with Months you will be recording.

Mark the air temperature in red and the water temperature in blue by first dotting your result then drawing a line from the previous to the new result. Mark the air and water temperatures in different colours.

Turbidity

NTU



Month	NTU
March	
April	
May	
June	
July	
August	
Septem-ber	
October	
November	
December	

Transfer your data to this table each month

Month

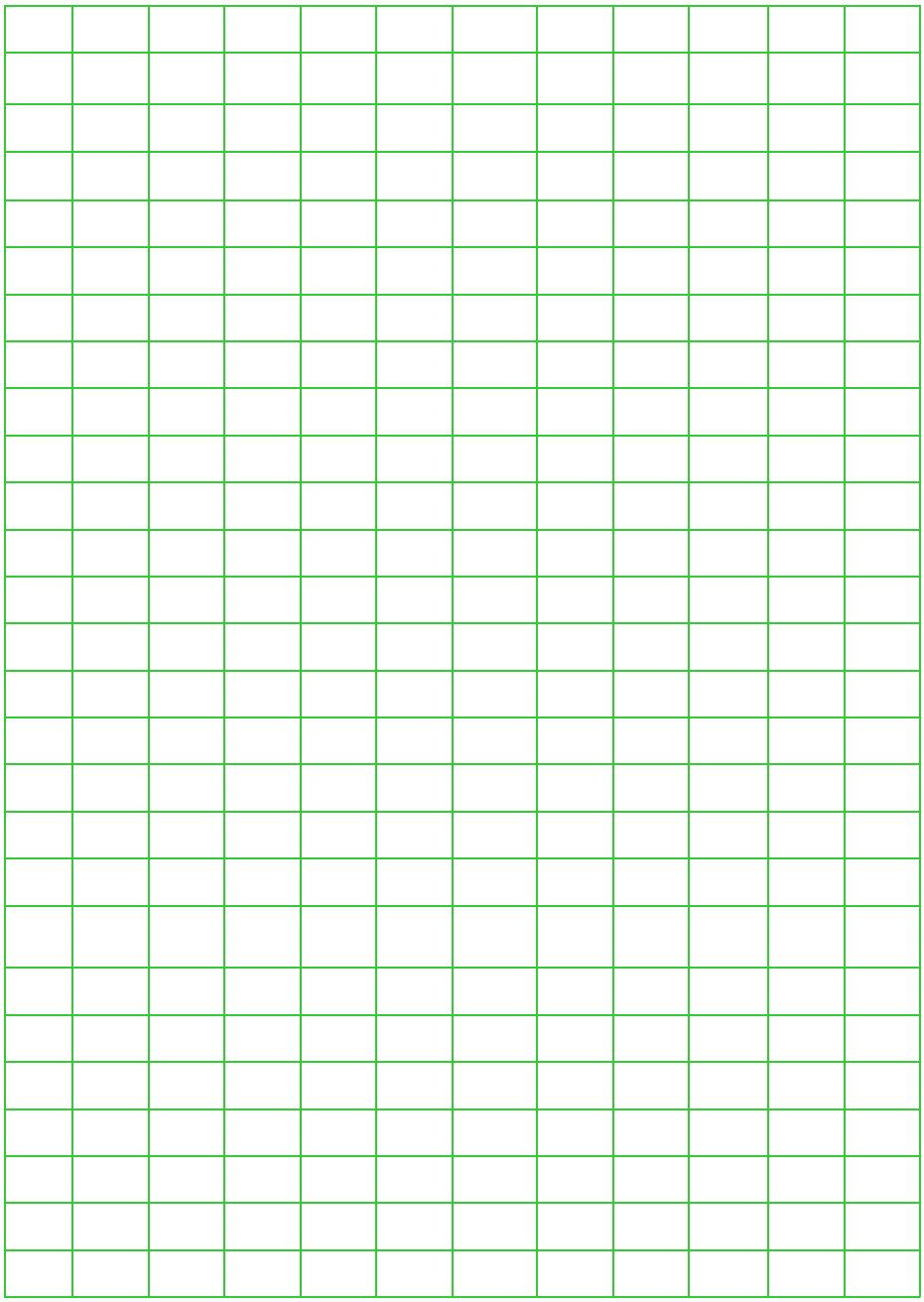
Column Graphing

We will be using a Column graph to record turbidity variations of your watercourse during the year. This will give us a visual representation of the physical parameter of turbidity.

Setting up your Graph — In your graph you will need to draw your Y axis with the possible turbidity range (you will find this on the turbidity tube) and the X axis with Months you will be recording.

Mark the turbidity by colouring in the column up to the point that your result corresponds with.

Salinity—Electrical Conductivity



Month	EC reading
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
	Total (mm)

Transfer your data to this table each month

Bar Graphing

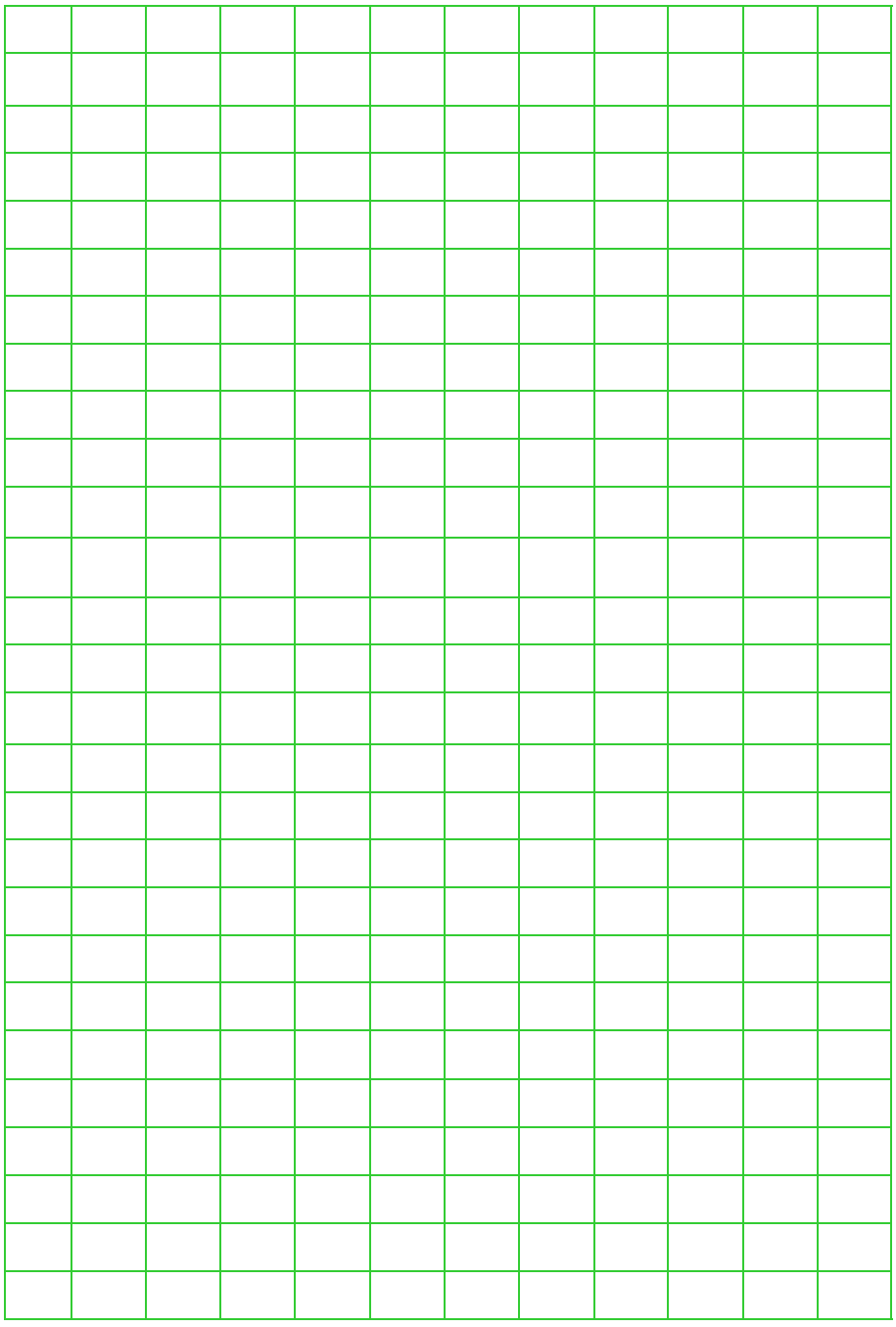
We will be using a bar graph to our electrical conductivity results over the year. This will give us a visual representation of the chemical parameter relating to salinity .

The bar graph is different to a column in that the bars run horizontally rather than vertically like in the column graph

Setting up your Graph — In your graph you will need to draw your Y axis with the months you will be recording and the X axis with the expected electrical conductivity range.

Mark the electrical conductivity by colouring across the row until it aligns with the EC measurement

Phosphorus (milligrams per litre)



Month	Phospho-rus (mg/L)
March	
April	
May	
June	
July	
August	
Septem-ber	
October	
November	
December	

Transfer your data to this table each month

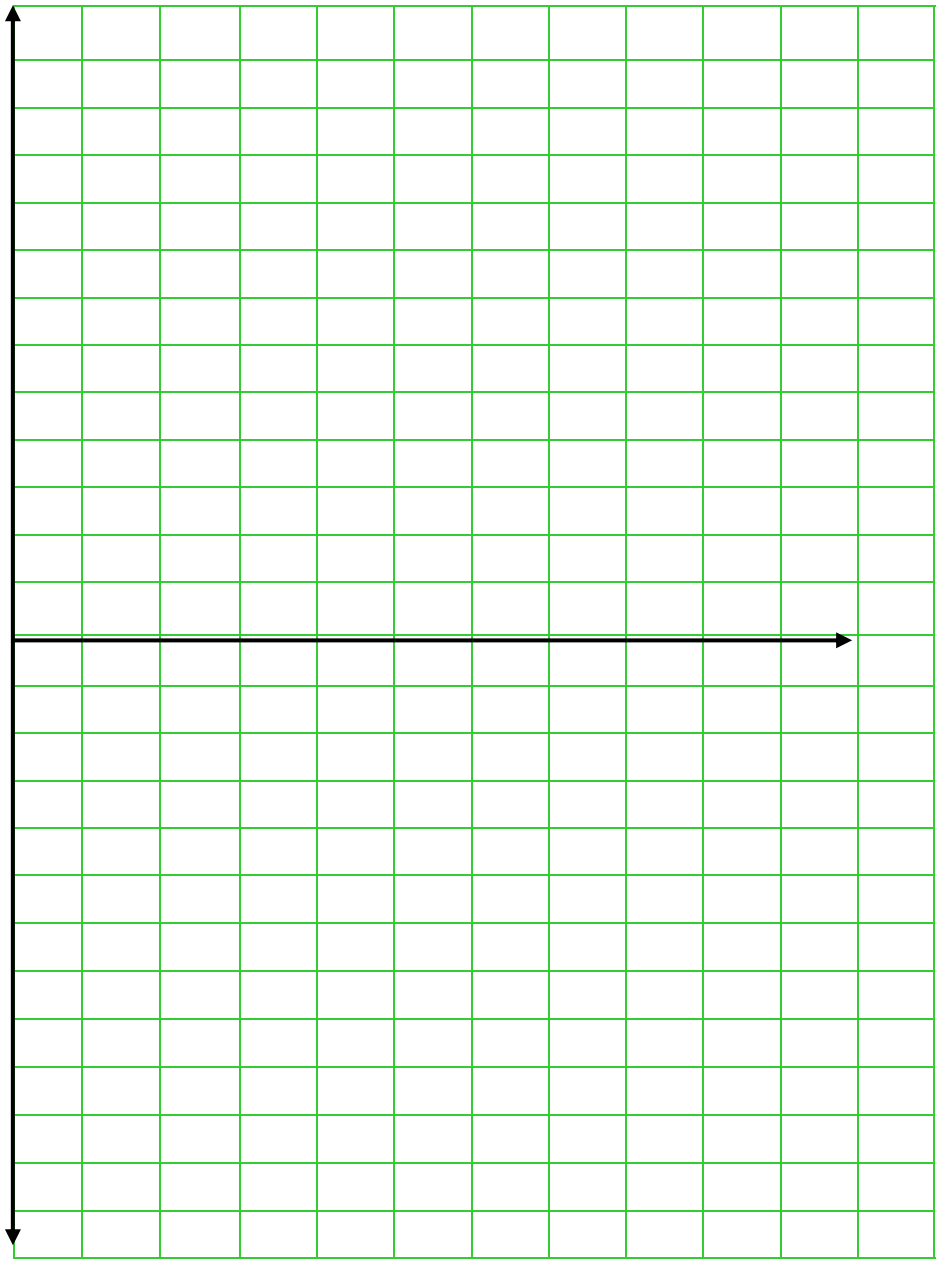
Point Graphing

We will be using a point graph to record phosphorous variations over the year. This will give us a visual representation of the chemical parameter relating to phosphorous.

Setting up your Graph — In your graph you will need to draw your Y axis with the measurable phosphorous range (you will find this on the colour wheel in the phosphorous kit) X axis with Months you will be recording.

Mark the phosphorous reading by first dotting your result then drawing a line from the previous to the new result.

ph



pH

Month	pH
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

Transfer your data to this table each month

Month

Line Graphing

We will be using a liner graph to record phosphorous variations over the year. This will give us a visual representation of the chemical parameter relating to phosphorous.

Setting up your Graph — In your graph you will need to draw your Y axis with the measurable pH range (this is from 0-14) and the X axis with Months you will be recording.

Mark the phosphorous reading by first dotting your result then drawing a line from the previous to the new result.