JUNE 2012

Sarina Catchment Schools Program Activity Book "Understanding & Caring For Our Catchments"

Proudly supported by:

Queensland Government

Mackay REGIONAL COUNCIL

Australian Government
Great Barrier Reef Marine Park Authority

sarina high school

Contents

Acknowledgements

Sarina Landcare Catchment Management Association Inc. would like to thank local schools for participating in the program.

Thank you also to the following organisations for their contributions towards the:"Sarina Catchment School's Program: Understanding & Caring For Our Catchments", without your support this would not have been possible.

- **Qld Government Natural Resource Awareness Grants**
- **Mackay Regional Council**
- **Sarina State High School Rural Skills Centre**
  (Tracy Soward-Amalfi, Frank Langfield, SSHS Agricultural Students)
- **Great Barrier Reef Marine Park Authority**
  (Carolyn Thompson)
- **Sarina Landcare Catchment Management Assoc. Inc.**
  (Nadine Hamill, Margaret Meng)

Queensland Government

Mackay Regional Council

SARINA Landcare Catchment Management Association Inc.

sarina high school

Australian Government
Great Barrier Reef Marine Park Authority

Sarina State High School Agriculture Department

Sustainable Farming

Welcome to our working farm. It is important to know that as farmers and as consumers we need to understand that all we do when growing food and fibre can affect the environment around us. At Sarina State High School we are striving to be a productive farm whilst ensuring that the environment and ecosystems around us kept safe from irreversible harm and damage. The following activities will let you know what we are doing here at our school.

Our Wetlands

Our wetlands in 2008

Why did the school build its own wetlands area?

.....

.....

What purpose does the wetlands serve as part of the farm operation?

.....

.....

.....

How do we know the wetlands are working effectively?

.....

.....

What other ways does the school farm help to protect the environment?

.....

.....

The school farm makes its own compost for growing why is this an advantage for our farm and the environment?

.....

.....

What type of methods does the farm use to grow plants?

.....

.....

Name three types of plants that are grown on the school farm.

.....

.....

When growing plants what do we have think about as farmers to protect the environment?

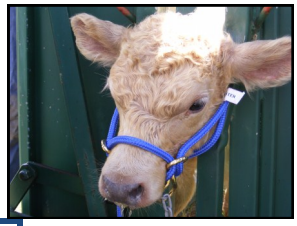
.....

.....

Our Farm

Aquaponics

Poultry



Cattle

Thanks for visiting our farm.

The River Story

(Adapted from Who polluted the Potomac? Alice Ferguson Foundation, USA)

Aim

This activity encourages students to explore the links between water pollution and land use and aims to stimulate them to consider preventative actions.

Background

Discuss the concept of Australia being the driest inhabited continent; that water is so precious yet many ecosystems are under threat of pollution of waterways. All of us living within water catchments contribute directly or indirectly, significantly or insufficiently to the degradation of our waterways, often without realising the impacts that humans have. As we rely upon water so heavily, it is vitally important that this resource is managed wisely so that water quality will be maintained for future generations.

This activity can be followed up by observing the impact of pollution on a catchment in your local area. Observations can be made through simple water quality testing.

Materials

- Large tub (for River catchment)
- Watering cans and small canisters for substances
- Labels for canisters
- Vinegar, salt, yellow & red food colouring, fishing line, toilet paper, litter (plastic, drink cans, paper/plastic bags), baking powder, vegetable oil, detergent, dirt/muddy water.

Instructions

1. Label canisters using industries/land uses in the table below and fill with corresponding pollutant substances.
2. Several volunteers are selected to hold props representing different types of land uses and canisters representing different types of pollutants.
3. One/two volunteers are selected to carry a watering can (representing rain).
4. Participants congregate in a horse-shoe around the hypothetical river (clear tub).
5. Read story in a dramatic way, stopping at the end of each section when land use/industry is mentioned.
6. On cue, participants empty their canister into the tub of water (river).
7. Everyone observes & discusses what happens to the water quality as it goes down the river.

Labels and corresponding pollutant substances

Industry	Substance/pollutant	Industry	Substance/pollutant
Power Station	Vinegar (acid rain)	Herd of cattle	Thick muddy water (eroding banks)
Farming country	Baking Powder (fertilizer)	Coal mine	Vinegar (acid run-off)
Piggery	Thick muddy water (Manure & water runoff)	Hobby Farms	Yellow food colouring in water, toilet paper
Grazing land	Salty water (salinity)	Fishing	Nylon fishing line
Waterskiing	Vegetable oil	Roads	Vegetable oil

Industry	Substance/pollutant	Industry	Substance/pollutant
Subdivision	Soil	Industry	Soapy water (phosphates)
Gardens	Baking soda (pesticide)	Waste drums	Red food colouring in water (toxic waste)
Park	Litter (plastic bags, ect.)	Tourism	Drink cans or bottles

Activity: The River Story

This is the story of a very special river flowing through its catchment. It begins in the higher parts of the catchment where the **RAIN** runs off the slopes and begins its long journey to the sea.

In the valley below there is a **POWER STATION** that generates electricity for the region. It burns large quantities of coal and releases pollutant gases into the atmosphere. These pollutants combine with moisture in the atmosphere to produce **ACID RAIN. RAINFALL** carries these acids back to the earth's surface and can pollute the very source of the river. The water gathers momentum as it descends the slopes.
The river continues its journey towards the sea through **FARMING COUNTRY**, where recently some crops were fertilised. Afterwards, they were **WATERED** and the run-off into the river has brought with it some of the **FERTILISER**.

The neighbouring farm is a **PIGGERY**. Some of the **MANURE** from the pig pens washes into a drainage pipe which empties into the river.
On the other side of the river are **GRAZING LANDS**. There are very few trees remaining and, in some of the lower parts of the pasture, the water table has risen because the trees are not using the water any more. This water brings the salts in the soil up to the surface, making the land unusable. It also means that run-off from the land is **SALTY** and this threatens the freshwater organisms and animals in the river.
The **COAL MINE**, which supplies raw mineral for the power station, pumps water out of the river to clean its equipment and flush our some of the waste. This includes various **ACIDS** which all drain back into the river.

Slowly the river starts to wind its way through the outskirts of a major town. Out here, there are a number of **HOBBY FARMS**. The houses here are not connected to a sewerage system but have their own septic tanks. Occasionally these tanks overflow and untreated **SEWERAGE** seeps directly into the river.

There are a number of people using the river around the bend. Someone is **FISHING** on the banks. Unfortunately their **LINE** gets caught around a rock and is left in the water. Other people are **WATERSKIING**. Their boat needs a service and in the meantime its engine is leaking **OIL** directly into the river.

Other groups of people are enjoying a picnic at a **PARK** overlooking the river. A gust of wind blows some of their **RUBBISH** off the table and down into the water. Further downstream the river is being utilised for **TOURISM**. A charter boat is giving some people a scenic tour of the river. **DRINKS** are for sale on board and not everyone uses the bins provided.

The river now starts to meander through the suburban part of the town. A new **SUBDIVISION** is being developed. Many of the trees have been removed and when it **RAINS** the top layer of **SOIL** is eroded and contributes to silting up the river. Most

houses in the developed parts of the town have **GARDENS**. To keep those nasty bugs away the gardeners use a range of pesticides. At the end of the day the **SPRINKLERS** are turned on to water the plants. The **PESTICIDES** wash off into the stormwater drains and enter the river.

People who have spent the day at work are now starting to drive home. In large towns there are many cars on the **ROADS. OIL** drips out of many of these cars and sometimes they brake in a hurry, leaving traces of rubber on the road. Every time it rains these pollutants are carried into the stormwater drains and straight into the river.

There is still some **INDUSTRY** along the river here. It uses **DETERGENTS** to keep its production equipment clean. But sometimes, the dirty water is **HOSED** out of the factory into the gutter where it disappears into a stormwater drain. Once again, this water flows straight into the river. If there were phosphates in the detergent it will cause excess algae growth in the river. When the algae die and begin to rot, this uses up the oxygen which animal in the water rely on. They may suffocate as a result.

Redevelopment is occurring on the opposite bank. Demolishers have discovered a few **DRUMS** of something mysterious. They won't be able to use these as scrap. Someone suggests emptying them into the river. Everyone agrees, and the **WASTE** is released into the river, to the detriment of all organisms and animals living in it.

With one final bend, the river finally arrives at its mouth and flows into the sea (or large inland lake). But look at what flows out with it.

What can we do with our river? A heavy **RAINSTORM** would help. The fresh supply of river water from rain can help flush out many pollutants. Indeed, rivers can be a major way of flushing and cleaning ecosystems. However, this only moves the problem to a coastal area where other ecosystems will be affected.

We must reduce the amount of pollution that is entering the river.

Questions

Describe the water in the river before it rained and flowed down through the catchment. (What did the water in the container look like at the start of the activity?)

In comparison, how would you describe the water in the river at the end of the activity when it flowed into the sea? (What did the water in the container look like at the end of the activity?)

What types of production contributed to pollution of the river? (Remember the props handed out for the activity and what land uses they represented e.g. grazing).

What types of recreation contributed to pollution of the river?

What other land uses contributed to pollution of the river?

Why is it important to have good water quality? (Think about what water is used for)

List the ways that pollution in a catchment might affect you personally, how might this accumulated pollution affect the coast / beach /ocean, and in turn you?

What can you do to prevent water pollution?

Additional learning

Students can graph pollution levels in a hypothetical waterway and interpret the effects this pollution has on the waterway.

Students could investigate the occurrence of water pollution problems in Queensland and Australia. Students conduct a ‘media watch’ where they collect articles and/or take notes on related issues related to water pollution which appear in local, regional and national newspapers, magazines, or television programs. When sufficient articles have been collected, pollution problems that have been identified are discussed and any potential solutions are proposed, which may help remedy these problems. If conducting the ‘media watch’ activity outlined in additional learning, request that students start collecting articles at the beginning of the unit of work to ensure enough time is available to collect a variety of articles concerning this issue. The publication Testing the Waters may provide further information on pollution of Queensland watercourses.

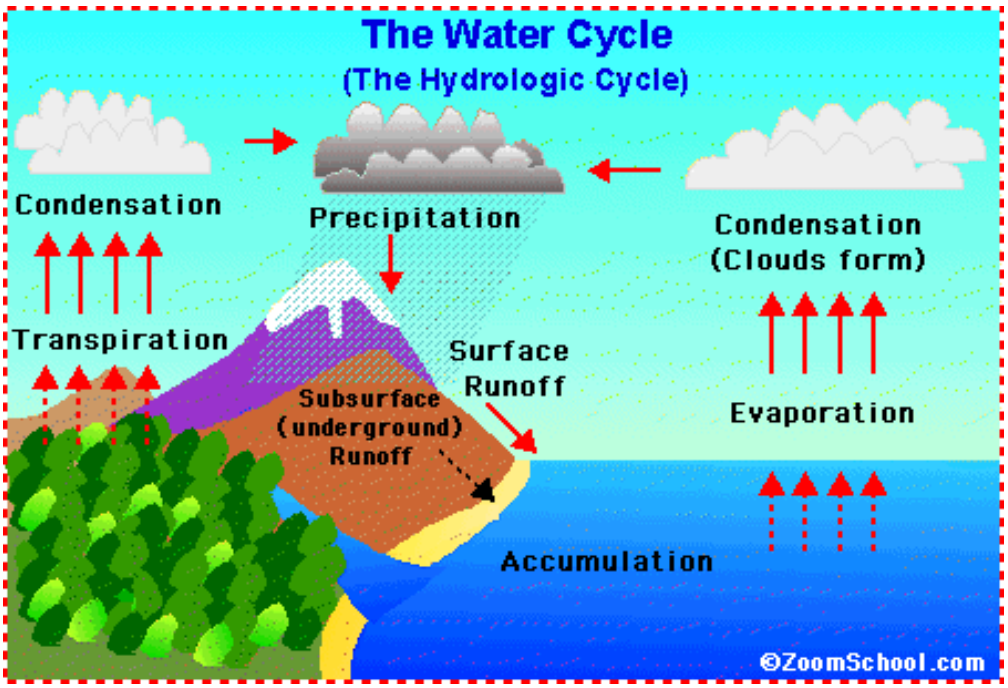
What is in a catchment area?

A range of natural resources and land uses will be found in a catchment area from the headwaters to the mouth of the river, but these may vary greatly. Some of the following may be found:

- land
- water
- natural vegetation
- crops and pastures
- gardens
- wildlife
- people
- domestic animals
- recreation facilities
- national Parks
- industry
- cities and towns
- farms
- transport routes
- windmills and pumps
- refuse / Waste
- irrigation systems
- dams
- sewage system
- forestry areas
- homes

Water movement in a catchment area

Water is the linking factor in a catchment area. The water cycle is shown in the following figure. The sun's energy enables the transfer of water from the sea to the atmosphere in the form of water vapour. This process of evaporation also takes place on land. Plants add water vapour to the atmosphere through transpiration. People, animals and machines add small amounts of water vapour as well, by means of respiration and combustion. The water vapour condenses then falls as precipitation. This may be in the form of rain, snow, sleet or hail. Some precipitation evaporates while falling and returns to the atmosphere. Most precipitation soaks into the soil (infiltration). Part of it sinks to the watertable. This underground water is called groundwater. Any excess water runs off the land and is carried away by streams and rivers (surface run-off). The sun evaporates some surface water. Some underground water is taken up and then transpired by plants.



Health of catchments

All land in Australia is part of a catchment, regardless of whether is it a desert or a swamp, Catchments provide water for primary production, recreation and sanitation as well as maintaining those natural environments essential for plants and animals (including humans). Poor management practices on land can lead to deterioration in water quality. Poor water quality is damaging to the natural environment, and treating such water to ensure that it is safe is costly and energy consuming. Good water quality depends on us understanding and managing each of the environments in the catchment.

An unfortunate result of our lifestyles and growing populations is a range of environmental problems such as soil erosion, water pollution and loss of native plants and animals. We all contribute to these problems, either directly or indirectly. By using practices not suited to our harsh climate and by managing natural resources separately and independently, we have upset the natural balance of our environment. The quality and quantity of the water we drink, the food we eat, and the building products we use, are dependent on the condition of the land and the practices used on that land.

We have created a number of problems; many interrelated, not only for ourselves but for future generations. For example, in the past we disposed of waste thoughtlessly, causing problems now and for the future. Everyone can do something to overcome these problems in their own area.

We all live in a catchment. Catchments are ideal units to work with when looking at land use and management issues because everything is linked by water and what happens in one part of a catchment area is likely to affect the rest of it. For example, a soil erosion problem, on a farm near the top of a catchment area, may lead to silt and agricultural chemicals ending up in catchment creeks and rivers and eventually making their way out the ocean where they can severely damage coral reefs. Similarly, poor management of effluent discharge from cities and towns can have a devastating effect on water quality.

WATERBUG (invertebrate) SURVEY

(Adapted from *The Streamwatch Water Bug Detective Guide* produced by the Water Board, Sydney-Illawarra-Blue Mountains, and CSIRO's Double Helix)

Materials

- Activity book and pen
- Macro-invertebrate identification keys and survey chart
- A large, fine mesh net (dip net)
- Buckets
- Large pale coloured or white trays for collected samples
- Tweezers, plastic spoons, plastic pipettes
- Magnifying glass
- White ice cube trays for sorted bugs

Introduction

The number and variety of waterbugs found in a stream can give an indication of the relative levels of water pollution. This is because they vary their sensitivity to changes in their environment. Some bugs can survive as the stream's quality (water quality and habitat) deteriorates and others will not. By undertaking a waterbug survey, you can determine the likely pollution level of your waterway.

The four categories of water bugs are:

- Very sensitive waterbugs – will only survive in clean water
- Sensitive waterbugs – only live in slightly polluted water
- Tolerant waterbugs – will live in moderately polluted water
- Very tolerant waterbugs – will survive in heavily polluted water

Aquatic habitats

We can broadly categorise aquatic habitats as still water (wetlands, backwaters, lakes and pools) or moving water (rivers, creeks & streams).

Moving water can contain three different habitats:

- *Riffles* - shallow, rocky sections of rivers with fast flow, often contain more variety of macro-invertebrates because of greater number of places to live (on, under and between rocks)
- *Pools* - deeper areas with slower flows and finer material on the stream bed
- *Runs* - transition zones, the section between pools and riffles

Activity instructions

1. ½ fill buckets with water from waterway and place in shade
2. Slowly drag dip net along creek bed, banks and around vegetation
3. Place any bugs you collect immediately into buckets
4. Carefully pour water and bugs from buckets into large white trays
5. Search for bugs in trays (look carefully, some are very small, some are camouflaged)
6. Place bugs into ice cube trays and using identification keys, list the bugs in the survey chart and write in a pollution score
7. Follow the instructions at the bottom of the survey chart to get a score for your waterway (the higher the score the cleaner the water)
8. Carefully return bugs to waterway

In the boxes below: draw and name the waterbugs you find.

Survey Identification Chart

Common Name	Scientific Name	Score	Tick if present	Write pollution score
Stoneflies	*Plecoptera*	10		
Mayflies	*Ephemeroptera*	8		
Caddisflies	*Trichoptera*	8		
Riffle Beetle - Adult	*Elmidae*	8		
Riffle Beetle - Larvae	*Elmidae*	8		
Crane Flies	*Tipulidae*	6		
Damselflies	*Odonata*	6		
Dragonflies	*Odonata*	6		
Freshwater Crabs	*Hymenosomatidae*	6		
Freshwater Yabbies	*Parastacidae*	6		
Water Measurers	*Hydrometridae*	6		
Biting Midges	*Ceratopogonidae*	5		
Black Flies	*Simuliidae*	5		
Freshwater Shrimps	*Atyidae*	5		
Freshwater Snails	*Gatropoda*	5		
Isopods	*Isopoda*	5		
Scuds/Side Swimmers	*Amphipoda*	5		
Water Scorpions	*Nepidae*	5		
Waterfleas	*Clad`ocera*	5		
Whirligig Beetle Adult	*Gyrinidae*	5		
Whirligig Beetle Larvae	*Gyrinidae*	5		
Backswimmers	*Notonectidae*	4		
Copepods	*Copepoda*	4		
Freshwater Mussels	*Bivalva*	4		
Hydras	*Hydridae*	4		
Leeches	*Hirudinea*	4		
Scavenger Beetle - Adult	*Hydrophilidae*	4		
Scavenger Beetle - Larvae	*Hydrophilidae*	4		
Seed Shrimps	*Ostracode*	4		
Water Striders	*Gerridae*	4		
Watermites	*Acarina*	4		
Flatworms	*Turbellaria*	3		
Mosquitos	*Culicidae*	3		
Non-Biting Midges	*Chironomidae*	3		
Predacious Diving Beetle - Adult	*Dyticidae*	3		
Predacious Diving Beetle - Larvae	*Dyticidae*	3		
Water Boatman	*Corixidae*	3		
Round Worms	*Nematoda*	1		
Segmented Worms	*Oligochaeta*	1		
Soldier Flies	*Stratiomyidae*	2		
Springtails	*Collembola*	2		
Others				
A *Write the number of different taxa groups found at your site here* ⇒			A =	B =

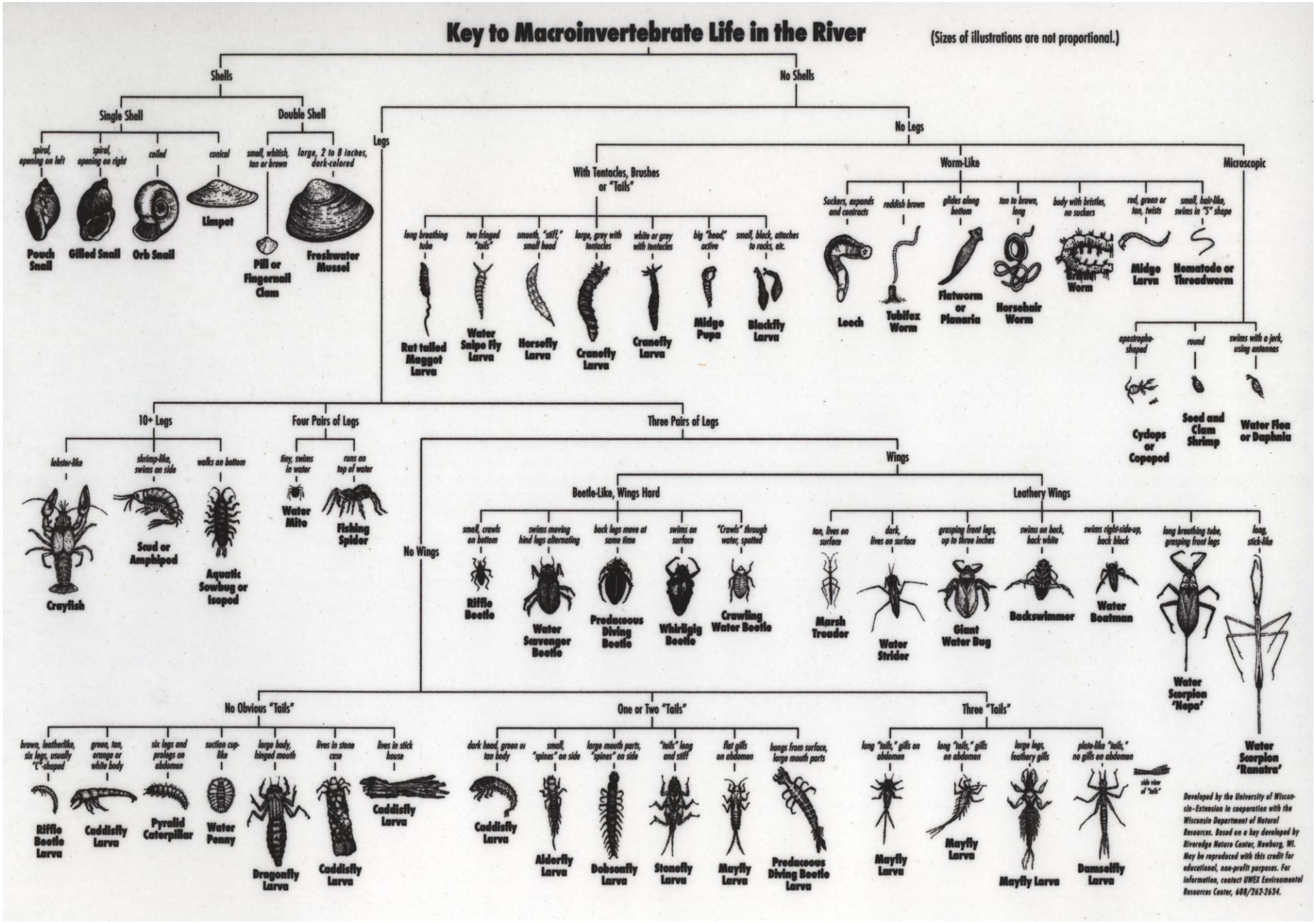
Your Signal 2 index score ⇒ *Signal 2 index Score* = B / A		B *Write the sum of sensitivity scores here* ⇑

Signal 2 score: *circle the answer for your site*

> 6 = Healthy	5 - 6 = Mildly polluted	4 – 5 = Moderately polluted	< 4 = severely polluted

Key to Macroinvertebrate Life in the River

(Sizes of illustrations are not proportional.)

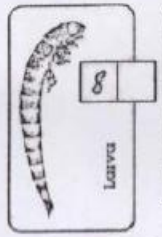


Aquatic Macroinvertebrate Identification Key

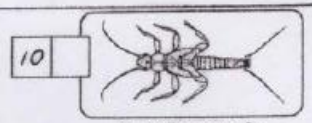
Here are the most common aquatic invertebrates that may be found in Queensland. Tick the spaces next to the numbers to keep a record of which macroinvertebrates you have found in your samples. If you have collected more than one sample, photocopy both sides of this sheet.

The numbers indicate the sensitivity of the macroinvertebrate; the higher the number, the more sensitive to pollution. Use the Record Sheet over to determine the health of your sites.

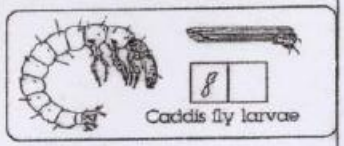
Very Sensitive



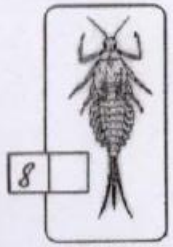
Riffle beetle



Stonefly nymph

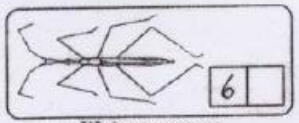


Caddis fly larvae



Mayfly nymph

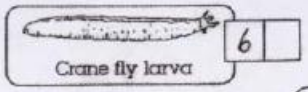
Sensitive



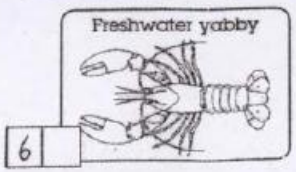
Water measurer

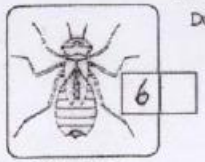
Freshwater crab

Damselfly larva



Crane fly larva



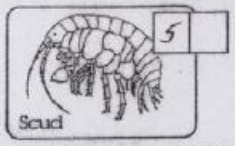


Dragonfly larva

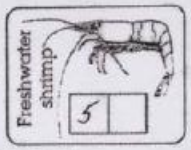
Tolerant

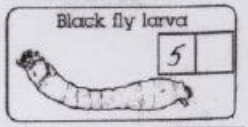
Water scorpion

Water flea



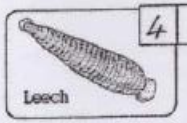
Scud



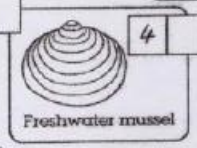


Black fly larva

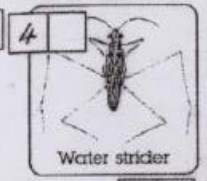
Copepod



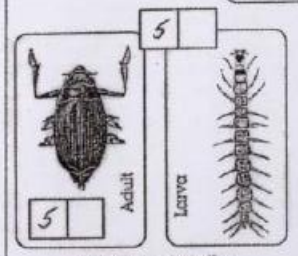
Leech



Freshwater mussel

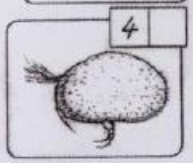


Water strider

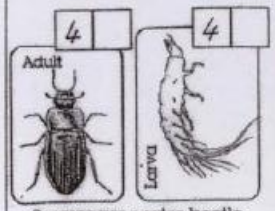


Whirligig beetle

Freshwater snail



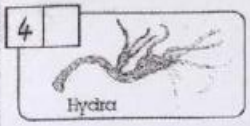
Seed shrimp



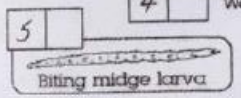
Scavenger water beetle

Back swimmer

Water mite

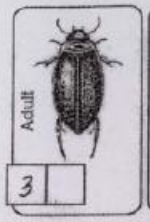


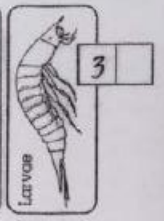
Hydra



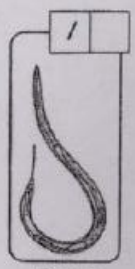
Biting midge larva

Very Tolerant



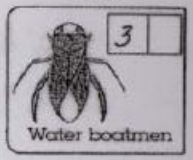


Predacious diving beetle



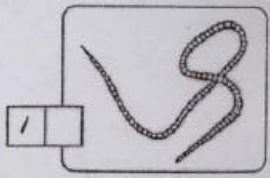
Round worm

Mosquito larvae

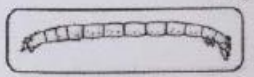


Water boatmen

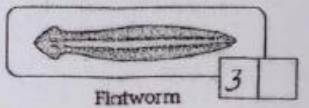
Springtail



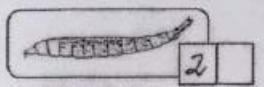
Segmented worm



Non-biting midge larva



Flatworm



Soldierfly larva

WATERWATCH Queensland

Queensland Government

WATERWATCH South Australia

Adapted by Waterwatch Queensland

CATCHMENTS

TEACHER RESOURCE BOOKLET

Image: Jeff Wright, © QM.

Giant Water Bug, *Lethocercus insulanus*

Image: Jeff Wright. © QM.

Water Scorpion, *Laccotrophes sp.*

Image: Steve Wilson, © QM

Eastern Water Dragon, *Physignathus lesueerii*

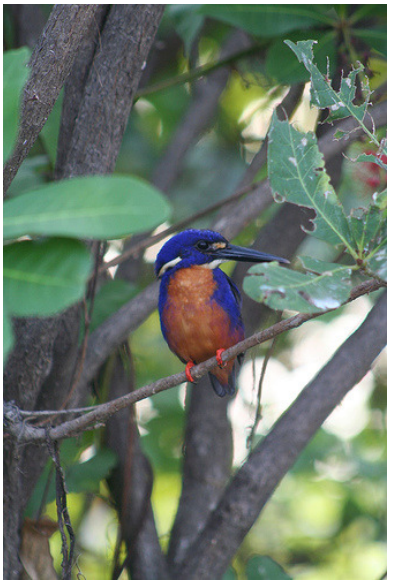


Image: Stephen Barnett, Creative Commons, BY.

Azure Kingfisher, *Alcedo azurea*

Image: teejaybee, Creative Commons, BY, NC, ND.

Broad-palmed Rocket Frog, *Litoria latopalmata*

Image: kookr, Creative Commons, BY, NC.

Wandering Percher Dragonfly, *Diplacodes bipunctata*

CATCHMENTS WATERWAY NASTIES

Weeds are a major threat to protected bushland and waterways. They spread quickly, blocking sunlight from native plants and reducing the food and shelter available for wildlife. Aquatic weeds block waterways, increasing risks of flooding. They obstruct recreational access, provide breeding grounds for mosquitoes, pollute the water, and kill native fauna.

Flora foliage and fruit specimens of aquatic weeds included in this kit are:

BROAD-LEAFED PEPPER TREE (*Schinus terebinthifolia*)
This tree infests coastal wetlands, watercourses and other low-lying areas. Its fruit is highly toxic to humans, birds and mammals.

CAMPHOR LAUREL (*Cinnamomum camphora*)
These trees form dense masses along waterways replacing native blue gums, a favoured food of the koala. The fruit is toxic to native pigeons.

CAT'S-CLAW CREEPER (*Macfadyena unguis-cati)*
This woody vine grows aggressively and smothers other vegetation. It covers tree trunks and threatens riparian and rainforest habitats.

CHINESE ELM (*Celtis sinensis*)
This fast-growing species forms dense pockets along creek banks and competes with native riparian vegetation. Leaves that drop into the water affect water quality. Its seeds are spread by birds, flying foxes and water.

MADEIRA VINE (*Anredera cordifolia*)
This weed invades riparian areas and tall open forests smothering native trees. It reproduces by knobby tubers that grow along the stem.

OCHNA (*Ochna serrulata*)
Ochna is a hardy shrub with fine-toothed and wavy leaves. Birds spread the seeds to native bushland where the plant forms dense thickets that smother and displace native species. Ochna is a Class 4 Noxious Weed.

SALVINIA (*Salvinia molesta*)
This highly invasive aquatic fern was introduced from Brazil and is now commonly found along waterways. Its fast growth rate means it forms thick mats covering lakes, slow-moving rivers and other waterways.

SINGAPORE DAISY (*Sphagneticola trilobata)*
This plant is a vigorous ground cover and out-competes native species. It has been declared a Class 3 plant pest under Queensland legislation.

WATER HYACINTH (*Eichhornia crassipes*)
This floating water weed is a Class 2 plant pest. It is one of the world's worst aquatic weeds clogging waterways, limiting transport, reducing dissolved oxygen and providing breeding grounds for mosquitoes.

CATCHMENTS RIPARIAN VEGETATION

Riparian vegetation covers the land immediately alongside creeks, rivers and lakes, including the land up to 30m back from the waterway. It plays a key role in ecosystems by maintaining bank stability and controlling riverbed erosion which can be directly linked to water quality. These plants reduce the amount of sediment and pollutants entering the stream by stabilising the river bank.

Examples of riparian vegetation included in this kit are:

WEEPING BOTTLEBRUSH (*Callistemon viminalis*)

This is a weeping, small to medium-sized tree with light green foliage and sprays of bright red bottlebrush flowers in spring and summer. Many different varieties have been developed from this species which grows naturally along watercourses.

CREEK SANDPAPER FIG (*Ficus coronata*)

This tree grows along creeks in subtropical and dry rainforest habitats. The leaves feel like sandpaper, hence its name. The fruit is edible when fully ripe but the furry skin should be removed first.

HARD QUANDONG (*Elaeocarpus obovatus*)

This medium to large tree is found in subtropical, dry and rainforest areas of Queensland. The fruit is blue and attractive to birds, such as silvereyes. After eating the flesh, some Aboriginal groups make necklaces out of the seeds.

WEEPING MYRTLE (*Syzygium floribundum*)

This is the dominant species along the creek banks in Enoggera in Brisbane. It forms a beautiful canopy, produces deep shade and its roots stabile creek banks.

MAT RUSH- spiny-headed (*Lomandra longifolia*)

Mat rush can grow in a range of sandy soils, in swamps, along the banks of creeks, rocky hillsides and in open forests. It is drought-tolerant but can also withstand occasional flooding. Some Aboriginal groups eat the base of the leaves as well as using the leaves to make strong nets and baskets,.

RIVER SHE-OAK (*Casuarina cunninghamiana*)

This she-oak is a large and fast-growing tree with dark green foliage. It occurs naturally along watercourses and is often used in park and embankment plantings. These trees attract a wide range of bird species.

RIVER TEA TREE (*Melaleuca bracteata*)

This is a fast-growing tea-tree of drier watercourses and may dominate stream-side vegetation. It has grey furrowed bark and fine, dark green foliage.

CATCHMENTS

AQUATIC MACRO-INVERTEBRATES

An invertebrate is an animal that does not have a backbone. Macro-invertebrates are animals that can be seen with the naked eye. That is, a microscope is not needed to see them.

Some examples of macro-invertebrates include insects, worms, snails, crayfish and spiders. The larval stages of many insects are found in creeks, rivers and streams. The type of these animals found in waterways gives an indication of water quality. Some larvae are sensitive which means they are found only in areas with good to excellent water condition. Others are more tolerant of pollutants and so can be found in poorer quality water.

Some examples of animals that can be found in local waterways are given below with an indication of the quality of the water that they require.

Water Quality Rating	Examples of Macro-Invertebrates
Excellent	<u>Very Sensitive animals:</u> Stonefly nymphs Mayfly nymphs Freshwater shrimps
Good	<u>Sensitive animals:</u> Mussels Freshwater prawns Freshwater crayfish Dragonfly nymphs Damsel fly nymphs Caddis fly nymphs Water mites
Fair	<u>Tolerant animals:</u> Beetles True bugs Leeches Freshwater snails Flatworms
Poor	<u>Very Tolerant animals:</u> Black fly larvae Mosquito larvae Fly larvae Non-biting midges Freshwater worms

CATCHMENTS

USEFUL WEBLINKS

- ***Water bug & riparian vegetation snapshot*** (PDF, 370 kB)
  http://www.qld.waterwatch.org.au/resources/pdf/bug_id_parta.pdf

- ***Water bug identification booklet*** (PDF, 1.04 MB) — Guide to Identifying Macro-invertebrates. This booklet has been taken from the *Queensland community waterway monitoring manual.*
  http://www.qld.waterwatch.org.au/resources/pdf/bug_id_partb_web.pdf

- ***Record sheet – basic level*** (PDF, 108 kB) — Use this sheet to record which water bugs have been found in the waterway you are monitoring. It also includes a simple method for deciding how polluted the waterway is.
  http://www.qld.waterwatch.org.au/resources/pdf/bug_id_record_sheet_basic.pdf

- ***Queensland community waterway monitoring manual*** (2007)
  http://www.qld.waterwatch.org.au/

- ***Health and safety guidelines for community-based waterway monitoring*** (2006)
  http://www.qld.waterwatch.org.au/

- ***Fun Activities-*** *Help Freckles the Frog Now!*
  http://www.qld.waterwatch.org.au/

- ***Waterwatch Queensland community estuarine monitoring manual*** (2005)
  http://www.qld.waterwatch.org.au/resources/monitoring_tools.html#monitoring_manual

- ***Waterwatch Queensland stream quality slide*** (2006)
  http://www.qld.waterwatch.org.au/resources/monitoring_tools.html#monitoring_manual

- **Background Information**
  http://www.nrw.qld.gov.au/education/teachers/catchment/background.html

- **Activities**
  http://www.nrw.qld.gov.au/education/teachers/catchment/activities.html