

## Life in our waterways

**Key Learning Outcomes****Level 4 Science: Living together**

Identify living and non-living things that affect the survival of organisms in an ecosystem.

**Structure and function**

Describe the functioning of the support, transport and reproductive systems in plants and animals.

Explain how animals use their senses to detect and respond to their environment.

**Level 5 Science: Living together**

Explain the effects of various environmental changes on living things in ecosystems.

**Structure and function**

Explain how plants and animals obtain, transport and store nutrients.

**Biodiversity, change and continuity**

Identify features of living things that determine their classification into major groups.

English, Art

If conducting these activities for Level 5, provide and obtain more detailed information and responses.

**Aims**

- to help students become familiar with some freshwater plants and animals
- to develop understandings of what these aquatic animals eat and where they live
- to develop understandings of some of these animals' adaptations to living in water

**Materials**

cards cut to approx 12 cm square, one for each student

safety pins

Student sheet 8: Wetland lifestyles

Information sheet 1: Wetland life in Victoria

Information sheet 2: Adapted for living in water

**Additional references**

*A Community Water Quality Monitoring Manual for Victoria*, Biological Survey section, and Glossary.

*Wetlands Wildlife*. Gould League of Victoria.

*Ponding*. Gould League of Victoria.

*Water Plants in Australia*. G. Sainty & S. Jacobs. Merritt Madden Printing. 1988.

*The Platypus Information Kit*. Australian

Platypus Conservancy and Melbourne Water.

*A Guide to the Freshwater Fish of Victoria*.

P. Cadwallader and G. Backhouse. Victorian Government Printing Office. 1983.

Your local Council or Catchment Co-ordinator for regional lists of native plants and animals, and weeds and pest animals. Some Councils have produced booklets on plants and animals of their regions.

**Advanced preparation**

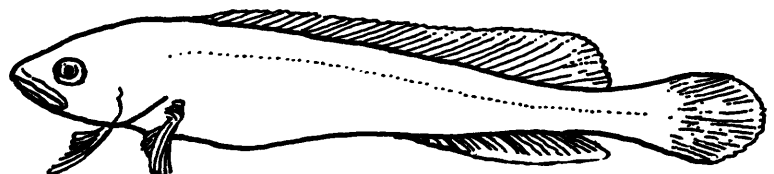
1. Read Teacher sheet 9: Freshwater macro-invertebrates and decide how you will use that activity with this one.
2. Duplicate required copies of Information sheets 1 and 2.

**Activity**

1. Explain the terms 'invertebrate', 'macro-invertebrate', 'crustacean', 'nymphs', 'larvae', 'detritus' and carrion. [See Glossary in *A Community Water Quality Monitoring Manual for Victoria*.

*Crustaceans are a group of animals which have a hard outer skeleton, e.g. yabbies, crayfish, shrimps, side-swimmers (scuds).*

*Carrion is the name for dead animals. Carrion is a type of food eaten by some animals.]*





## Life in our waterways

### Level 4

2. Decide which wetlands plants and animals to include in this activity to suit your region and the number of students in your class.

*[Choose from the list in Information sheet 2: Victoria's wetland life, or lists of native plants and animals for your region].*

3. Distribute the student and information sheets.  
4. Students research and prepare the cards for the 'What am I?' game.

*[This could be done as a homework assignment. Wetlands Wildlife is a useful reference.]*

Each 12 cm square card should include:

- Plant's/animal's name
- What it eats
- What eats it
- Which type of aquatic habitat it prefers (e.g. under rocks, burrows in mud, deeper water, near water's edge, or a mixture of these)
- Any special features which help it survive
- An illustration of the plant or animal

5. Use these as in the 'What am I' game in the macro-invertebrate activity for students to become familiar with these larger forms of aquatic life.

6. Use these cards along with the macro-invertebrate cards to create food chains.

7. Students prepare a poster of their wetland species in its environment. They use the poster to illustrate their brief presentation about how their wetland plant or animal uses its senses to detect and respond to its environment.

8. Using Information sheet 2: Victoria's wetland life, students identify a threatened and endangered Victorian wetland species. They prepare a verbal or written report which covers:

- what it needs to survive
- reasons why numbers are reducing
- suggested ways to help protect this species

### 'What am I?' Card

Plant/animal name

What it eats

What eats it

Preferred aquatic habitat

Special features

An illustration



## Life in our waterways

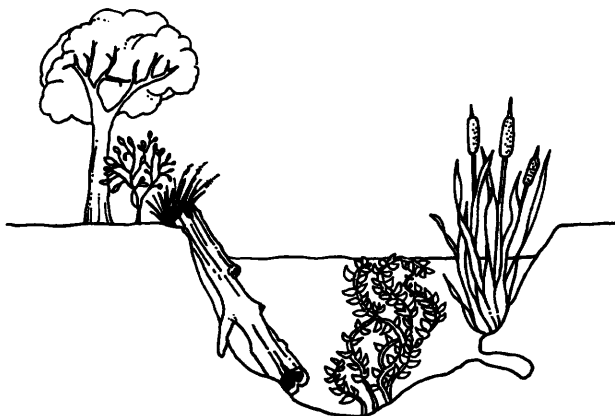
**Level 5**

9. Students research and prepare posters to illustrate different wetland plant or animals and cover all the aspects as listed for the 'What am I' card.

They use the poster as part of their brief presentation to the class to explain how the support, transport or reproductive systems of their aquatic plant or animal helps it to survive in a wetland environment.

10. Place the posters around the class. Students draw food chains using the examples in the posters.

11. These plants and animals can be used as examples to explain the major classification groups.

**Habitats**

1. Create a class mural(s), or students create individual artwork, of a cross section of a river scene showing different kinds of micro-habitats. (Include fallen branches, pools, riffles, stones, vegetation, etc)

[Base this scene on Blackline master 4A: River habitats.]

2. Use the mural(s) or an overhead of Blackline master: 6A to review ways the river bank vegetation affects the aquatic habitat

[shade, shelter, food supply].

3. Students place their 'What am I' card in the correct part of the river habitat mural, or draw their plant or animal in the correct location in their own river scene.

4. As a class, summarise the different river habitats and types of animals that live in each.

[E.g. Some plants and animals prefer to live in deeper pools with muddy bottoms while other prefer shallow riffles with rocky bottoms. Some animals live on or among plants in the water. Some animals feed in the water but live in trees or burrows out of the water.]

**Student sheet 8: Wetland lifestyles**

1. Review the different sections of a river (pools, riffles, runs), the types of habitat they provide, and changing water levels over seasons and years.

[See explanations in Teacher sheets 7: River habitats.]

2. Distribute Student sheet 8.

3. Students work in small groups to complete page 1 of the sheet.

4. Selected students representing River Red Gums, Reeds, Fish and Ducks report to the class on what living conditions are like for them at different times. For each species, selected students from 4 different groups to allow each student to report on conditions for their species at a different time (i.e. summer, winter, flood or drought).

5. Distribute Information sheet 1: Adapted for living in water.

6. Students work in small groups to complete page 2 of the sheet.

7. Summarise the groups finding as in step 4.

8. Groups that finish early could choose an additional plant or animal to complete Q. 3b.

**A wet life**

1. Students research and write a story about a day in the life of an aquatic animal, describing how it lives and what type of habitat it needs. e.g.

- a platypus
- a macro-invertebrate such as a dragonfly larvae (mud-eye)
- a frog
- a native fish such as an Australian Grayling or River Blackfish

Explain how a change in water availability or quality could affect its survival.

**Extension idea**

- Explain why a wetland in Victoria may be important to a bird that breeds in the Northern Hemisphere.

[E.g. Migratory waterbirds such as Eastern Curlews, and Latham's Snipe breed in the Northern Hemisphere but spend summer in Australia. They rely on wetlands in Australia for food in summer.]



# Wetland lifestyles

## A changing place to live

Wetlands and river banks are living places that can change a lot over the weeks and months of a year. During winter and spring the water level rises. During summer the water level is usually low. In droughts there may be no water at all in the wetland or waterway. This means that the plants and animals that live in these environments have to be able to cope with very different living conditions.

### Activity

Working in groups of 4:

1. Draw a cross section of a river or wetland, with a River Red Gum growing away from the water's edge, a clump of reeds growing just in the water near the bank, a fish and a duck.
2. Draw in some likely water levels for summer, winter, flood and drought times. Label each level.
3. Each person imagines they are either a River Red Gum, a clump of reeds, a fish or a duck.
  - a) Fill in the table below for the plant or animal you represent. Briefly describe what the living conditions for you are like at these different times (i.e. completely covered by water; completely out of water, plenty of water to swim and feed in).

### Changing water level

	summer	winter	flood	drought
River Red Gum				
Reeds				
Fish				
Duck				

b) After hearing the class reports, complete the table for the other plants and



## Wetland lifestyles

3c) Read Information sheet 1: Adapted for living in water.

Fill in the table below to briefly explain what special features (adaptations) you have that help you cope with summer, winter, flood and drought conditions. (e.g. Do you avoid the problem by moving away? Can you survive drying out?)

### Adaptations for living in water

	summer	winter	flood	drought
River Red Gum				
Reeds				
Fish				



## Adapted for living in water



### Plants

Some plants such as water lilies that grow right in the water have long stems so their leaves can float on the surface and catch enough sunlight to photosynthesize.

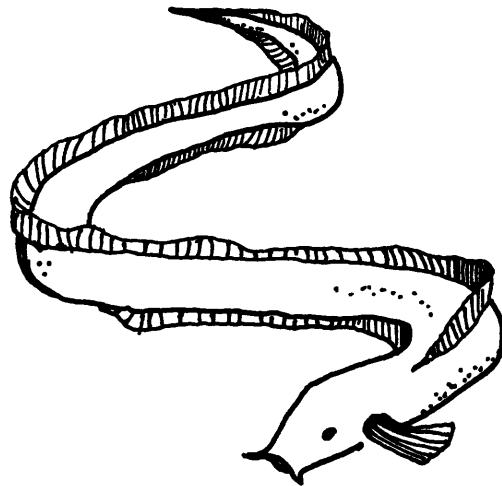
Some water plants such as Duckweed and Water Fern (Azolla) have no roots in the mud so that they can always float on the surface where the most sunlight is available.

Plants at the water's edge often have tall straight stems and leaves to reach above the water.

Plants such as reeds and rushes growing at the water's edge may be partly submerged in higher water times and quite dry at low water times. Plants need special features to be able to grow in the waterlogged silt and mud on the side or at the bottom of a waterway. These plants have air-filled tissue in their stems to allow air to get to their roots so they can grow.

Plants such as Bulrush and Common Reed store food (starch) in their roots to use in drought or flood times when conditions are not right for them to photosynthesize.

In times of drought or high floods, plants such as Water Ribbons become dormant. They lose their leaves, use less water and stop growing.



### Animals

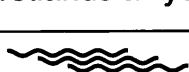
Living in water is quite different to living on land. Because waterways and wetlands are so changeable, animals that live in them must be able to cope with the changing conditions. As water level drops, the salinity level may increase and the oxygen level decrease.

In faster water, small animals such as macro-invertebrates have legs with claws so they can hold onto a plant or rock and not be washed away.

Macro-invertebrates such as caddis fly larva have a case to not only hide in from predators, but to anchor them so they are not normally carried away by the current.

Animals such as waterbirds, tortoises and yabbies move to another more suitable wetland when the one they are in dries up.

Some waterbirds migrate large distances each year so they can breed and feed in suitable wetlands all year round.



## Adapted for living in water



Some animals lay eggs in protective casings to survive the dry time and hatch when conditions are right for the young to survive. The eggs of native fish often have a sticky coating so they will stay attached to aquatic plants, underwater rocks or logs and not wash downstream with the current.

Some frogs and tortoises burrow into the subsoil and stay 'dormant' until conditions are right for them again.

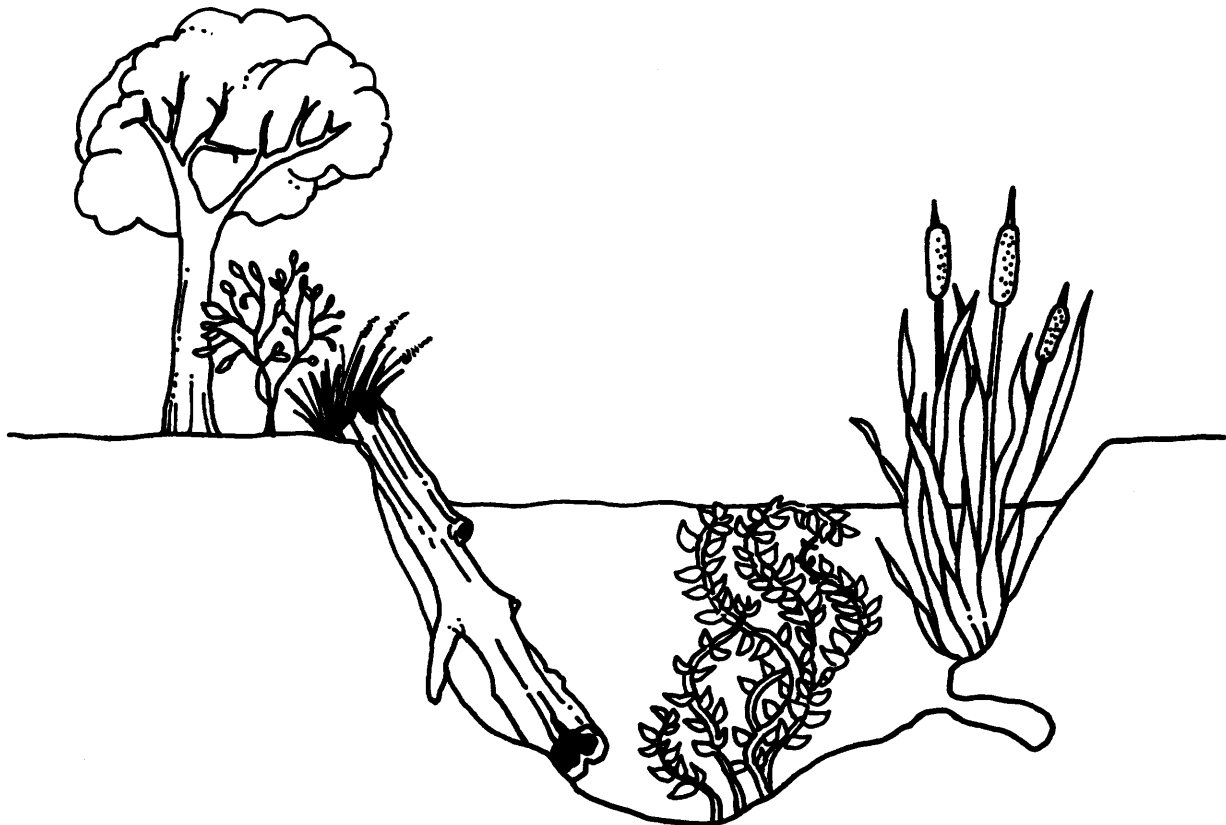
There is less oxygen in water than there is in air. Animals still need oxygen but because lungs will not work in water, many aquatic animals such as fish and tadpoles have gills to extract oxygen from the water.

Some aquatic animals such as bloodworms have special pigments in their blood that are more efficient at trapping oxygen.

Animals such as yabbies live in air-filled burrows.

Macro-invertebrates such as water beetles trap air bubbles around their body so they can use this air supply when they dive.

Other macro-invertebrates such as mosquito larvae have breathing tubes. They attach to the underside of the water surface and poke their air tube through the surface to take in air above the water.



## Victoria's wetland life



### Native plants and animals of waterways and wetlands include

*Some plants and animals are purely aquatic, others live on the riverbank, while some live both in and out of the water.*

- Aquatic plants such as Water Ribbons, Water Milfoil, Azolla, Duckweed, algae.
- Water's edge plants such as Common Reed (*Phragmites*), other reeds, rushes, sedges.
- River bank trees such as River Red Gums, Swamp Gums, Black Wattle, Blackwood.
- River bank shrubs and grasses such as River Bottlebrush, Woolly Tea-Tree, Tangled Lignum, Tussock Grass, Spear Grass, Kangaroo Grass
- Waterbirds such as ducks, swan, herons, kingfishers, swamp hens, coots, moorhens, grebes, cormorants, pelican, ibis, egrets, spoonbills, White-bellied Sea-eagle.
- Platypus.
- Eastern Water Rat.
- Frogs and tadpoles.
- Tortoises.
- Water dragons and other lizards.
- Snakes such as carpet pythons, tiger snakes.
- Fish such as River Blackfish, Australian Grayling, Murray Cod, Macquarie Perch, Long-finned Eel, Short-finned Eel, Mountain Galaxias, Southern Pygmy Perch, Australian Smelt, Flat-headed Gudgeon.
- Macro-invertebrates such as stonefly nymphs, mayfly nymphs, water beetles, water bugs, water snails, mussels, freshwater shrimps.
- Yabbies and crayfish.
- Freshwater worms.
- Flying adult insects such as dragonflies, damsel flies and mayflies.

### Additional references

*Wetlands Wildlife.* Gould League of Victoria.

*Water Plants in Australia.* G. Sainty & S. Jacobs. Merritt Madden Printing. 1988.





## Victoria's wetland life



### Extinct wetland species

Wetland animals that have become extinct in Victoria since European settlement include the Magpie Goose and two fish species, the Western Chanda Perch and the Southern Purple spotted Gudgeon

### Threatened animals dependent on Victorian wetlands

#### *Waterbirds*

Australian Pelican, Australasian Bittern, Ballions Crake, Blue-billed Duck, Brolga, Cape Barren Goose, Cox's Sandpiper, Darter, Eastern Curlew, Freckled Duck, Glossy Ibis, Gull-billed Tern, Great Egret, Intermediate Egret, Lewins Rail, Little Bittern, Little Egret, Painted Snipe, Pied Cormorant, Royal Spoonbill, Rufous Night Heron, Whiskered Tern.

#### *Reptiles*

Alpine Water Skink, Glossy Grass Skink, Southern Water Skink, Swamp Skink, Broad Shelled Tortoise.

#### *Amphibians*

Giant Burrowing Frog, Barking Marsh Frog.

#### *Insects and snails*

6 species of Caddisfly, a species of Damselfly, Mt Donna Buang Stonefly, 6 other species of Stonefly, Otway Black Snail

#### *Crustaceans and Snails*

Alpine Spiny Crayfish, South Gippsland Spiny Crayfish, Glenelg River Crayfish, Murray River Crayfish, Orbost Crayfish, Narracan Burrowing Crayfish, Lilly Pilly Burrowing Crayfish, Mallacoota Burrowing Crayfish, Strzelecki Burrowing Crayfish, Warragul Burrowing Crayfish, Eastern Freshwater Shrimp, Dandenong Freshwater Amphipod, 7 species of copepod.

#### *Fish*

31 of Victoria's 44 fish species are endangered, vulnerable, restricted in distribution or of uncertain status.

The 4 endangered fish species are: Trout Cod, Freshwater Herring, Brown Galaxias, Ewen's Pygmy Perch.

The 6 vulnerable fish species are: Freshwater Catfish, Australian Grayling (regarded as potentially threatened throughout its entire range), Murray Cod, Macquarie Perch, Silver Perch, Tasmanian Mudfish.

Only 13 fish species are considered common or locally abundant with no foreseeable threat to their survival.

### Introduced plants and animals affecting rivers and riverbanks

These include:

Fish such as Redfin, Carp, Trout, Mosquito Fish, Rabbits, Foxes, Cats.

River bank plants such as Willow, Blackberry, Briar Rose, Fennell, Ivy, Box Thorn, Broom.

Water plants such as Water Hyacinth, Water Couch, Townsend's Cord-grass.



## Victoria's wetland life



### Wetland species

#### Fish

Native fish species have been particularly affected by human activities.

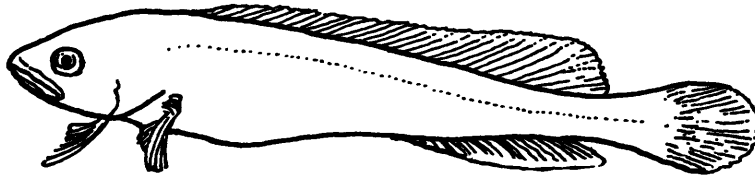
#### Blackfish

Once occurred in most of Victoria's rivers; now uncommon.

- Lives near the bottom of clear, flowing creeks, rivers and lakes with plenty of cover such as rocks and fallen logs.
- Eats insect larvae, other invertebrates and sometimes small fish.
- They are secretive fish which hide under stones, in hollow logs or undercut banks. To help them live in these environments they have smaller than usual fins on their back which probably are sensitive to touch. They also have a very heavy coating of slime.

The survival of Blackfish is threatened by activities that change its habitat:

- silting up of rivers and creeks because of erosion
- channelising of watercourses
- removal of dead timber and other debris



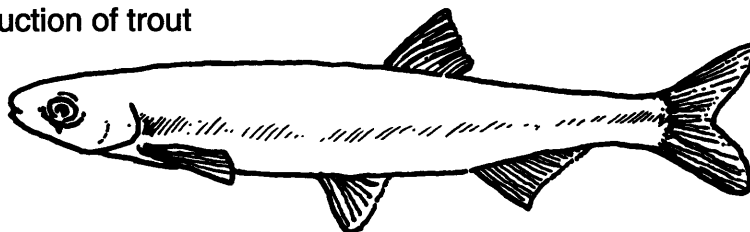
#### Australian Grayling

Lives mainly in coastal rivers. Much less common than it once was and considered vulnerable to extinction if actions are not taken to protect it.

- Prefers rivers and streams with cool, clear water with a gravel stream bed and pools and riffles.
- Eats a wide variety of small aquatic organisms such as insect larvae, and algae.
- They are fast swimmers, able to quickly dart away from danger.
- The young fish (fry) are swept downstream to the food rich waters of river estuaries or the sea. They live here for about 6 months before they swim back upstream for the rest of their lives.

The Australian Grayling's survival is threatened by activities such as:

- the building of dams and weirs on coastal rivers
- the clearing of land
- the introduction of trout



## Victoria's wetland life



### Platypus

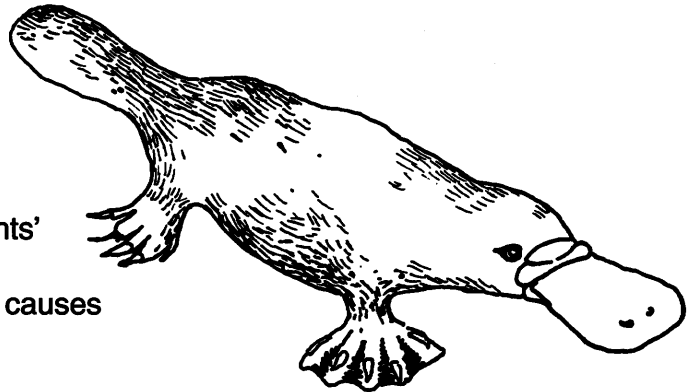
The platypus is well suited to life in and near the water. It is an excellent swimmer. On land it spends most of its time in a short simple residential burrow just above the water level in the stream bank, under a tangle of tree roots. The nesting burrow, built by the female platypus, can be up to 20 metres long.

- Lives in fairly shallow water and needs steep vegetated banks for its burrows.
- Eats invertebrates (freshwater shrimps, mussels, worms and the larva of various insects, especially caddis-flies that live on the bottom of waterways).
- Relies on touch of the sensitive skin on its bill to sift out food from the bottom silt.
- Can close its eyes, nostrils and ears when submerged.
- Stores food in large cheek pouches to eat at the surface.
- Has webbed feet and a flattened tail to help it swim. Uses its front webbed feet for power and its hind feet for steering and braking.

Platypus can live in waterways in most of Victoria. They live in every river catchment except the Avoca, Mallee and Corangamite Basins. However it seems to have disappeared from the Murray River downstream of Barmah forest and, although once common in the Wimmera River System, platypus are now very uncommon there. The Australian Platypus Conservancy is conducting surveys and supporting programs to protect platypus.

The platypus's survival is threatened by activities that change its water or streambank habitat:

- dams
- irrigation
- stream and river bank 'improvements'
- fish netting and trapping
- large discharges of sewerage (this causes oxygen levels in the water to fall)
- chemical pollution
- thermal pollution (increased water temperature caused by heated water being released by industries into waterways)



Although the platypus itself may not be very sensitive to water quality, the invertebrates it eats are.

### Water Rat

Water Rats like to live near permanent waterways or wetlands.

- Lives in the banks of rivers, lakes, estuaries and marine shores.
- Water rats build burrows or hide on rock crevices or under debris.
- Mainly carnivorous, eating large insects, yabbies, mussels, fish, frogs, and carrion.
- Has broad, partly webbed hind feet and soft water-proof fur.
- Nest in tunnels made in the stream bank.
- Young water rats are eaten by snakes and large fish.

Water Rats often use feeding tables (such as a log or flat round stones) for eating and sometimes put mussel shells in the sun and wait for them to open naturally.



## Victoria's wetland life



### Brolga

The Brolga is a stately looking bird. It performs an elegant, elaborate dance involving leaping into the air and parachuting down with its wings outstretched. Aboriginal legend says the Brolga was once a famous dancer who spurned the attentions of an evil magician who changed her with a whirlwind cloud of dust into the graceful crane.

#### Brolgas

- live close to swamplands dominated by sedges.
- eat tubers and insects.
- nest on the ground on islands or by building nests in shallow water

There are far fewer Brolgas in Victoria now than there were at the time of European settlement and even around 1900.

The survival of Brolgas is threatened by:

- wetland drainage
- egg collecting
- poisoning
- introduced predators
- shooting

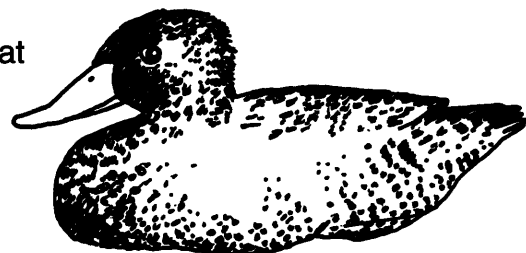
Most of the wetlands suitable for breeding on by Brolgas occur on private land. The people who own these wetlands may not know that their wetland is one of very few left for Brolgas to breed on. Also, they may need to make a living from their land. Landowners often drain the wetlands on their property so they can grow more crops or have more livestock.

### Freckled Duck

This is one of the rarest and least known of Australia's ducks. It is one of the 10 rarest waterfowl in the world. Freckled Duck like open wetlands. They feed in shallow water. They like to stay at a favoured swamp. It is larger and less agile than many other ducks so it is an easier target for duck hunters.

The survival of Freckled Ducks is threatened by activities such as:

- illegal shooting (hunting it is not allowed)
- lack of knowledge about its food and habitat needs



### Yabbies and crayfish

Eleven different kinds of crayfish and yabby live in Victoria's waterways. (Other yabbies live on land.)

- The crayfish mostly live in the cooler, upland sections of rivers with fast running, highly oxygenated water.
- Yabbies can live in a wide range of aquatic environments including creeks, wetlands, irrigation channels, farm dams and also brackish water in coastal streams.
- They can leave the water and walk overland for some distance.



## Victoria's wetland life



### River Red Gums

This eucalypt grows along the banks of waterways throughout most of Australia.

River Red Gums are able to cope with flooding. They can survive floods of up to 6 months. Most other land plants would be killed within a few days or weeks.

The flood waters carry the tiny seeds to higher ground where they germinate. A dense stand of saplings then grow at the high water mark in the damp soil. Flood water carries soil and nutrients from upstream with it. These are deposited in places where the flood waters slow down. This means the flood water also deposits nutrients which help the young Red Gum seedlings to grow.

The saplings (young trees) grow quickly but only a few survive to become adult trees. A River Red Gum can live for over 500 years. As adult trees they often have twisting, gnarled trunks and spreading branches. Many are photographed for their beauty and interesting shapes.

### Habitat

River Red Gums are very important habitat trees. They provide food and living places for animals both on the land and in the water.

### Branches

River Red Gum's often drop branches (so people should not camp beneath these trees). The fallen branches create homes for wildlife on the ground or in the water. Many kinds of small animals use the hollow branches to hide in or under. Fish, frogs and macro-invertebrates live and feed in and under the branches that fall into the water.

### Hollows

A hollow develops in the adult River Red Gum where its branch has fallen off. Animals such as possums, bats, tuans, parrots, cockatoos and owls live in these hollows. When it is a small hollow, small animals live in it. Sometimes cockatoos use their sharp strong beaks to gnaw at the wood around the hollow to make it big enough for them to nest in and raise their young.

### Leaves

Eucalypts drop their leaves gradually all year round. When their leaves fall into the water they become an important source of food for animals such as macro-invertebrates in the river.

The trees provide a light shade for the river. This helps keep the water temperature cooler in the heat of summer.

In some places, River Red Gums are not regenerating.

The survival of Red Gums is threatened by:

- Cattle and sheep eating and trampling the young saplings.
- Rabbits ringbarking young trees.
- Changes to the natural flooding and drying patterns of rivers affects the health of adult trees and can prevent seedlings from surviving.
- Raising salinity levels.
- Insect attack.



## Victoria's wetland life



### Pest plants

#### Willows

Willows were commonly planted along waterways in the past because people liked how they looked or used them for erosion control. Today we know that willows are not as good as native vegetation for maintaining water quality and river habitats.

The leaves of native riverside trees are important for life in the river. When the leaves fall into the water they are one of the main sources of food for many aquatic animals.

Willows are very different to the native trees that grow along our waterways. Willows are deciduous trees and so drop all of their leaves in late autumn. For the rest of the year they cast a heavy shade on the water. Eucalypts drop their leaves gradually all year round and cast a light shadow. Willow leaves fall all at once and rot quickly. This provides a lot of food for a short time, then nothing for the rest of the year.

The roots of willows grow through a waterway and clog it. This can increase flooding problems. The roots reduce the amount of habitat needed for fish, macro-invertebrates and other aquatic animals.

Part of the problem is that some management agencies are still advising people to plant willows along waterways for erosion control. River banks that are bare will erode and so planting of their banks is needed. Where possible though this should be with suitable native plants that provide both erosion control and habitat for native aquatic life.

Several different kinds of Willow have been planted along waterways.



#### Blackberry

Blackberries can grow along waterways and form such dense barriers that they stop people and larger animals from reaching the water's bank. Its dense growth smothers smaller native plants.

Blackberries invade disturbed land such as cleared creek banks, along fence lines, cut-over forests and mined sites. They do not usually invade undisturbed areas.

## Victoria's wetland life



### Pest animals

#### European Carp

Carp were introduced into Australia in the early 1860s as ornamental fish. They are native to Asia.

The early strains of Carp did not survive in the wild. However in 1961 a 'River strain' of European Carp was illegally imported from Germany by a fish farmer in Gippsland. The farmer advertised and sold large numbers to stock farm dams. In 1962 the Victorian Government declared European Carp a noxious fish because of the potential damage it could cause to fishing industries and waterways. The possessing, handling or releasing of live noxious fish is prohibited. However many of these Carp had already been sold. Although Fisheries and Wildlife Department staff killed all the Carp in these farm dams, Carp had been secretly put into Yallourn Storage dam and Lake Hawthorn in Gippsland. From here the Carp spread on their own into the vast Murray Darling river system.

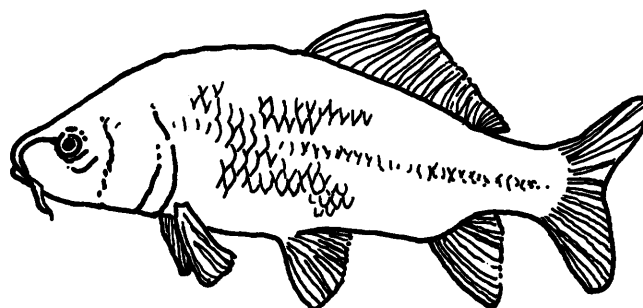
The Government has conducted major Carp eradication programs but only the Mallee and the area to its south are free of this introduced fish.

Although it is illegal, Carp are popular with some anglers as live bait. They can live for several hours out of water. Some of these Carp escape from hooks or are dumped at the end of the day's fishing. In this way they spread into previously Carp-free waters. The bodies of large numbers of dead Carp left by anglers can pollute the river banks and water. Floods also spread Carp into lakes and billabongs.

Carp usually live in still or slow-moving water with a muddy bottom. They can tolerate very poor environmental conditions such as high turbidity and salinity, low oxygen levels, and wide temperature ranges. They can survive in situations where the water quality is too poor for other species. They are long-lived fish (they reach 40 years of age in captivity). Carp breed often and in large numbers; one female Carp can lay over 3 million eggs.

Young Carp feed on microscopic algae and invertebrates. Adult Carp eat algae and macro-invertebrates. They often feed by sucking in mud from the bottom, filtering out the food, then spitting out the mud. Their feeding makes the water more muddy and can kill aquatic plants by pulling their roots out of the mud.

Carp are eaten by native fish such as Murray Cod and Golden Perch.



# Freshwater macro-invertebrates

## Key Learning Outcomes

### Level 4 Science: Living together

Identify living and non-living things that affect the survival of organisms in an ecosystem.

### Level 5 Science: Biodiversity, change and continuity

Identify features of living things that determine their classification into major groups

## Aims:

- to help students become familiar with some freshwater macro-invertebrates before monitoring them as part of their Waterwatch fieldwork (or after an initial site visit as a stimulus).
- to develop understandings of what these macro-invertebrates eat and where they live.
- to develop understandings of some of these animals' adaptations to living in water.

## Materials

Blackline master 5: Freshwater macro-invertebrates

Gould League's coloured stickers: Pond animals; Pond Insects

card cut to approximately 12 cm square; one for each student safety pins

4 larger cards, labelled as follows to represent aquatic habitats:

- Living in the water under stones, branches or on plants
- Living on the top of the water
- Living in the mud or a burrow at the bottom of a creek, pond or lake
- Living in plants at the water's edge

Large cards as required, labelled as follows to represent:

- Plant eaters
- Predators
- Macro-invertebrates found in quiet pools
- Macro-invertebrates found in fast running water
- Macro-invertebrates found in higher quality water
- Macro-invertebrates found in lower quality water

## Advanced preparation

- Duplicate required number of Blackline master 5.
- Obtain coloured stickers: *Pond animals*; and *Pond Insects*, from the Gould League or your regional Waterwatch Co-ordinator.

- Attach one Gould League sticker onto each card (or alternatively, use photocopies of these creatures on pages 11 - 17 of the Biological Surveys section of the *A Community Water Quality Monitoring Manual for Victoria*).
- To make up enough cards for the entire class, prepare duplicate cards of the plant eating macro-invertebrates.

## Additional resources

Biological Survey section, and Glossary in *A Community Water Quality Monitoring Manual*.

*Ponding*. Gould League of Victoria.

## Activity instructions

- Explain the terms 'invertebrate', 'macro-invertebrate', 'crustacean', 'nymphs', 'larvae', 'detritus'.

[See Glossary in *A Community Water Quality Monitoring Manual for Victoria*.

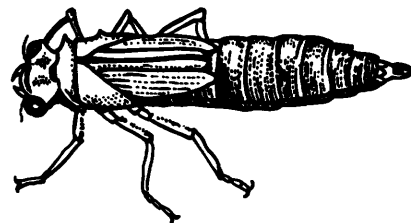
*Crustaceans are a group of animals which have a hard outer skeleton, e.g. yabbies, crayfish, shrimps, side-swimmers (scuds).]*

- Distribute to each student:

- a 12 cm sq card with a macro-invertebrate sketch on one side,
- a safety pin and
- a copy of Blackline master 5.

- Students read Blackline master 7 to identify what their animal eats and where it lives in the water. They write this onto their card.

## Sample card



**Animal's name:** Dragonfly nymph

**What it eats:** Water fleas, young fish

**Where it lives:** In the water under rocks, in logs, under leaves





## Freshwater macro-invertebrates



4. Collect all the completed cards then redistribute them so that each student has a card. They use the safety pin to attach their card to another student's back, without letting the student see what is on the card being attached to their back.
5. Organise the class to play 'What am I'. Students take their copy of Blackline master 5 with them as they move about to ask another student:
  - i) What do I eat?, then to another student to ask
  - ii) where do I live?, then to another student to ask
  - iii) do I have any special features?

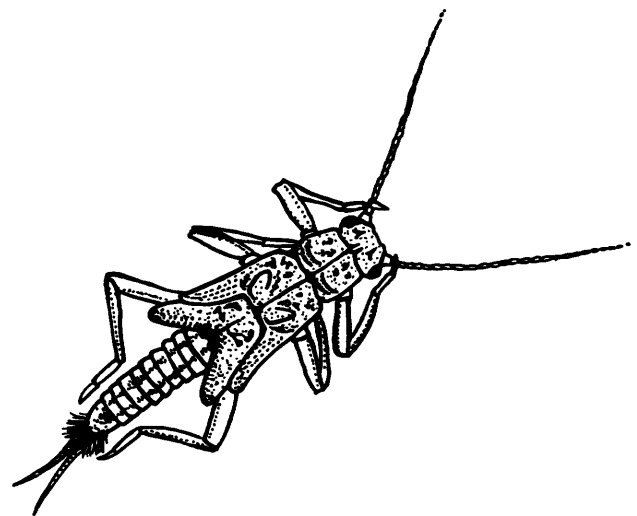
From these 3 clues each student guesses which macro-invertebrate they are representing. If they are not right, that student repeats the questions for a 4th (and 5th) clue as necessary until they guess correctly.
6. For a more advanced level, conduct step 4 with students asking for clues until they guess what they represent: e.g. 'Do I eat plants?' 'Do I live under rocks?' 'Am I eaten by fish?' 'Am I a mudeye?'
7. Arrange the 4 large habitat cards around the room. To reinforce students familiarity with the range of macro-invertebrates and where they live, ask the students to collect in groups according to where the macro-invertebrate they represent *usually* lives:
  - underwater, on plants, branches or under stones
  - on the top of the water
  - in the mud or a burrow at the bottom of a creek, pond or lake
  - in plants at the water's edge
8. Once in their habitat group, ask each student to call out the macro-invertebrate they represent.
9. Repeat step 7 and 8 by asking students to group as:
  - i) plant eaters OR predators.
  - ii) macro-invertebrates usually found in quiet pools OR macro-invertebrates usually found in fast running water such as riffles
  - iii) macro-invertebrates usually found in higher quality water OR macro-invertebrates usually found in lower quality water.

### Extension

Create a card game using Blackline master 5: Freshwater macro-invertebrates.

1. Cut out the dot point clues for each species, without the animal's name, and paste the clues onto a card, one card for each species. Paste a sticker or a sketch of that species onto the opposite side on its clue card.
2. Small groups of students play as follows:
 

The cards are placed in the centre, in a stack with their clue side facing up. One student takes a card and holds the card so the others can see the animals but he/she can't. The student with the card reads the clues out aloud then says what the animal is, scoring one point for each correct answer. The other students in the group tell him/her if the answer is correct. If correct, the player takes another card; if not, it becomes the next person's turn. Each person must correctly guess the macro-invertebrate card in their hand before collecting a new card. The winner is the person with the most points once all the cards have been read.





## Freshwater macro-invertebrates

Below are general notes on some of the macro-invertebrates that live in Victoria's waterways and wetlands.

### Stonefly nymph

- I eat plants, or animals, or both.
- I usually live under stones in fast flowing water or on the exposed edges of lakes
- I am eaten by larger aquatic larvae, fish, spiders, and birds.
- I have claws to hold onto rocks and a flattened shape so I am not swept away by the current. I have 2 long tails.



### Caddis-fly larvae

- I mostly eat plant material, algae and detritus.
- I usually live attached to rocks, stones or plants in quiet water.
- I am eaten by dragon-fly nymphs, frogs and fish.
- For protection, I build a portable home from stones, leaves, twigs and silk.
- I prefer good quality water to live in.

### Damsel-fly nymph

- I prey on other larva, water fleas, worms and small fish and tadpoles.
- I mostly live in slower moving water and the edges of lakes.
- I am eaten by fish, frogs, reptiles and birds.
- I have claws to hold onto rocks and plants so I am not swept away by the current, and 3 leaf-like gills for my 'tail'.
- I am similar to a dragon-tails.

### Mayfly nymph

- I eat algae and detritus, but also small aquatic animals such as dragonfly nymphs.
- I can live under stones in fast flowing water and on plants in slow moving water.
- I am eaten by larger aquatic larvae, fish, spiders, birds and adult dragonflies.
- I have claws to hold onto rocks and plants so I am not swept away by the current, and 3 tails.
- I prefer good quality water to live in.

### Dragon-fly nymph (mud-eye)

- I prey on other larva, water fleas, worms and small fish and tadpoles.
- I mostly live in slower moving water and the edges of lakes.
- I am eaten by fish, frogs, reptiles and birds.
- I patiently wait for my prey to get near me, then use my special grasping mouthpiece to shoot at lightning speed to catch my dinner.
- I have claws to hold onto rocks and plants so I am not swept away by

### Bloodworm (larvae of Gnats or Midges)

- I mainly eat detritus, algae and plants.
- I attach to the underwater surface in quiet water.
- As a larva I am worm-like, with distinct segments.
- I am eaten by water beetles, water bugs, fish, spiders, frogs, birds.
- Red-coloured versions of me can live in oxygen poor water (the red pigment is good at getting oxygen from water).
- I can survive in lower quality water than many other macro-invertebrates.



## Freshwater macro-invertebrates

**Biting Midge larvae**

- I mainly eat detritus, algae and plants.
- I live in the mud, debris or rotting vegetation in shallow waters and along creek banks.
- As a larva I am worm-like, with distinct segments.
- I am eaten by water beetles, water bugs, fish, spiders, frogs, birds.
- I am not red like my cousin the bloodworm.
- I can survive in lower quality water than many other macro-invertebrates.

**Scud or Sideswimmer (Amphipod)**

- I eat algae, detritus and dead animals.
- I prefer still or slowly flowing water where I can hide among plants.
- I am eaten by water beetles, water bugs, fish, and frogs.
- My body is flattened sideways so I swim sideways.

**Mite**

- I feed by sucking the body fluids of insect larvae and nymphs.
- I often live on the surface of the water but can dive below it.
- I use my hair fringed legs like oars to crawl through the water.

**Flatworm**

- I eat dead material and small worms and crustaceans.
- I like to live in shallow edges of lakes.
- My flattened shape helps me hide under rocks and in the mud.

**Yabby**

- I mainly eat detritus but also plants and invertebrates.
- I live in burrows in the mud.
- I am eaten by fish and birds.
- I have large claws for grasping food.

**Segmented Worm**

- I suck in mud to extract detritus from it.
- I am eaten by many aquatic animals, especially fish.
- I can survive in lower quality water than many other macro-invertebrates.

**Pond Snail**

- I eat algae and the leaves of aquatic plants.
- I live among the leaves of aquatic plants.
- I am eaten by fish and birds.
- I have a shell for protection.

**Water Bug: Lesser Water Boatman**

- I eat plants, detritus, bloodworms and mosquito larva.
- I prefer quiet water and live in vegetation or in the mud near the edge of waterbodies.
- I am often eaten by fish.
- I have hairy hind legs which I use like oars to help me swim through the water.
- I trap air around me to use when I dive underwater.

**Water Bug: Marsh Threader (or Water Strider)**

- I eat small insects which have fallen onto the water.
- I prefer quiet water.
- I am often eaten by fish.
- I use my long legs to walk over floating plants to catch my prey.
- I have a beak-like mouth to pierce my prey and extract its body juices.

**Water bug: Giant Water Bug**

- I eat small invertebrates and very small fry (young fish).
- They can be found among aquatic plants on the water surface or swimming through slow moving water.
- I have hairy legs which I use like oars to help me swim through the water.
- I have a beak-like mouth to pierce my prey and extract its body juices.

**Screech Beetle (Diving Beetle)**

- I am a predator, catching anything I can.
- I am eaten by fish and birds.
- I have hairy legs which I use like oars to help me swim through the water.
- My streamlined shape helps me dive through the water.





## Freshwater Macro-invertebrates

### Macro-invertebrates

Macro-invertebrates are a very important part of aquatic environments. Many of them live in the water for long periods of their life and are food for many larger animals such as fish, frogs and birds. Macro-invertebrates are sensitive to the condition of the water; their survival depends on it. Because they are small, not as fast moving as fish or frog, and easier to find in a waterway, measuring their presence or absence is one good way to measure the quality of the water.

Different types and numbers of macro-invertebrates tend to live in still water compared to those in fast moving water.

### Riffle habitat

Macro-invertebrates are found in greatest numbers in riffle areas because the stones provide places for them to hold onto, to attach their homes and to hide from predators. Also, as the shallow water bubbles over the rocks it absorbs oxygen, so these areas are oxygen-rich environments. The larger the stones, the more invertebrates that can be found because there is more area for macro-invertebrates to attach to, and more bubbling and oxygenation will occur.

Rocks oxygenate the water, provide shelter and trap food for macro-invertebrates. Vegetation provides food and shelter.

### *Life in the fast land*

Small animals living in moving water need be able to hang on so they are not swept away. They often have special hooks or suction-type attachments to hold onto rocks or vegetation. They often have streamlined or flattened shapes. Some build structures to keep themselves in place.

Food is grabbed as it passes by in the water, it is usually not actively chased.

### *A quiet(er) life*

The animals in these quiet waters do not have to hold on all the time. They have to chase their food so need to move more than riffle species. Some have special adaptations to live on the surface, some on the bottom. Some live in the leaf litter around the edges and others burrow into the soft sediment. You often find a wider range of animals in still or slower moving water.

### *Where do they live?*

Water surface  
Water column  
Bottom dwelling

Worms that live in mud need to have ways to cope with the low oxygen levels in the mud. Some aquatic worms have blood pigments that are very efficient at picking up the oxygen that is present.

Another way some animals cope with low oxygen levels is to increase the rate at which oxygen passes over their gills.

