

# Biodiversity Study Field Trip

This activity allows students to compare different ecosystems using a formalised method, either over time or in one field trip. It can also be used to highlight pest plant invasions, or the differences between healthy and degraded ecosystems.

## Materials

- *Biodiversity Study Record Sheet*, page 60
- *Canopy Density Chart*, page 62
- Measuring tape
- Calculators
- Pens
- Measuring tape
- Small trowel
- 2 lt water bottle
- Local plant identification books

## Learning methodology

1. Students should be familiar with the concepts of different ecosystem/habitats types, e.g. forests, heath lands.
2. Students should recognise the differences between shrubs, trees and grasses.
3. Students should understand the differences between living and non living components of ecosystems.
4. Contrasting ecosystems could be used for comparison, such as heath and forest, coast and grassland, or similar ecosystems with differing levels of health.
5. Identify two contrasting ecosystems to study. This could include two different sites near the school or involve a field trip to compare very different ecosystems.
6. Mark out a 10 m transect at both sites and complete the Biodiversity Study Record Sheet.

## Extension activities

- Ecosystem Research Project

Note: Canopy Density Charts can be printed and laminated for re-use.

# Biodiversity Study Record Sheet

## Trees

The canopy cover is measured by the amount of sky that is seen from below the highest tree level (canopy) for every meter along your transect. Use the Canopy Density Chart to determine the % cover. Can you name the dominant tree? e.g. Snow Gum.

Dominant tree species: \_\_\_\_\_

### How many different types of trees are in each metre?

Complete the table for each site you visit.

		0-1 m	1-2 m	2-3 m	3-4 m	4-5 m	5-6 m	6-7 m	7-8 m	8-9 m	9-10 m
Site 1	% cover										
	No. of species										
Site 2	% cover										
	No. of species										

## Shrubs

### How many different types of shrubs?

Complete the table for each site you visit.

		0-1 m	1-2 m	2-3 m	3-4 m	4-5 m	5-6 m	6-7 m	7-8 m	8-9 m	9-10 m
Site 1	% cover										
	No. of species										
Site 2	% cover										
	No. of species										

## Ground cover

### How many different types of grasses, herbs and plants?

Complete the table for each site you visit.

		0-1 m	1-2 m	2-3 m	3-4 m	4-5 m	5-6 m	6-7 m	7-8 m	8-9 m	9-10 m
Site 1	% cover										
	No. of species										
Site 2	% cover										
	No. of species										

# Biodiversity Study Record Sheet

## Site characteristics

**Soil:** Use a small trowel to scrape away the leaf litter and dig down 10 cm.

Write a brief description of your soil.

Pour water onto the soil and record how long it takes to soak into the soil.

	Leaf Litter	Colour	Time	Sandy/clayey
Site 1				
Site 2				

**Animals:** Look to see evidence of large animals (macrofauna), i.e. dropping and tracks.

Can you see or hear birds?

Look to see evidence of small animals (microfauna), i.e. ants, beetles, spiders and flying insects.

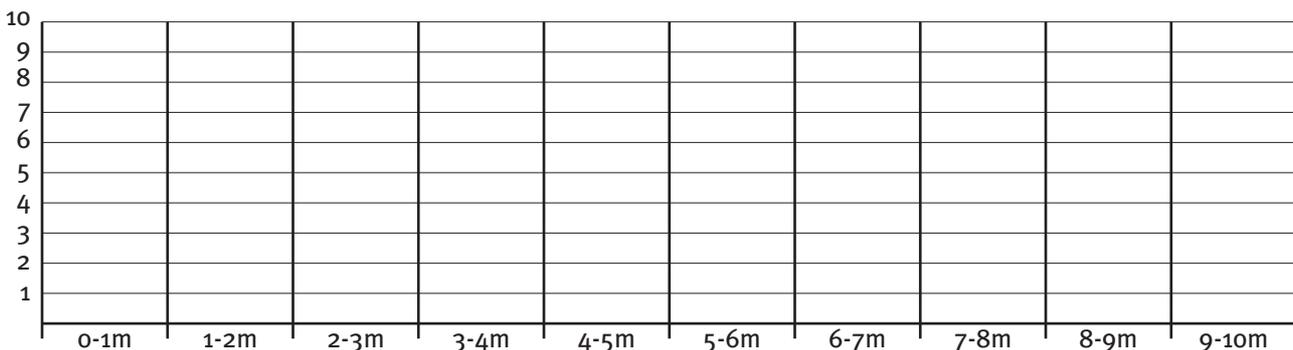
	Macrofauna	Microfauna	Birds
Site 1			
Site 2			

## Comparing biodiversity

Using the data collected you can compare your ecosystems easily.

Using 6 different colours, prepare a bar graph of the data,

e.g. Trees site 1 yellow, trees site 2 blue, shrubs site 1 green, shrubs site 2 orange.



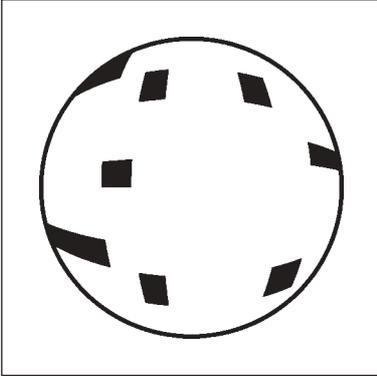
## Ecosystem study questions

1. Which site had the highest number of different plant species?
2. Which site had the highest number of different animal species?
3. Therefore, which site had the greater biodiversity?
4. Which site had the highest % canopy cover? How might this affect ground temperature?
5. What was the difference between the soil at the two sites?  
How might this relate to the type of ecosystem you saw?
6. What other differences did you notice between the sites? Can you suggest reasons for this?

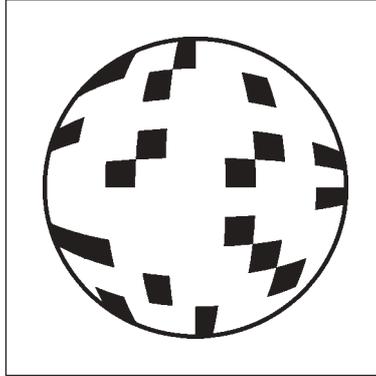
# Biodiversity Study Record Sheet

## - Canopy Density Chart

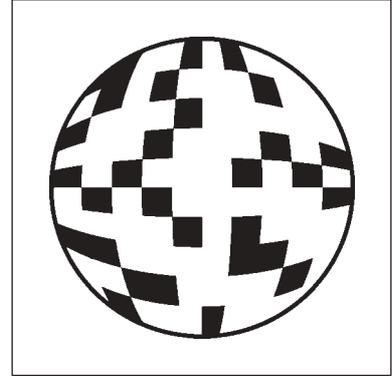
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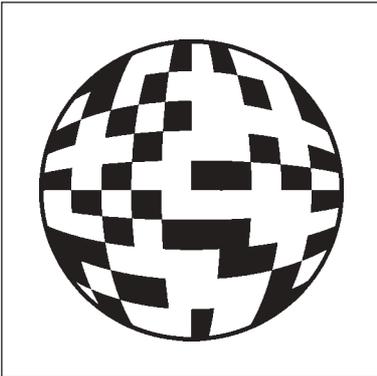
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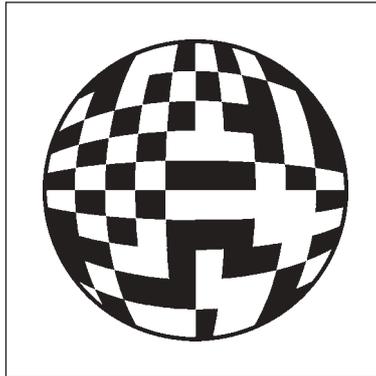
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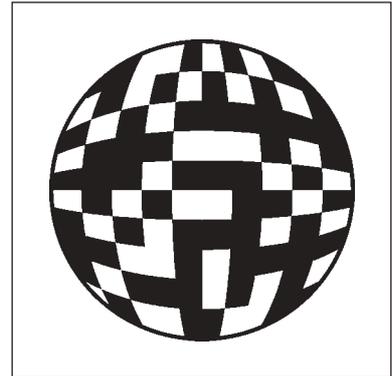
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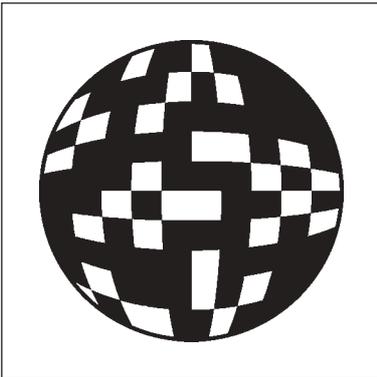
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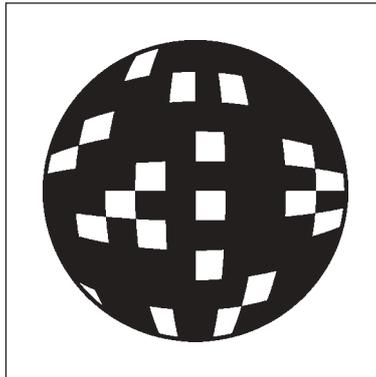
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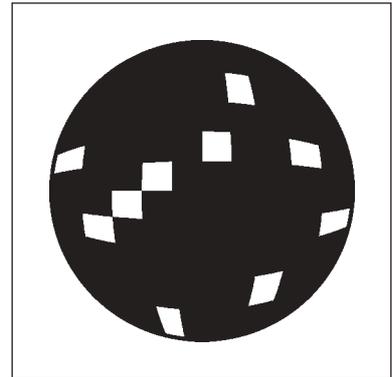
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80% COVER



90% COVER



# Ecosystem Research Project

To enhance a students concepts of biodiversity and the activities that lead to a reduction in biodiversity.

## Materials

- Poster paper
- Access to the Internet
- Access to the School library

## Learning methodology

1. Students should be introduced to the concepts of ecosystems and the feeding relationships between organisms.
2. Projects should be undertaken in teams to enhance information sharing and ideas.

### Biodiversity research project ideas

- Make a poster of an ecosystem you have studied.
  - Look at the biodiversity of a coastal bush land area near you. Put together an information sheet on coastal plants.
  - Make a poster to inform home gardeners how they can attract birds and butterflies to their gardens.
  - Create a wetland walk map of your favourite wetland with five stops along the way, highlighting the biodiversity hot spots.
  - Create a forest walk map of your favourite reserve with five stops along the way, highlighting the biodiversity hot spots.
  - Create a 10 point checklist for farmers to measure the biodiversity on their farms.
  - Prepare a radio interview with a Park Ranger about a local National Park.
3. Each project should contain information on these questions:
    - What is biodiversity?
    - What are the benefits of biodiversity?
    - What are the consequences of reduced biodiversity in Gippsland?
    - What are the main threats to biodiversity in Gippsland?
    - What can we do to help protect biodiversity?

## Extension activities

- Undertake all or part of the Biodiversity Study Field Trip on page 59.
- Research one of Gippsland's threatened species. Action statements can be found on the Department of Sustainability and Environment's website [www.dse.vic.gov.au](http://www.dse.vic.gov.au) by following this path – DSE Home → Plants and Animals → Native Plants and Animals → Threatened Species & Communities → Action Statements

# Pest Research Project

To gain a greater understanding of how pest plants and animals impact upon the biodiversity of a region.

## Materials

- Poster paper
- Overhead transparencies
- Overhead pens
- Landcare notes from [www.dpi.vic.gov.au/notes](http://www.dpi.vic.gov.au/notes)

## Learning methodology

1. Using the Pest Plant and Animal Information Sheet, introduce the concepts of how pests impact on biodiversity.
2. Ask students to brainstorm plants and animals that are considered pests, writing the names up on the whiteboard.
3. Students working in pairs should research the answers to the following questions:
  - a. What is the scientific name for the pest?
  - b. When was it introduced to Australia? Why?
  - c. Where did it originally come from?
  - d. What is its role in the ecosystem, e.g. producer?
  - e. What is its diet (animal)? What is its distribution (plant)?
  - f. Where does it live (animal)? How does it reproduce and disperse (plant)?
  - g. Why is it considered a pest?
  - h. What is the community doing to control the pest?
4. Primary school students can display this information as a poster. Perhaps a guest speaker from Landcare could judge the posters.
5. Secondary school students could be encouraged to prepare this information as an oral presentation to the class.

## Questions

1. Ask students to choose an animal or plant from another country and describe the impacts that may occur if it became naturalised in Gippsland, e.g. piranhas in the Latrobe River.

## Extension activities

- Organise a guest speaker from DSE, DPI or a Landcare facilitator.
- Find out if there are any pest plants or animals living in the school ground using a suitable reference book.

# Seed Raising After Fire

Wattle seeds have a very hard seed coat that has to be split before the seed can absorb water and germinate. The aim of this activity is to investigate the effect of heat on wattle and grass seeds by comparing the rates of germination.

## Materials

- 10 grass seeds and 10 wattle (Acacia) seeds per group
- Containers that will hold boiling water (e.g. beakers or mugs)
- Boiling Water
- Fine sieve
- Seed raising mix
- Plastic labels
- Permanent marker
- Seedling trays or egg cartons

## Learning methodology

1. Each group will require 10 seeds of each species.
2. Place five wattle seeds and five grass seeds per group into two separate containers. The remaining 10 keep to the side.
3. Pour freshly boiled water onto the seeds, allow to sit for 15-20 minutes, then pour into a fine sieve and rinse with cold water.
4. While the seeds are heating each group will need to prepare 4 labels with the following: heated grass; unheated grass; heated wattle; unheated wattle.
5. Fill seedling trays or egg cartons with seed raising mix and place labels in trays.
6. Shallowly plant all seeds making sure the different species and treatments are kept separate and labeled.
7. Keep moist.
8. After 3 days check for signs of germination, then observe daily, recording how many seedlings germinate from each group in a results table.

## Example results table

Date	Number of seedlings to germinate			
	Grass	Grass heated	Wattle	Wattle heated

## Questions

1. What are the differences between wattle seeds and grass seeds?
2. Which one is more susceptible to heat? Why?
3. What other ways can plants protect themselves from fire?

# Macroinvertebrate Study

This traditional Waterwatch activity aims to highlight the diversity of macroinvertebrates. Students use simple sampling techniques to collect macroinvertebrates. Species are identified using a visual key and water quality is determined from species diversity and numbers. This activity is best undertaken with a Waterwatch facilitator.

## Materials

- *Macroinvertebrate Key*, page 67
- *Macroinvertebrate Data Sheet*, page 68
- Sampling net
- Tweezers
- White plastic tray
- Ice cube trays
- Magnifying glass to help with identification

## Learning methodology

### Kick sampling for fast moving water

Kick sampling gently disturbs the organisms living in or on the rocky bottom and enables the current to push them into the net.

1. Select a shallow fast-moving section of river approximately 10–30 cm deep with stones that are 6–7 cm or larger.
2. Place the sampling net downstream so that the current flows through it, ensuring the bottom of the net fits snugly against the streambed. Try not to allow any water to flow over the top of the screen as organisms can flow past.
3. Using a helper disturb the stream-bed for a distance of 1 metre upstream of the sampling net by vigorously kicking the mud and stones around your feet for a couple of minutes. The water current will sweep dislodged invertebrates into the net.
4. When lifting the net from the water, move it upstream to prevent any insects from escaping.
5. Gently empty its contents into a white tray for identifying and counting.
6. Rinse the net back in the river or stream so that all the animals and debris are removed before taking another sample.

### Sweep sampling for vegetated edges and still water

This technique is best used to sample the organisms living in and around the vegetation and/or edges of water sources. Generally the sample length is determined by multiplying the width of the stream at its widest point by ten, i.e. if your stream is one metre wide, sample no more than 10 m of stream-bank length.

1. Using your net, actively sweep the water around the banks, sweeping through any vegetation. You can walk along the stream-bank and scrape the surface of tree roots, gravel, piles of leaves and other debris with the sampling net. Dip the net into the bottom while scooping it forward, disturbing about the first 10 cm of bottom material. Continue the forward motion to lift up the net. Allow the water to drain and sort the sample. If this collects too much debris and leaves, an alternative would be to sweep the net back and forth over leaf packs, dislodging animals and some leaves, which would then be swept into the net.
2. To avoid collecting a sampling net full of mud, water can be poured through to wash out fine silts before emptying the contents into the tray for identification.
3. Gently empty its contents into a white tray for identifying and counting.
4. Rinse the net so that all the animals and debris are removed before taking another sample.

### For both sampling types

1. Sort for 30 minutes and transfer macroinvertebrates into an ice cube tray.
2. Use the key to identify the species.
3. Refer to instructions on the Macroinvertebrate Data Sheet to determine the stream condition.



# Macroinvertebrate Data Sheet

Group name: \_\_\_\_\_ Group size: \_\_\_\_\_

Survey site: \_\_\_\_\_ Date sampled: \_\_\_\_\_

	Column 1	Column 2
Macroinvertebrate name	Value	Number found
<b>Very sensitive macroinvertebrates</b>		
Stonefly larvae	8	
Mayfly nymph	7	
Caddisfly larvae	7	
<b>Sensitive macroinvertebrates</b>		
Toe-biters/Dobsonflies/Alderflies (Megaloptera)	6	
Damselfly larvae	6	
Dragon fly larvae	6	
Freshwater mussel	5	
Aquatic caterpillars (Lepidoptera)	5	
Freshwater shrimp/prawns	5	
Water mite	5	
Freshwater slater	5	
<b>Tolerant macroinvertebrates</b>		
Hydra	4	
Beetle larvae	4	
True bugs (Backswimmer, water scorpion, water boatman, lesser water strider, water strider/treader)	4	
Freshwater sandhopper (amphipod)	4	
Beetles (Dytiscid beetles, whirligig beetles)	3	
Nematodes	3	
Leech	3	
Freshwater snails	3	
Flatworm	3	
<b>Very tolerant macroinvertebrates</b>		
Mosquito larvae	2	
Midge larvae	2	
Fly larvae	2	
Freshwater segmented worms	1	
Bloodworms	1	
<b>Total</b>		

Sample type (tick):

Edge  Riffle

## Instructions to determine stream quality

Record in column 2 the number of each macroinvertebrates found.

Circle the value for macroinvertebrates found, and add up the circled values and write in the totals box.

Note: These value indicate the sensitivity of each macroinvertebrate.

### Stream condition chart

Use the total of column 2 to find the abundance category. Use the scale on the side of the stream condition chart to rate the abundance category (0-5).

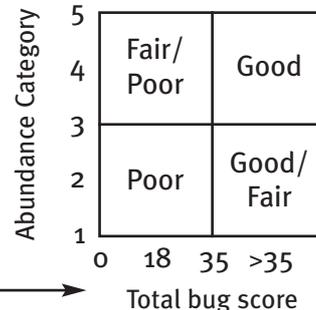
Use the total of column 1 to determine your total bug score on the bottom axis of the stream condition chart.

e.g. a sample with an abundance category of 4 and a total bug score of 40 will have a rating of 'Good'.

### Overall abundance Category

No. of animals	Category
0-30	1
31-100	2
101-200	3
201-500	4
>500	5

### Stream condition chart



# Food Webs Level 4

This activity uses cards depicting species that are common to our wetlands and waterways. The cards can be used to explain the concepts of food chains, including producers and consumers, predators and prey. They also contain information on biological classification for Level 5. The cards can be used in many ways, and the following list is not exhaustive.

## Materials

- *Species Cards*, page 71 (photocopied both sides)
- Ball of coloured string or wool
- Safety pins
- Blue tack
- Whiteboard markers or chalk
- Pens
- Papers

## Learning methodology

### Level 4 Food Web Methodology

1. Give each student a species card to hang around their neck or pin to their shirt.
2. Students should form a circle.
3. Choose a student to act as the 'food chain linker' to pass the ball of string around the group.
4. To start the exercise, ask a student to suggest the next link to their species card, i.e. What eats the frog? What does the mayfly eat? etc...
5. As a relationship is formed, the string is passed to that student. They then need to work out what forms the next link to their species card and so on...
6. Students will need to hold the string loosely in their hand so it can move freely throughout the group.
7. Eventually the chain will create a web of relationships (food web) throughout the circle, e.g. frog eats insect, insect eats plant, fish eats plant, bird eats fish.

### Level 4 Who Am I Methodology

1. Students work in pairs. Each has a set of cards printed back to back.
2. Each student selects one card from the pack and take it in turns to guess each others card.
3. 'Yes' and 'no' questions such as 'Am I a plant?', and 'Have I got six legs?' can be used to eliminate cards and guess who they are.

## Other ideas

- Students can take the cards water watching and mark off the organisms they see
- Younger students can use the cards to colour in

## Extension activities

- Contact your local Waterwatch coordinator to organise a macroinvertebrates sampling activity
- Ask students to create their own organism cards and add new species to the food chain

# Food Webs Level 5

These activities use cards depicting species that are common to our wetlands and waterways. The cards can be used to explain the concepts of food chains, including producers and consumers, predators and prey. They also contain information on biological classification for Level 5. The cards can be used in many ways, and the following list is not exhaustive.

## Materials

- *Species Cards*, page 71 (photocopied both sides)
- Ball of coloured string or wool
- Pens
- Papers

## Learning methodology

### Level 5 Food Web Methodology

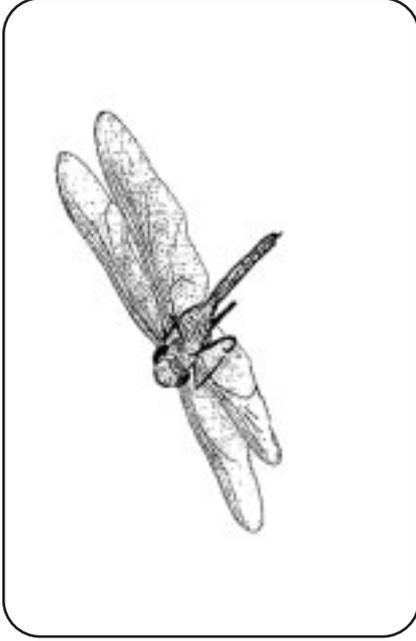
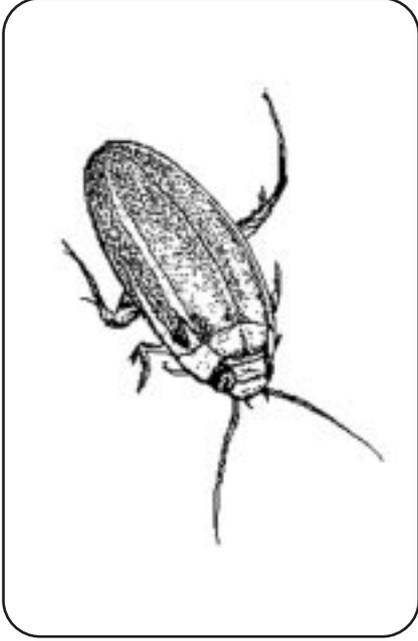
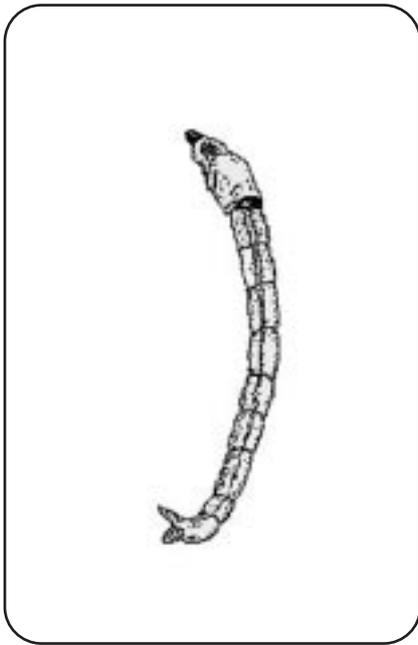
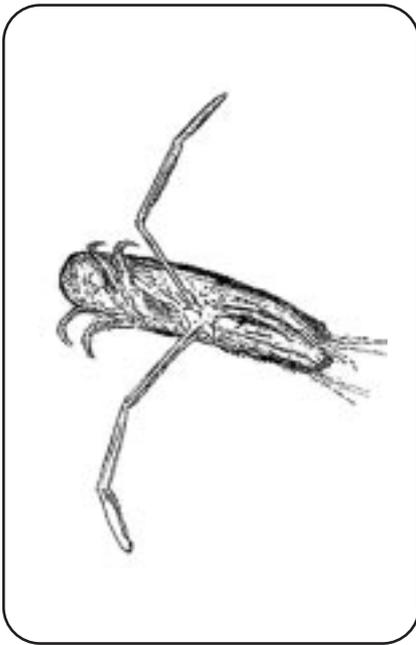
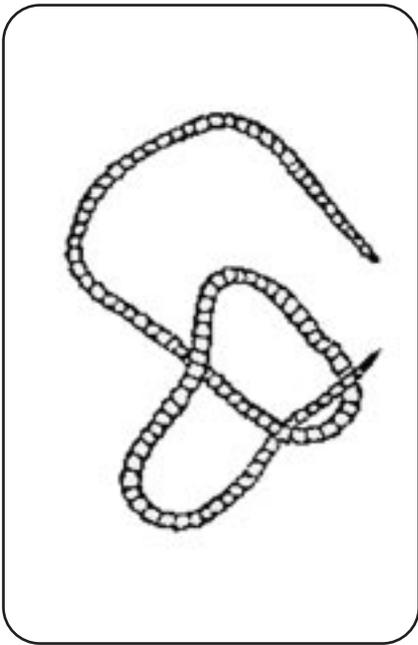
1. Students are asked to make a food web out of the cards by working in groups to determine the characteristics of the organism and its relationship between others in the food web
2. Coloured string can be used to show the food web.
3. When this is completed, ask students to remove all the very sensitive water organisms in their food web and rebuild it. Repeat with the sensitive, tolerant and very tolerant.
4. Students report on the changes as the different organisms are removed from the food chain.
5. Introduce the concept of pest species such as carp or water hyacinth. How would they impact on the food chain?

### Level 5 Classifying Organisms

1. Groups of four students are given a set of species cards.
2. They are asked to read the biological classification of their organisms and sort them into groups.
3. Each group should be given a different criteria, e.g. biological classification, habitat, diet, trophic level, etc.
4. Each group presents their classification system to the class.
5. Students then discuss the pro's and con's of each sorting criteria.

## Extension activities

- Contact your local Waterwatch coordinator to organise a macroinvertebrates sampling activity
- Ask students to create their own organism cards and add new species to the food chain



### **Bloodworm**

*Phylum:* Annelida

*Class:* Oligochaeta

*Order:* Diptera

*Family:* Chironomidae

*Size:* 20 mm long

*Water quality tolerance:* Very tolerant; can withstand low oxygen levels.

*Description:* Bright red in colour (extra iron), which helps them to breath when the water has low oxygen levels.

*Habitat:* They make burrows or tubes in bottom sediments.

*Functional groups:* Detritores and herbivores, filter-feeders.

*Food web:* Mainly feed on algae or plant detritus. Eaten by fish, water beetles, bugs, spiders, and frogs.

*Behavior:* May be attached to underside of the water surface, or at bottom of stagnant pools. Swims quickly with looping movements.

### **Backswimmer**

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Hemiptera

*Family:* Notonectidae; Six genera

*Size:* Up to 15 mm

*Water quality tolerance:* Tolerant.

*Description:* Have large eyes and a long body. Underside may be coloured in blues or whites. Easily recognised by their backward swimming motion.

*Habitat:* Slow moving water in ponds, dams, lakes, and streams. They do not require permanent water.

*Functional groups:* Carnivores, predators, piercers and suckers.

*Food Web:* Eats mosquito and fly larvae, small insects, tadpoles and small fish. Eaten by fish, larger insects, birds.

*Behavior:* Need to come to the surface to breathe air. Can give a nasty bite especially if handled.

### **Aquatic Earthworm**

*Phylum:* Annelida

*Class:* Oligochaeta

*Size:* 1–30 mm

*Water quality tolerance:* Very tolerant

*Description:* Segmented; usually coloured red or brown; they may have stiff needle-like structures located on the top and bottom of each of the body segments.

*Habitat:* Found in virtually all water bodies. Often found under rocks.

*Functional groups:* Detritores.

*Food web:* Feeds on small pieces of dead and decomposing plants and animals. Eaten by fish, birds, frogs and reptiles.

*Behaviour:* Can suck in mud to extract detritus for food.

### **Damselfly Nymph**

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Odonata (Zygoptera)

*Family:* 11 Families, 107 species

*Size:* Up to 35 mm (including gills)

*Water quality tolerance:* Sensitive

*Description:* Many bright colours, with long slender bodies with 3 leaf-like tails that act as gills. Has claws to hold onto rocks and plants.

*Habitat:* Often found amongst reeds near the edges of slow rivers, swamps lakes and creeks, but can be found in fast moving streams.

*Functional groups:* Predators

*Food web:* Eat small aquatic creatures such as worms, small fish, shrimps and tadpoles. Eaten by larger fish, frogs, reptiles and birds.

*Behaviour:* Adults are similar to dragonflies except wings fold back.

### **Cumbugi (Bull rush)**

*Phylum:* Anthophyta

*Class:* Liliopsida (Monocotyledons)

*Order:* Typhales

*Family:* Typhaceae

*Species:* Typha orientalis

*Size:* Grows to 4 m tall

*Description:* Perennial with tall, narrow flat leaves with large brown cylindrical flower heads, each with tightly packed flowers in a spike. Each flower head produces vast numbers of seeds.

*Habitat:* Common in shallow inland lakes and swamps around water margins. It often establishes if water levels change, and flourishes in nutrient rich water.

*Functional groups:* Emergent

*Food web:* Leaves are eaten by birds and animals, roots are edible.

*Features:* Dense clumps provide excellent shelter for invertebrates, reptiles, amphibians and waterbirds.

### **Caddisfly Larvae**

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Trichoptera

*Family:* 26 families; 479 species

*Size:* 2–40 mm

*Water quality tolerance:* Sensitive

*Description:* Segmented, 3 pairs of tiny legs. Often hidden inside twig-like case.

*Habitat:* May live in the sediment, or anchored on rocks, branches and among algae and plants in quiet water.

*Functional groups:* Herbivores, detritores. Scrapers, shredders or collector-filterers.

*Food web:* Some scrape algae from the surface of rocks. Others chew live or dead plants. Eaten by dragonfly nymphs, frogs and fish.

*Behaviour:* Some build a protective case out of sand, algae, plant material, silt, silk or anything from their habitat. Often they seem to be swimming sticks.

### **Duckweed**

*Phylum:* Anthophyta

*Class:* Liliopsida (Monocotyledons)

*Order:* Arales

*Family:* Lemnaceae

*Species:* Lemna disperma

*Size:* Individuals up to 25 mm wide.

*Description:* Free-floating, parts of plant are below water surface, often forming large groups or mats of interconnected plants. Has small oval fronds, each with a single root extending into the water. No stems.

*Habitat:* Found in slow moving or still water in swamps, rivers and lakes. Tolerant of brackish water.

*Functional groups:* Free-floating.

*Food web:* Eaten by waterbirds such as ducks and grebes.

*Features:* Often significant in stagnant water. Provides shelter and habitat for invertebrates and fish.

### **Dragonfly**

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Odonata (Anisoptera)

*Family:* 6 families, 198 species

*Size:* Up to 50 mm

*Water quality tolerance:* Sensitive

*Description:* Dragonflies occur in most colours and have four permanently extended wings. Larvae have stout bodies with six legs and large eyes on the side of their heads.

*Habitat:* Common around clean fresh water habitats. The larvae live under stones and amongst bark, branches and reeds in slow flowing pools.

*Functional groups:* Predators.

*Food web:* Efficient hunters, feeding on midges and small insects. Larvae feed on insects and crustaceans. Eaten by fish, frogs, reptiles and birds.

*Behaviour:* Larvae are called mudeyes.

### **Diving Beetle**

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Coleoptera (Beetle)

*Family:* Dytiscidae; over 185 species

*Size:* 3–40 mm long

*Water quality tolerance:* Tolerant

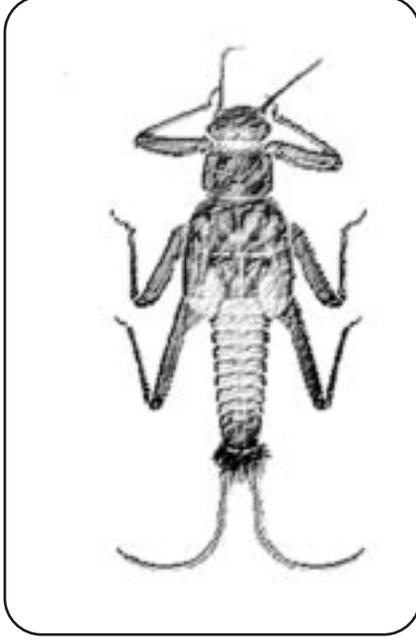
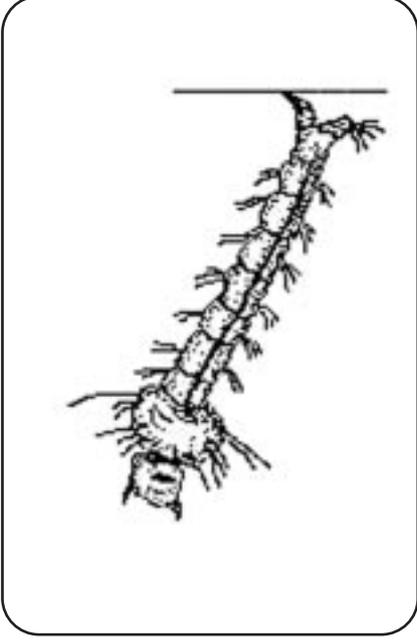
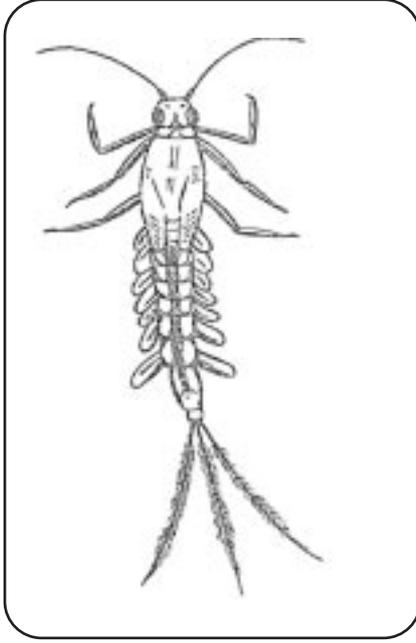
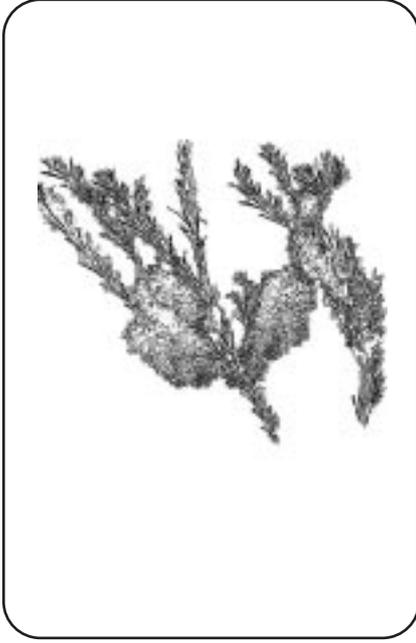
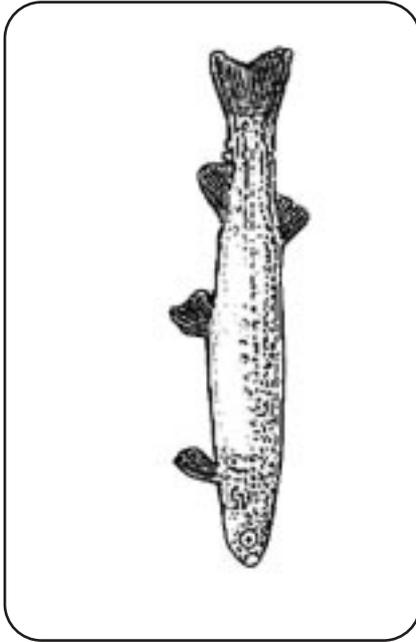
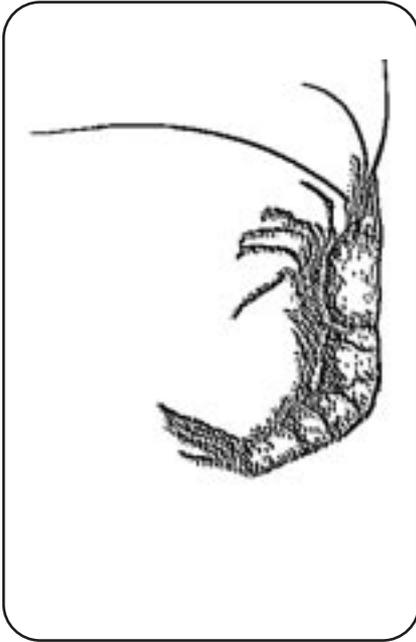
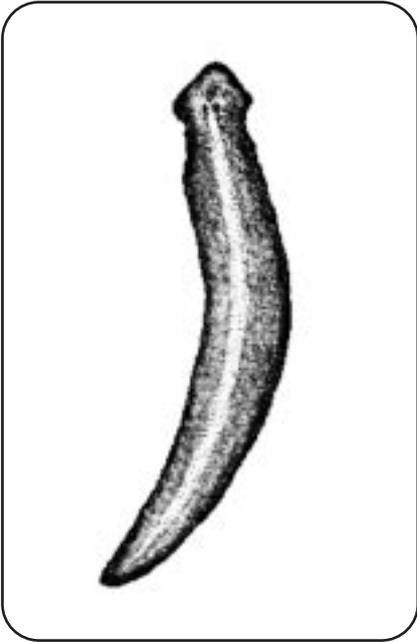
*Description:* Very smooth and oval shaped with hairy legs and wings folded down their backs. Adults are very large.

*Habitat:* Lives in most types of large and small water bodies. Do not require clean water.

*Functional groups:* Carnivores and predators.

*Food Web:* Feed on small invertebrates, some even attack tadpoles, frogs and fish. Eaten by fish and birds.

*Behaviour:* Air breathing; dive with an air 'bubble' on their stomach. Can fly from waterhole to waterhole.



### Galaxias (Jollytail)

*Phylum:* Chordata

*Class:* Vertebrata

*Order:* Osteichthyes

*Family:* Galaxiidae

*Size:* Adults grow to 100–190 mm

*Water quality tolerance:* Tolerant

*Description:* A small fish, usually silver with spots.

*Habitat:* Widespread and salt-tolerant. Found in a many habitats. Prefers slow moving water with dense vegetation, such as creeks, saline lakes or marshes.

*Functional groups:* Predators, carnivores.

*Food web:* Eats small crustaceans and water insects. Eaten by eels, birds and larger fish.

*Behaviour:* Spawn among aquatic plants. Newly hatched larvae are washed down to a lake or the sea. Juveniles return to the river or lake in the spring.

### Freshwater Shrimp

*Phylum:* Arthropoda

*Class:* Crustacea

*Order:* Decapoda

*Family:* Atyidae; 8 genera

*Size:* Up to 35 mm

*Water quality tolerance:* Sensitive

*Description:* Small, nearly transparent except for their eyes. They have 5 pairs of walking legs and two long antenna.

*Habitat:* They live in the shallows of still or slow moving rivers, streams and wetlands. Found near banks, amongst vegetation and areas of slow moving water such as behind large rocks.

*Functional groups:* Omnivores, detritivores, shredders.

*Food web:* Scavenge animal and plant material and detritus. Perform a very important role in the food chain.

*Behaviour:* Slow moving, but can flick their tails for a burst of speed.

### Flatworm

*Phylum:* Platyhelminthes

*Class:* Turbellaria

*Order:* Tricladida

*Size:* Up to 30 mm

*Water quality tolerance:* Very tolerant

*Description:* Flatworms have long, very flat bodies that are very dark in colour.

*Habitat:* Inhabit the shallows of ponds, streams, ditches, marshes and lakes.

*Functional groups:* Detritivores and carnivores.

*Food web:* Eat decomposing animal matter and small live worms and shrimp.

*Behaviour:* Flatworms glide over the bottom though may be found near the underside of the water's surface film

### Mayfly Nymph

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Ephemeroptera

*Family:* 9 families, around 40 species

*Size:* 2–32 mm

*Water quality tolerance:* Very sensitive

*Description:* Three tails with seven pairs of gills on abdomen that flap as they breathe. Two short antennae and three pairs of legs with claws.

*Habitat:* Prefers cold, clear streams in higher altitudes, but sometimes found in still waters in lower areas.

*Functional groups:* Detritivores, herbivores, shredders, collectors.

*Food web:* Scrape algae from reeds and rocks, or detritus from decaying plants and animals. Eaten by larger larvae, fish, spiders, dragonflies and birds.

*Behaviour:* Found under stones and logs, and may bury themselves in mud. Free swimming in still water.

### Swamp Paperbark

*Phylum:* Anthophyta

*Class:* Magnoliopsida (Dicotyledons)

*Order:* Myrtales

*Family:* Myrtaceae

*Species:* *Melaleuca ericifolia*

*Size:* Up to 5 m tall

*Description:* Flood tolerant, evergreen dense shrub. Creamy white bottle-brush flowers. Dark green small needlelike leaves. Distinctive flaky white bark that peels off in strips.

*Habitat:* Prefers wet or damp soil, usually found near swamps, marshes etc. Often grow in dense clumps.

*Functional groups:* Flood-tolerant emergent.

*Food web:* Nectar of the swamp paperbark is an important food source for local native insects and birds.

*Features:* Can tolerate brackish water. Provides cover and shelter for amphibians, insects and waterbirds.

### Freshwater Snail

*Phylum:* Mollusca

*Class:* Gastropoda

*Order:* Two orders

*Family:* 12 families, around 200 species

*Size:* 3–35 mm in length

*Water quality tolerance:* Tolerant

*Description:* Protective shells have various shapes, spirals and markings. Coloured brown or black through to yellow. Usually hermaphrodites.

*Habitat:* Live amongst weeds and stones in creeks, swamps, dams and billabongs.

*Food web:* Scrape algae and other plant material from surfaces of rocks and plants. Eaten by fish and birds.

*Functional groups:* Herbivores, scrapers.

*Behaviour:* Some breathe surface air which is stored in a lung inside shell, others have gills to breathe underwater. Can retract into shell when threatened.

### Stonefly Nymphs

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Plecoptera

*Family:* 4 families, around 200 species

*Size:* From 13mm up to 50 mm

*Water quality tolerance:* Very sensitive

*Description:* Usually brown but may be brightly coloured. A flattened body with 2 long antennae and 2 long gilled tails. Has claws for attaching to rocks.

*Habitat:* Typically live on stones in clear, cool, fast flowing mountain streams. May also be found amongst reeds and vegetation in slow flowing pools.

*Functional groups:* Mainly detritivores, some carnivores; Collector-gatherers.

*Food web:* Feed on dead plant and organic detritus. Some are carnivorous. Eaten by larvae, fish, spiders and birds.

*Behaviour:* An excellent water quality indicator.

### Pacific Black Duck, or Black Duck

*Phylum:* Vertebrata

*Class:* Aves (Neorninthes)

*Order:* Anseriformes

*Family:* Anatidae

*Species:* *Anas superciliosa*

*Size:* Adults are 50 to 60 cm in length

*Water quality tolerance:* Tolerant

*Description:* Brown, white-tipped plumage. Characteristic pale head, marked with dark bands.

*Habitat:* Found in almost every wetland, though preferring well-vegetated swamps with tracts of open water.

*Functional groups:* Omnivores, predators.

*Food web:* Eats seeds, flowers, aquatic plants and insects, crustaceans and shrimps.

*Behaviour:* Commonly nest in tree holes or on raised sites. Congregate in small groups in open water. Wary of humans.

### Mosquito Larvae

*Phylum:* Arthropoda

*Class:* Insecta

*Order:* Diptera

*Family:* Culicidae

*Size:* 3–6 mm

*Water quality tolerance:* Very tolerant

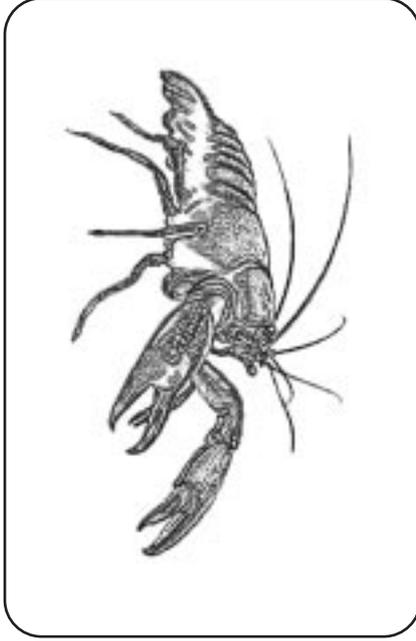
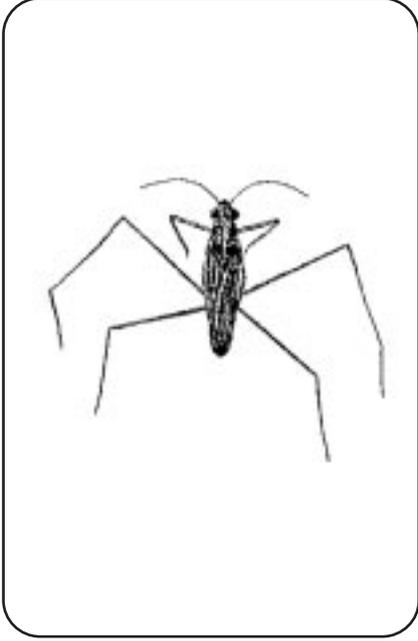
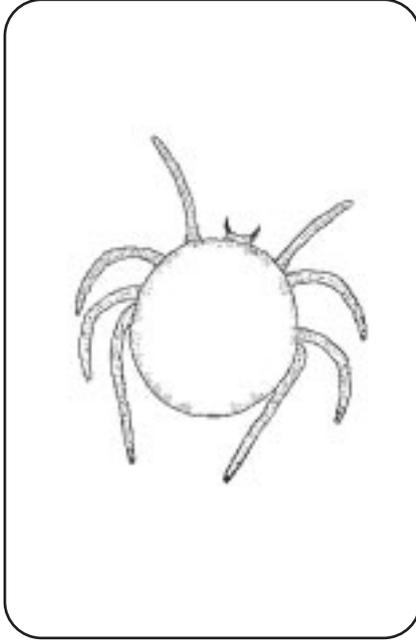
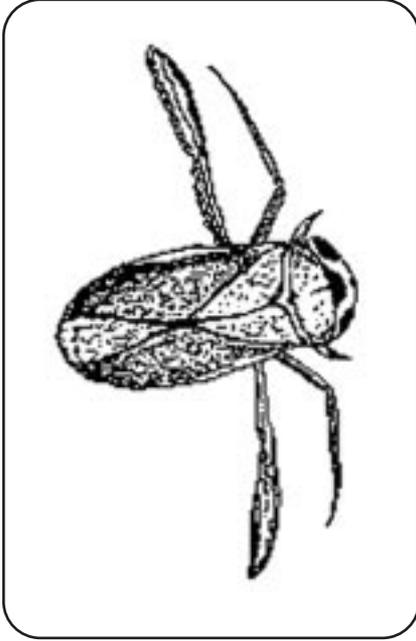
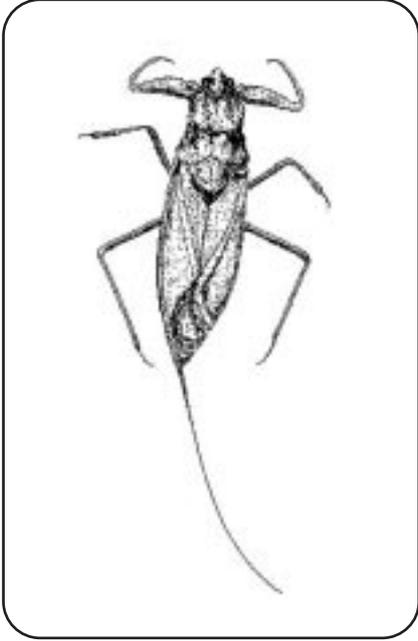
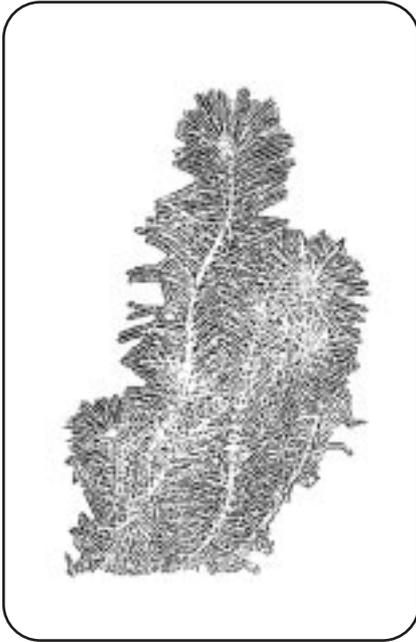
*Description:* Larvae are legless and have a wide thorax. Have mouth brushes on head. Known as 'wigglers'.

*Habitat:* Found in still waters at any depth including ponds, ditches, pools, swamps.

*Functional groups:* Detritivores, herbivores, collector-filterers.

*Food web:* Feed on algae or dead plant or animal matter. Food for fish, frogs, dragonflies, damselflies and predatory waterbugs.

*Behaviour:* May attach to the underside of the water surface but often seen wriggling at any depth.



### Water Plantain

*Phylum:* Anthophyta  
*Class:* Liliopsida (Monocotyledons)  
*Order:* Alismatales  
*Family:* Alismataceae  
*Species:* *Alisma plantago-aquatica*  
*Size:* Up to 0.5 m tall  
*Description:* Perennial, fleshy plant. Large spade-like leaves with parallel ribs. Tall flowering stems with multiple small white flowers and golden centres.  
*Habitat:* Slow moving and still water, in ponds and swamps to half a metre deep. Survives or persists in mud if water levels fall or swamp dries out.  
*Functional groups:* Emergent  
*Food web:* Food for waterfowl; dead leaves eaten by water creatures.  
*Features:* Provides shelter for amphibians, insects, fish and invertebrates. Seeds germinate in muddy banks. Develops underwater.

### Watermilfoil

*Phylum:* Anthophyta  
*Class:* Magnoliopsida (Dicotyledons)  
*Order:* Haloragales  
*Family:* Haloragaceae  
*Genus:* *Myriophyllum*; Over 30 species  
*Size:* Some species grow stems over two m long.  
*Description:* Water fern with feathery foliage, stems can be submerged or emergent. Stems are rooted in the sediment, often trailing in the water current.  
*Habitat:* Slow-moving or still waters up to one metre deep. Some species can 'choke' waters particularly if nutrient-rich.  
*Functional groups:* Submerged  
*Food web:* Source of food for diving ducks and invertebrates.  
*Features:* Attractive aquarium plant, ideal habitat for invertebrates and fish.

### Striped Marsh Frog

*Phylum:* Chordata  
*Class:* Vertebrata  
*Order:* Amphibia  
*Species:* *Limnodynastes peronii*  
*Size:* Up to 7.5 cm in length  
*Water quality tolerance:* Tolerant  
*Description:* Marked with alternating dark and light-brown stripes along back, and splotches down sides. Belly is white.  
*Habitat:* Very common along Australia's east coast, typically found amongst vegetation in wetlands and swamps.  
*Functional groups:* Predators, carnivores. Tadpoles are herbivores.  
*Food web:* Mainly eat insects. Tadpoles eat algae and are food for birds and fish.  
*Behaviour:* Hide under stones, leaf litter, logs or in burrows during the day. Its call is a distinctive loud 'Pok'. Females lay 700–1000 eggs near water's edge. These eventually hatch into tadpoles.

### Watermite

*Phylum:* Arthropoda  
*Class:* Arachnida  
*Order:* Acariformes  
*Genus:* 2 genera – Hydrachna, Eylais  
*Size:* Up to 2.5 mm  
*Water quality tolerance:* Sensitive  
*Description:* Small, bright red in colour. Four pairs of legs, with two appendages used for feeding. Freeswimming or crawling. No antennae.  
*Habitat:* Fairly sensitive to pollution. Occur mostly in shallow still water where there is plenty of vegetation.  
*Functional groups:* Predators, carnivores, piercers, suckers.  
*Food web:* Feed on smaller aquatic animals. The larvae are parasitic on other aquatic animals.  
*Behaviour:* They are good swimmers.

### Water Boatman

*Phylum:* Arthropoda  
*Class:* Insecta  
*Order:* Hemiptera  
*Family:* Corixidae; Four genera  
*Size:* Usually less than 15mm long  
*Water quality tolerance:* Tolerant  
*Description:* Long brown flattened oval bodies with three pairs of legs. Back legs are long and oar-like. Swim similarly to backswimmers. Breathe air, trapping a bubble when diving.  
*Habitat:* Found amongst vegetation near edges of still or slow-moving water, or on the muddy bottom.  
*Functional groups:* Omnivores, detritivores.  
*Food web:* Eat plant or animal detritus but may eat small live invertebrates. A favourite food for fish.  
*Behavior:* Adults are strong fliers and move readily to new waterholes.

### Water Scorpion

*Phylum:* Arthropoda  
*Class:* Insecta  
*Order:* Hemiptera  
*Family:* Nepidae  
*Genus:* *Laccotrephes*  
*Size:* Up to 100 mm  
*Water quality tolerance:* Tolerant  
*Description:* Air breathing, long broad and flattened bodies with a very long rear breathing tube. Sharp claw-like front legs.  
*Habitat:* Found amongst vegetation in ponds, dams and wetlands. Generally found upside-down near the surface.  
*Functional groups:* Carnivores and predators.  
*Food web:* Eat small insects, fish, shrimp, dragonfly nymphs and worms.  
*Behavior:* Lie in wait for prey to come within striking distance. Able to fly to new water holes.

### Freshwater Yabbie

*Phylum:* Arthropoda  
*Class:* Crustacea  
*Order:* Decapoda  
*Family:* Parastacidae  
*Species:* *Cherax destructor*  
*Size:* Adults 100 to 150 mm in length.  
*Water quality tolerance:* Tolerant of low oxygen levels and high temperatures.  
*Description:* Smooth-shelled, large claws. Colours from brown to blue.  
*Habitat:* Widespread, usually in dams and billabongs. Can live in both temporary and permanent waters.  
*Functional groups:* Predators, shredders.  
*Food web:* Generally feed on detritus but catch and eat any small animal that comes within range, including other yabbies. Eaten by fish and birds.  
*Behaviour:* Burrows into muddy banks. Can walk overland to new waterholes.

### Watertreader

*Phylum:* Arthropoda  
*Class:* Insecta  
*Order:* Hemiptera  
*Family:* Mesoveliidae  
*Genus:* *Mesovelia*; two species  
*Size:* Up to 5 mm in length  
*Water quality tolerance:* Tolerant  
*Description:* Small, with an oval shaped body. 3 pairs of legs, two long antennae. Can be winged or wingless. Have water repellent hairs on their limbs and feet.  
*Habitat:* Found on the surface amongst vegetation in shallow, slow moving or still water near water's edge.  
*Functional groups:* Carnivores, predators, piercers and suckers.  
*Food web:* Eat smaller insects near the water surface. Eaten by larger bugs, birds, and fish.  
*Behaviour:* Often dart across surface or run on adjacent bank to capture prey.

### Water Strider

*Phylum:* Arthropoda  
*Class:* Insecta  
*Order:* Hemiptera  
*Family:* Gerridae; Three genera  
*Size:* up to 13 mm  
*Water quality tolerance:* Tolerant  
*Description:* Black or brown with 4 long legs, and 2 short legs for catching prey. Water repellent hairs on legs and feet  
*Habitat:* Quite tolerant to pollution, living on the surface of ponds, slow moving streams and small dams.  
*Functional groups:* Carnivores, predators.  
*Food web:* Hunters and scavengers eating insects that have fallen on the water surface. Eaten by fish.  
*Behavior:* Use their long legs to walk or skate on the water surface. Scatter in all directions when approached. Fast moving and hard to catch.

# Word Find

Circle each letter of the words from the word list below. Don't forget to cross words off as you find them! Remember, words may be found horizontally, vertically, diagonally or even backwards!

To answer the question below, start in the top left corner of the grid.

Working left to right, and top to bottom, list all uncircled letters in the space below.

As you find each word, define its meaning on a separate sheet.

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

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|------------|--------|---------------|----------|------------|
| ANIMALS    | FAUNA  | HABITAT       | PLANTS   | THREATENED |
| BIOREGION  | FERAL  | INDIGENOUS    | PRESERVE | VEGETATION |
| BIRD       | FISH   | MANAGEMENT    | PROTECT  | WILLOW     |
| CARP       | FLORA  | NATIONAL PARK | RABBIT   | WOODLAND   |
| ECOSYSTEM  | FOREST | NEST          | RAMSAR   |            |
| ENDANGERED | GULL   | PESTS         | SEEDS    |            |

**Question:** What makes up our Biodiversity?

Answer: All the plants and animals in Gippsland