



Victorian Aborigines' uses of water

Key Learning Outcomes

Level 4

SOSE: Place and Space

Analyse how people's beliefs & practices influence the ways they interact with places.

Time, continuity & change

Describe ways of life of people in the past.

Portray an event or occasion from a particular perspective.

Resources

Explain factors that affect resource use & development.

Natural & social systems

Describe responses of different elements (including people) to change in natural systems.

Level 5

SOSE: Place and Space

Explain how peoples' use of natural environments changes over time.

Resources

Describe how resources are owned and accessed.

English

Aims

- to develop understandings about how Aboriginal people in Victoria used waterways and water related resources

Materials

Information sheet 13: Victorian Aborigines' uses of water.

Additional Resources

Australian Heritage Commission
GPO BOX 1567
Canberra ACT 2601
Telephone (06) 271 2111

Aboriginal Affairs
115 Victoria Parade
East Melbourne, 3002
ph (03) 9412 7498

Booklets available from Aboriginal Affairs:
Aboriginal people in the environment.
Anne Brown (Ed.)
32 page booklet \$3.00

Aboriginal uses of water related resources
16 page booklet. \$3.00

Activities

- Students read Information sheet 8: Victorian Aborigine's uses of water. [Or arrange into reading groups, or read out to the class and write key uses on the blackboard.]
- Identify some water related resources used by Aborigines. How did Aborigines manage these resources? Discuss how the availability and location of these resources influenced their lifestyle.
[E.g. They moved to where the resources were when the resources became available.]
- Describe how traditional Aboriginal use of their environment changed over the seasons.
- Students write a short story/essay to convey the ways of life of a traditional Aboriginal family group, especially describing the ways in which they collected, used and managed water and water related resources. OR
- Students write a story describing a particular event relating to water or waterways, e.g. life during a drought or flood.
- Discuss traditional Aboriginal views of waterways and wetlands.

[E.g. Major sources of water, food; as boundaries.]

In what ways are their views different from our views today?

[E.g. Most people today do not view wetlands as important environment for their food, even though we eat fish and shellfish which rely on wetlands such as estuaries.]

Suggest reasons for any differences in views.

[E.g. Most non-Aboriginal people today are less aware of their environment, where their food and water comes from, and the food connection with wetlands and waterways.]

Extension

- Arrange for a local Aboriginal Cultural Officer to meet your class to investigate this topic further.
- Compare traditional Aboriginal and European uses of rivers and wetlands. Discuss how each of their practices affected or influenced these environments.

[E.g. Traditional Aboriginal uses did not involve many major physical changes to rivers or to water flows. European have constructed large dams on rivers and diverted water flows. Some uses such as gold mining physically changed river beds and denuded surrounding vegetation. Irrigation schemes direct water onto land which would not normally receive that quantity of water.]



Victorian Aborigine's uses of water



The Aboriginal or Koori people of Victoria did not need complex water supply or wastewater disposal systems. This is partly because there were not many of them, compared to Victoria's white population after European settlement. The nomadic lifestyle of Koori tribes also had less impact on any one place. They lived in small groups of 10 - 20 adults plus children.

Koori people used Victoria's natural resources for thousands of years, locating major camps close to rivers and lakes. Clan estates often centred on particular water sources such as sections of rivers or waterholes. Rivers sometimes marked tribal boundaries.

Water supplies

Aboriginal people usually relied on creeks and springs, or dug shallow wells to reach underground water supplies.

Wells are fairly rare although they can be found in a wide range of environments throughout Australia. Two types of wells were used by Aboriginal people.

1. *Earth wells or soaks* were cut through the ground to ground water, sometimes in the form of a soak or spring.
2. *Rock wells* were depressions, often quite narrow and deep, which occur in rock and were used as retainers of rainwater and run-off from rock slabs. The holes for the wells were usually natural, but may have been further hollowed out to enlarge their capacity. They sometimes had a stone or bark cap to prevent evaporation.

Uses of water related resources

The river and its environs were sources of food and shelter; along its lengthy course through various kinds of terrain was an abundant diversity of particular foods.

Aboriginal people in 1788 ate a better balanced diet than most European town dwellers of the time.

Based on their traditional division of labour, the men were responsible for hunting and fishing while the women and children gathered 'slow game' - frogs, lizards, snakes and small marsupials - and plant food. For example, the men might trap or spear fish in the river while the women and children collected the new young rhizomes of reeds at the water's edge, or fruits, gum and nectar from riverside trees.

River Red Gums were like the local supermarket because they provided many items.

1. In the hollows were birds and animals such as parrots and possums, which were both food and sources of fur and feathers.
2. They were the source of certain kinds of moth pupae, a soft food sought after for feeding to babies and individuals.
3. Gum or sap was obtained from these trees and used for medicinal purposes.
4. Bark from these trees was used for canoes and for implements like carrying dishes (coolamons) and heath shovels (wangats).

Reeds were used for making spears, baskets and nets. The tubers of some water plants were eaten.

Eels, fish, waterbirds and their eggs were harvested from waterways.

Fish traps were built in both marine and freshwater environments. They were usually made from dry stone walls, topped by wood or reed fences. Aboriginal fish traps are now extremely rare, so it is important that those which remain are looked after.

Aborigines built **mounds** along some floodplains and river courses subject to seasonal flooding. Mounds, up to 5 metres in height and 30 metres in diameter, provided dry living sites near the bountiful waterways.

All Aboriginal sites and artefacts should be respected and should not be disturbed.

European settlement

European settlers did not let the Aborigines continue to use the land for hunting and gathering food and water, so Aborigines had to or were forced to leave their traditional area. European diseases were also a disaster for the Aboriginal people.

Europeans and water in Victoria



European settlement quickly increased Victoria's population. The new settlers brought with them their experiences of living and farming in countries in the northern hemisphere. They did not want a nomadic lifestyle. They created towns and cities, and developed industries, all of which needed water supplies.

Getting water

Early settlers collected water directly from creeks and rivers. This was a necessary but often time consuming task and meant they had to live very near a suitable river that flowed all year round. As the population increased and spread further afield, water carters began collecting water in large barrels to transport on drays or wagons to sell to householders in the town market place or door to door.

Water quality

The European settlers had more wastes to dispose of and these wastes were often put into waterways. Water quality became an issue as the population increased, making the water no longer of drinking quality or in enough supply.

Population growth and changes in water consumption

Student sheet 13B shows Victoria's population growth (from about one million in the late 1880s to over 4 million today) linked to particular events.

More people meant more water was needed for:

- drinking and domestic uses
- growth of water intensive industries such as irrigated agriculture, paper manufacture and water cooling systems for coal-fired power stations.

Continuing growth and development of new industries in the late 1880s and early 1900s meant there was even further demands for water.

Although domestic use is a only small part of Victoria's total water use, it is particularly important because of the need to guarantee its quality and quantity. The amount of water used per person has steadily increased as changes in life-style over the decades have created new demands.

- Flush toilets replaced sanitary cans
- Automatic washing machines were introduced in 1950s
- More recently dishwashers and sink disposal units have further increased water consumption
- Garden use today in Melbourne accounts for 40% of Melbourne's annual domestic consumption.

The largest quantity of water by far is used for irrigated agriculture. This began last century when individual landholders diverted water from rivers and creeks that flowed by or through their properties. Irrigation schemes began in 1889, but most irrigation development has occurred since the 1930s when the amount of water stored in large reservoirs increased.

Today people also have more free time and money for leisure activities. This is placing further demands on water for industrial, domestic and recreational uses.

Changes to waterways since 1800s

Pastoralism, agriculture, gold-mining and urban and industrial developments changed Victoria's land and waterways. Each of these activities created its own demand for water and had its own particular impact on rivers and streams.

- Settlers cleared the native vegetation and drained the wetlands they saw as "useless swamps" or as waterlogged land.
- Wastes were disposed of by throwing or pumping them into waterways.
- Rivers were regulated (dammed) so their water could be controlled for human uses or used to generate electricity.
- Major rivers were often used for transport of goods in the late 1800s and early 1900s.

Forest clearing

Since 1830 about two-thirds of Victoria's forests have been cleared. Forests were cleared to make way for agricultural land and to use the trees as timber and fuel, especially for gold mining activities.

The hard-hooves of the introduced cows, sheep and horses compacted the soil. Just 10 years after the start of pastoralism, timber was in short supply in some areas and some colonists voiced concerns about land slips, dust storms and changes to native flora and fauna.

Clearing often began near waterways. In Victoria's east, clearing began on the river flats of the Mitchell, Avon, Thomson and Macalister Rivers in the 1850s, around the Dandenong Ranges in the 1860s and on the Strezlecki Ranges in the 1880s. Once the best agricultural land had been taken up, settlement and clearing of the Wimmera began in the 1860s then the Mallee in the 1880s. Forest clearing has continued through the 1900s. The clearing and development of the LaTrobe valley coal deposits in the 1920s led to major changes in the area.



Europeans and water in Victoria cont.



Pastoralism especially altered the waterways of:

- the fertile plains and foothills around Melbourne
- the volcanic plains from Colac to Hamilton
- the alluvial plains of the Goulburn River and the Murray River from Echuca to Wangaratta

Mining

The demand for water for industrial processing increased quickly once gold was discovered in 1851. Water was needed for processing the gold. Streams were diverted and water races built over long distances to bring water to gold-production areas. Initially the wastewater and the crushed rock, treatment waste and the sediment it contained were dumped into rivers. Mercury, cyanide and arsenic were used extensively in gold extraction processes and caused serious pollution problems as these minerals are highly toxic to animals and humans. Special government legislation was introduced to deal with the gold-mining waste or 'sludge'.

Giant mechanised bucket dredges began working Victoria's rivers in the early 1900s, turning over huge amounts of alluvium. These dredges caused dramatic changes in river courses and changed stream beds.

Mining has a major impact on waterways in the goldfields regions around:

- Bendigo, Castlemaine, Ballarat and Beechworth.

Water regulation

Since the early days of settlement, landowners have built small dams along drainage lines to catch the water flowing on its way to creeks and rivers. Rivers have been dammed to increase and control the river water supply in that holding area.

Today in Victoria dams vary in size from farm dams to the huge Hume Reservoir, which covers 200 square kilometres. The first major dam, Yan Yean, was finished in 1857 to supply water for Melbourne. Since then 14 more large reservoirs have been built, and two existing reservoirs have been enlarged. The combined effect of hundreds of small farm dams is to greatly reduce the amount of water that flows into waterways in that catchment. Large dams have a major impact on the quantity, timing and temperature of water flowing downstream and so on aquatic life downstream from the dam.

Water controls

Because water is a vital resource that all Victorians need, governments since the early 1800s have been introducing a range of controls to protect water resources and their catchments. These controls have sometimes come after the initial impacts have been made, or only after the cause of the problem has been understood.

Sometimes it is not possible to provide enough water of suitable quality for all the demands of different people, agriculture, industry and the environment. Water controls help to keep a balanced and sustainable water supply for now and the future. Increased water volumes are now being reserved each year for environmental flows, i.e. for the regeneration and maintenance of wetlands and Red Gum forests and woodlands.

Public ownership

In many countries and in some other Australian States, rivers, their banks and the water that flows past them are privately owned. British colonial administration arranged that the Crown (the public) would own some sections of river frontages.

Crown ownership of river banks had many advantages. It allowed public access to rivers for watering of stock and the collecting of water for domestic use. In larger rivers it helped the development of wharves and slipways, allowed for public access to punts and to the bridges that replaced the punts. So in the very early days of the colony, in 1838, land within 400 m of some rivers near Melbourne was reserved as public land by the Crown.

By 1873 the government held all Crown lands within 30 m of the entire length of the Murray, Goulburn, Mitta Mitta, Loddon and Avoca Rivers and all permanent lakes in north-western Victoria, as well as some rivers and creeks in the Wimmera region. In 1881 the government reserved a large number of the remaining river, creek and lake frontages not yet alienated.

The Victorian government at the time considered that, because of the competing demands for a limited supply of water, water should be owned by the public. The Water Act of 1905 gave the Crown the right to use and control water in any watercourse.



Europeans and water in Victoria

Urban issues

More people in Victoria now live in towns and cities than in rural areas. Urban areas with high populations create particular impacts on waterways. Major urban impacts are wastewater (stormwater) and waste disposal, and changes to natural water flows and waterways.

Recreational uses

Today, waterways in Victoria are also used for a wide range of recreational activities including canoeing, rowing, power boating, hunting, wildlife watching, fishing, gold fossicking, gem hunting, sightseeing and swimming.

Water quality

Water quality is lost through:

- the destruction of aquatic habitat
- pollution of water supplies, and
- damage to water storages caused by increased levels of sediment, nutrient and salinity.

Sources: State of Inland Waters Report. 1988.
LCC Rivers and Streams Special Investigation 1989.

Year	Changes
+ 40,000 years ago	Aborigines live in Victoria in a complex, environmentally sustainable hunter- gatherer society.
1830s-40s	European settlement, especially the establishment of pastoral runs, leads to conflict with Aboriginal custodians of water sources and resources linked with these water supplies. Major land changes begin - native vegetation is cleared and hard-hooved animals are introduced.
1840s	Melbourne's population reaches 7,000. Water pumps installed on the Yarra River. Water is collected into watercarts and sold door to door.
1851	The colony of Victoria is established. Gold is discovered in Victoria and mining begins. By 1858 more than 5000 puddling machines are in use in Victoria.
1857	Melbourne's population is now 100,000. Yan Yean Reservoir is built to provide domestic water for Melbourne.
1860s-70s	Exotic fish are introduced into Victoria.
1885	The first irrigation pump begins operation in Victoria.
1888	An irrigation system is designed for Mildura.
1912	Fifty-six bucket dredges work on Victoria's rivers, mostly in the Ovens and Buckland River valleys, looking for gold.
1914	Following a very dry year, it is decided to increase Melbourne's water storage system to cope with droughts and the higher population.
1915	The States and Commonwealth agree to establish a network of locks, weirs and dams on the Murray.
1940	Following a very dry summer, it is again decided to increase Melbourne's water storage system.
1955	Eildon is enlarged, nearly doubling the amount of water stored.
1961	European Carp is introduced into Victoria. It is declared a noxious pest in 1962.
1972	Clearing has removed more than half of Victoria's natural forest cover.
1979	Dartmouth Dam begins to fill, flooding 5,900 ha of forest.
1982-83	Severe drought throughout most of Victoria. Water conservation programs are promoted.
1984	Warnings about mercury contamination of trout in the upper Goulburn River. Melbourne's water storage system is increased again - the Thomson Reservoir is completed.
1987	Saltwatch Program commences.
1993	Waterwatch Community Monitoring Program commences.
1997	The El Nino weather pattern creates drought conditions as part of its regular cycle.



A watery history

1. Read the information sheet and complete this timeline about major events related to Victoria's water supply and waterways.

Year	Changes
+ 40,000 years ago	_____ live a traditional life in Victoria.
1830s-40s	_____ settlement. Major land changes begin - native _____ is cleared and hard-hooved _____ are introduced.
1840s	Melbourne's population reaches 7,000. Water is collected into _____ and sold door to door.
1851	The colony of _____ is established Gold is discovered in Victoria and _____ begins.
1857	Yan Yean Reservoir is built to provide domestic water for _____. Melbourne's population is now 100,000.
1860s-70s	Exotic _____ are introduced into Victoria.
1885	Irrigation _____ in Victoria.
1914	Following a very dry year, it is decided to _____ Melbourne's water storage system to cope with droughts and the higher population.
1940	Following a very dry summer, it is again decided to increase Melbourne's _____ storage system.
1955	Eildon is enlarged, nearly doubling the amount of _____ stored.
1962	European Carp is declared a noxious _____.
1972	Clearing has removed more than half of Victoria's natural _____ cover.
1984	Melbourne's water storage system is _____ again.

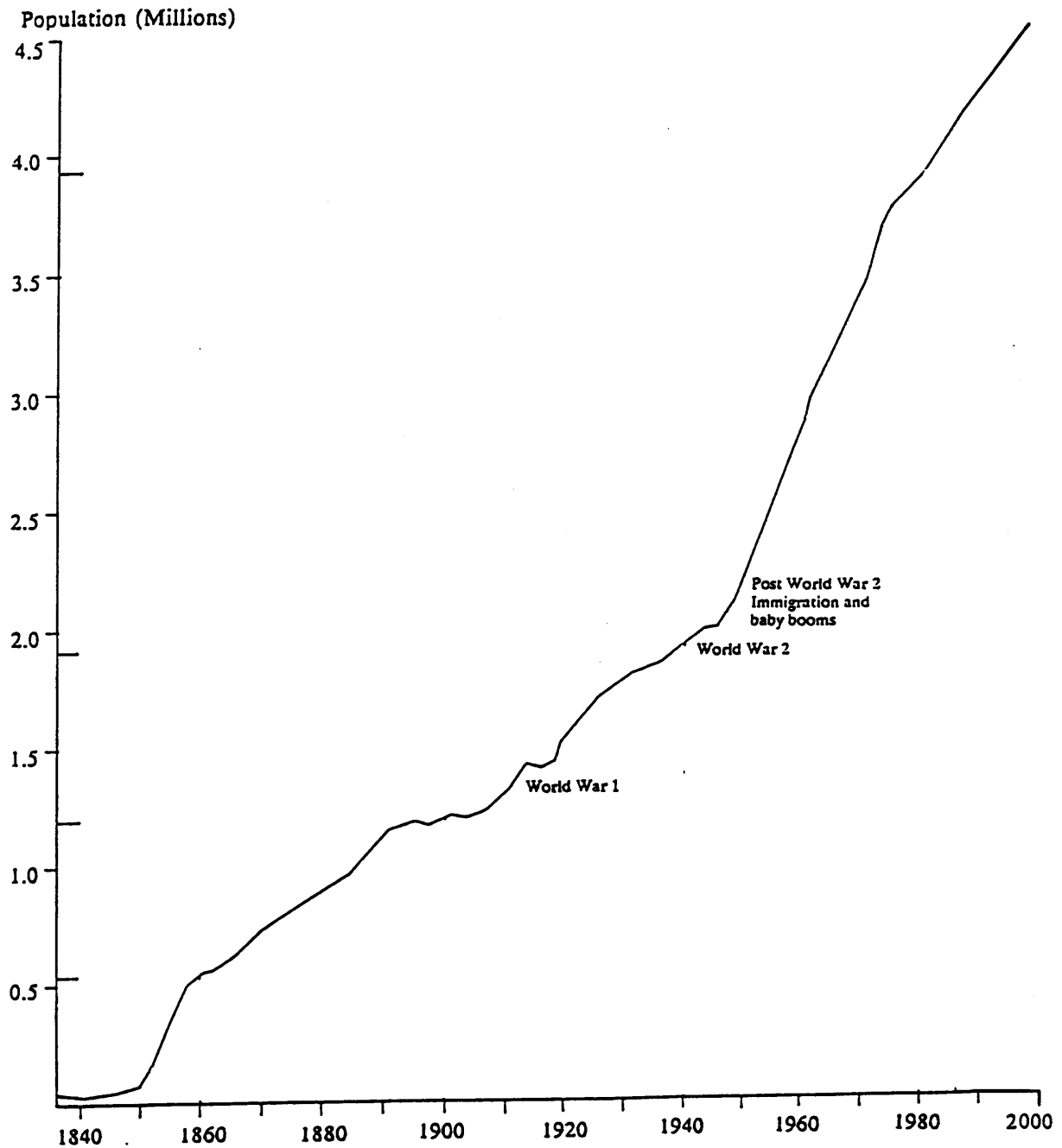
2. Construct a timeline. Annotate the timeline by drawing pictures to illustrate different times or features.





Water use and population

1. Plot major events related to Victoria's water supply and waterways onto this graph of Victoria's population over time. Label these major events on the graph.
2. Write a paragraph to summarise which changes and events have been the most significant for our water supply from 1840 to today.



Victoria's drinking water supply



Key Learning Outcomes

Level 4 SOSE: Resources

Explain factors that affects resource use and development.

Level 5 SOSE: Resources

Describe how resources are owned and accessed.

Maths

Aims:

- to develop understandings of where our tap water comes from and how it gets to our homes.
- to develop understandings of the role of water authorities and of the people of Victoria in maintaining water quality.

Materials

Information sheet 10: Victoria's water supply.

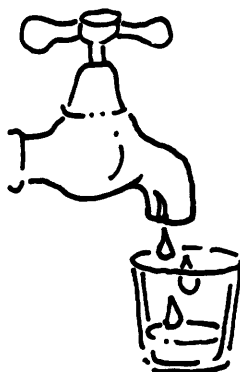
Student sheet 14: Water supply.

Student sheet 6: Victoria's major rivers (map only).

Blackline master 6: Water supply distribution system.

Advanced preparation

- Duplicate the student sheets and blackline masters - one per group or one per student, as required.
- Make an overhead of Blackline master 6: Water supply distribution system or draw on the blackboard.
- Map of local area of a scale to show the location of the water distribution components such as reservoirs, treatment plants, holding basins, etc.



Activity instructions

- Present the scenario to the class that early settlers were faced with: water was not available on tap - it had to be collected from a natural source or purchased by the barrel from water carters. What would life be like today if everyone had to get their water this way?

[Our present lifestyles would not be possible - today's population numbers and the quantity of water used means people would have to spend a large part of the day collecting and carting water. Agriculture and industry would not be able to operate on their current scale. Health risks would be very high for people drinking water from some waterways.]

- The need to supply Victoria's increasing population with a regular good quality water supply led to the development of the current water supply distribution system. Use the overhead of Blackline master 6: Water supply distribution system, or blackboard version to illustrate a typical water distribution system in Victoria.

Explain the names for each component and discuss what happens at each step

[Refer to Information sheet 10: Victoria's water supply system.]

- Distribute the student sheets and blackline master to small groups or individual students as required.
- Students cut out the cards illustrating components of the water supply system and place them in the correct sequence (or draw lines with arrows to show to the correct sequence). Place them in the right order to show how rainwater is carried to our homes.
- Map the major reservoirs onto a copy of Student sheet 6: Victoria's major rivers.
- Where does your water come from? Identify your local water supply and its catchment. Trace your water from tap to source. Name the components (reservoirs, etc) and locations (holding basins, treatment plants) of your local water distribution system. *[Contact your local water authority for this information if needed.]*
- Map and label the components of step 6 onto your local map.
- Identify your local water authority. Identify their role in managing your water supply

[E.g. maintaining all the infrastructure of the water supply distribution system in your area, ensuring that the water supplied is of drinking quality.]



Victoria's drinking water supply cont.



9. Residents and industries pay water rates to the local water authority. Compare fees early settlers paid for carted water and today's water rates. How do they compare in terms of what is provided and the quality of the water?

[We pay less for water today than did early settlers.]

In the 1840s, water was sold door to door from water carts for 3 shillings a barrel, equal to about 30 cents for 550 litres.]

10. Water authorities regularly test water samples from waterways and water storages to monitor water quality. One of the findings from a review of Victoria's water supplies in the late 1980s was that the level of water monitoring needed to be increased. The Waterwatch Community Water Quality Monitoring Program assists water authorities with monitoring water quality in our waterways and develops understandings of how we can lessen our impacts on water quality and waterways.

**Extension ideas**

- Identify and map the route water takes after it leaves your home/school.
- Make up a large wall mural of your catchment (obtain maps, simplify then enlarge these with an OH) and map your water supply onto it. Use blue wool to mark in water pipes and brown wool to mark in sewerage pipes.
OR As a class, create a 3D model of your region showing water holding tanks, reservoirs, rivers, your school.
- Use a map and measurements from the map to calculate how far your water has travelled to reach you.
- Create a graph to show how much water people use water today for different activities
[Use figures from Student sheet 16: A daily chore].
- What is the role of each of the following groups in looking after water quality and quantity in Victoria:
 - land and water management agencies
 - farmers
 - industry
 - townspeople
- Identify what were the most common views about waterways / wetlands and who owns the water in
 - early settlers times
 - around 1900s
 - late 1900s

How did these views at the time influence the use of waterways?

Victoria's water supply system



Water supply distribution

The source of all our tap water is rainwater. Rain flows over catchments and eventually into rivers. But it takes quite a journey from there to get to our taps.

Our present day water supply system is an incredible system of storage reservoirs, underground pipes, pumping stations, pressure reading valves, standpipes, fluoridation and disinfection plants, service basins, and tanks.

Water Authorities operate in different regions of the State and are responsible for providing safe and adequate supplies of water to the people and industries of Victoria.

Storing water

Because rain does not fall at the same rate and time as people use water, we need to store the freshwater that collects in rivers. Dams are built across some rivers to create storage reservoirs. The Hume and Dartmouth Dams are the biggest reservoirs in Victoria but there are over 40 other major water storages in the State.

Getting water to your tap

Getting water from storage reservoirs to your tap involves many steps, a lot of structures and quite a few work men and women.

Here is a typical path water may take:

Water is transported from the storage reservoir to smaller holding basins and then onto smaller service basins or tanks. This is usually by a series of pipelines or open channels placed so the water can flow by gravity to the service basin or tank.

The water is treated to remove sediment, kill any harmful bacterial germs and to add fluoride to help against tooth decay.

Water is piped from the closest service basin or storage tank to your house. There are usually some other steps along the way because some houses are on hills while others are in valleys, but they all want water at the same pressure. Pumping stations, standpipes and pressure reducing valves are therefore placed along the way where needed to increase or decrease the water pressure.

The amount of water used in your house is measured by a water meter. This is usually placed where the pipe enters your property.

In country areas where there are no water pipes laid, people rely directly on rainwater which they collect from their roof and store in water tanks.

Terms

Trunk mains

Larger diameter pipelines which deliver water from one major component of the water supply system to another, e.g. from source to water treatment plant, or from water treatment plant to service reservoir.

Reticulation mains

Relatively small diameter water pipes which carry water from the main trunks or service storages to individual houses.

Pumping station

A building with equipment which pumps water from a low lying area to a higher area.

Pressure reducing valve

A device which reduces the pressure in water pipes in low lying areas.

Service basin

An artificial structure, usually close to the areas they supply, filled with water from a reservoir. They store water for times of high demand.

Treatment Plant

A building where i) small amounts of chemicals are added to the water to kill any harmful bacterial germs, ii) water is filtered to remove sediment and make the water clear iii) small amounts of fluoride may be added to water.

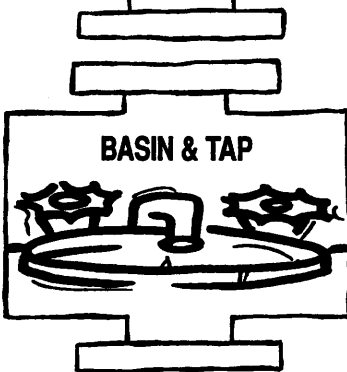
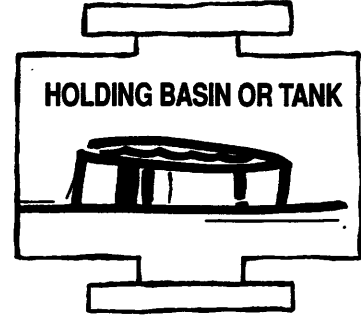
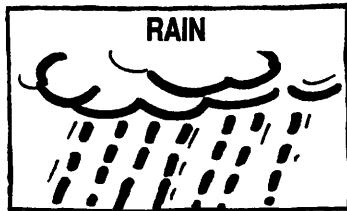
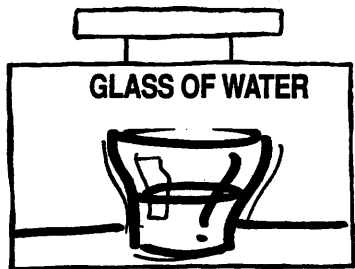
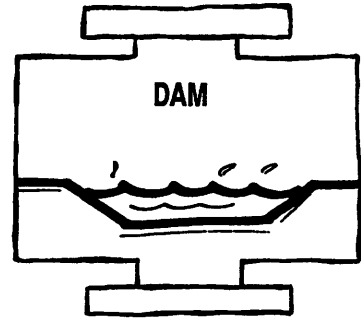
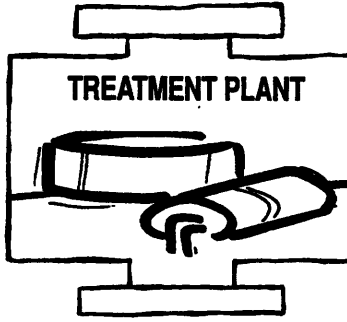
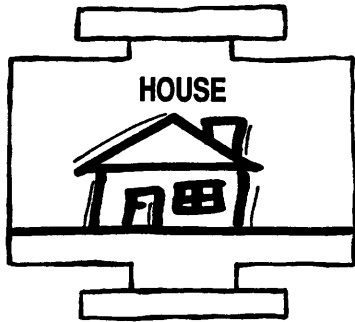


Water supply



Activity instructions

1. Cut out these parts of the water supply system. Place them in the right order to show how rainwater is carried to your home.

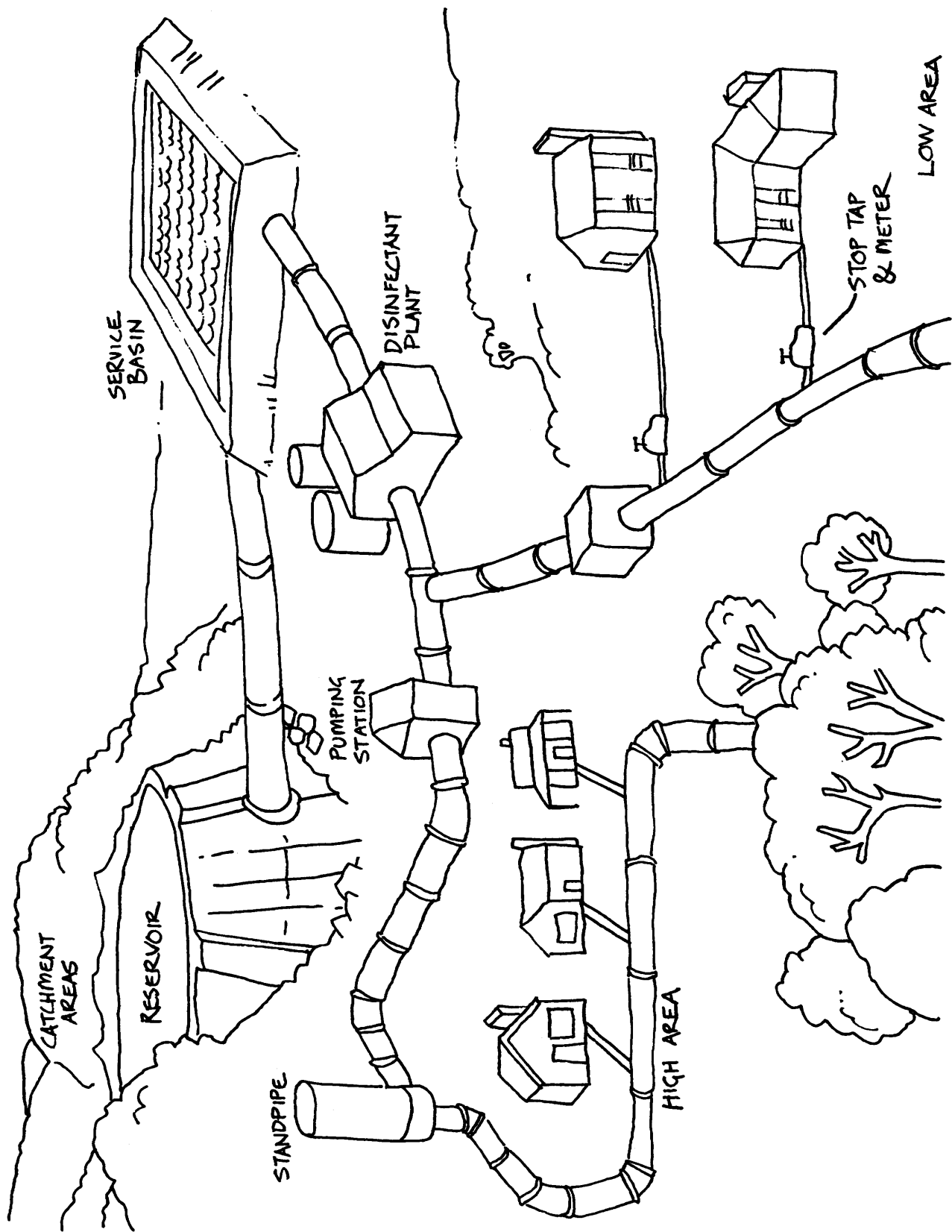
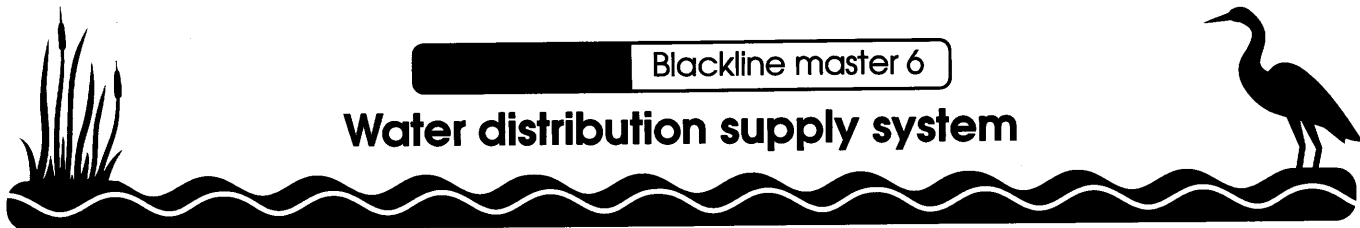


2. If you live in or visited these towns, where would your water come from?
Complete the table to name the reservoir that supplies the town, and the river that supplies the reservoir.

From river to town

Town	Reservoir	River
Bendigo		
Healesville		
Geelong		
Kerang		
Marysville		
Mt Beauty		
Traralgon		
Wangaratta		

Water distribution supply system





Uses of water

Key Learning Outcomes

Level 4 SOSE: Time, continuity and change

Describe ways of life of people in the past.

Level 4 SOSE: Resources

Explain factors that affects resource use and development.

Level 5 SOSE: Resources

Describe how resources are owned and accessed.

Level 5 SOSE: Place and space

Explain how peoples' uses of natural environments changes over time.

Aims:

- to identify different uses of water
- to compare peoples' uses of water in Victoria over time

Materials

Student sheet 15: Uses of water.

Advanced preparation

Duplicate required numbers of Student sheet 15.

Activity instructions

1. Use the illustrations to compare the ways people collected and used water at different times in Victoria's history: pre 1800s, mid 1800s, mid to late 1900s.
[Enlargements of the illustrations could be held up as cue cards for the students, building up a scene for each time period].
2. Distribute Student sheet 15: Uses of water. Students cut out the cards and place them in the correct time period. Summarise the typical water and river uses for each period.
3. As a class, make a list of all the ways that water is normally used at your school. Extend the list by adding to it the ways that water is used in your town, then in your region.
4. For each time period, compile a list of the ways that water was/is needed and estimate the comparative amounts of water needed for each.
[E.g. low, moderate, large quantities.]
5. Discuss this as a class.
[Four major reasons for the greatly increased demand on water are:
 - greatly increased population
 - irrigation
 - increased industry
 - Increased use by each person.]
6. Write a short story describing the uses of water and rivers during each of these times.


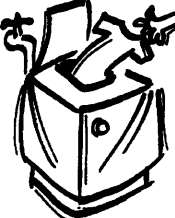



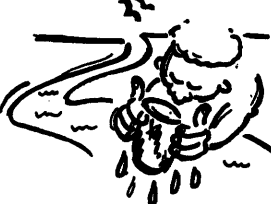





E.g.

pre 1800s	mid 1800s	mid to late 1900s
drinking water at river	drinking water in barrel or water cart	tap with glass
bathing in river	bathing in tub	showering
	washing clothes in river or	washing clothes in washing machine
	factory pumping water from & into river	factory not near river, on mains and sewerage system
river scene with no cattle/sheep	river scene with cattle/sheep	irrigation channel with many cattle/sheep
people fishing	many people fishing	No Fishing sign
river scene with no industry	industries pouring wastes into river	industries with water treatment facilities, releasing purified water back into the river

Adapted from Water supply activities in *The Water Cycle*. Barwon Water. 1997.

Uses of water

1. Cut out the individual illustrations and text blocks about water and river uses.
2. Place them in their right time period, under the headings: Pre 1800s times, Mid 1800s, Mid to late 1900s.

		<p>many people fishing</p>
		<p>MARKET SQUARE</p> 
<p>factory pumping water from & into river</p>		
<p>industries with water treatment facilities, releasing purified water back into the river</p>		<p>factory not near river, on mains and sewerage system</p>
		<p>one person fishing</p>
	<p>No Fishing sign</p>	<p>industries pouring wastes into river</p>



A daily chore

Key Learning Outcomes

Level 4 SOSE: Time, continuity and change
Describe ways of life of people in the past.

Portray an event or occasion from a particular perspective.

Maths, English

Aims:

- to demonstrate the difficulty of obtaining water for daily use in settlement times
- to develop an appreciation of today's water supply system
- to apply maths skills

Materials

Student sheet 16: A daily chore.

Buckets.

A hose if necessary for the outside tap.

Inflatable wading pool.

Advanced preparation

1. Duplicate Student sheet 15: A daily chore, or write the table onto the blackboard.
2. Locate an outside tap in your school grounds a suitable distance from your school building to require the students to walk a noticeable distance carrying the water.
3. Place the wading pool just outside the building.

Activity instructions

1. Distribute Student sheet 15, if required.
2. Explain that each person needs 2 litres of drinking water per day.
3. Briefly mention the other types of water uses listed in Table: Water quantities for everyday living.
4. Ask students to calculate the amount of drinking water needed for one day for your class.
[E.g. $30 \times 2 \text{ litres} = 60 \text{ litres}$.]
5. Students then calculate the amount required per day for the class if every one was going to have a bath.
6. Explain that the class is now going to collect the drinking water they need for the day just as people had to do in early settlement times. The tap outside will represent a river or water cart - there were no taps back then.
7. Organise the students to carry that amount of water from the tap to the wading pool just outside school building.

[Water is heavy but carrying water was a necessary chore in earlier times.]

8. Compare this quantity of drinking water to the amount that would have to be carried if every student was going to have a bath.

[Twice as much as they have just carried would be needed to fill a bath for just one person.]

9. Discuss whether the quality of today's tap water would be any different to river or carted water last century.

[A major feature in today's system is that water is treated to make sure it is safe to drink.]

10. Discuss how easy or difficult it would have been for people to have a bath every day in earlier times.

11. Ask students to suggest ways that their daily water requirement could be reduced if they had to carry all their water.

12. Discuss water conservation activities for today's world.

[Having short shower instead of bath, not leaving tap running while washing your hands or cleaning teeth, making sure taps are turned off, making sure the dishwasher has a full load if you use it].

13. Bucket the water from the wading pool to water trees around the school grounds rather than pouring it down the drain.

14. Back in class, or for homework, ask students to imagine they are living in Victoria in the mid 1800s. One of their chores each day is to collect water for your family. They are to write a short essay or story about this task in their day.

15. Students share their stories, then in small groups discuss what it is they value about today's water supply. Share these as a class.

16. Students use the information in the population table to write a paragraph describing how and why water use changed from pre European settlement to the mid 1800s. Discuss as a class.

[E.g. More demand for water because of many more people, many introduced livestock, and the more water consumptive way of life of Europeans not used to living in a drier climate.]

Extension

Water conservation activities.

Although water is now on tap in our homes, there is still a limited supply of water to meet all our needs and that of the environment.

1. Discuss the above with students, or have a class debate "There is enough water for all".
2. Make a list of water conservation ideas.
3. List things we can all do at school and home to help water quality.

[Based on Daily Chore activity, *Teaching About Water*. USA Dept Interior Texas. 1980.]



A daily chore cont.



Water quantities for everyday living

Daily drinking water	2 litres per person
Bath	120 litres
Shower	14 litres a minute
Toilet	5.5 litres (half flush) 11 litres (full flush)
Washing hands under running tap	5 litres
Cleaning teeth under running tap	5 litres
Washing dishes in sink	10 litres
Automatic dishwasher	30 litres
Washing clothes in tub	50 litres
Automatic washing machine	150 litres a load

Activity instructions

1. Calculate the amount of drinking water needed for one day for your class.

2. Calculate the amount required per day for the class if every one was going to have a bath.

3. List some ways that you could reduce you daily water requirement.

4. List some ways you could help water quality.

Population of Victoria

	Number of Kooris	Number of Europeans	Number of hard-hooved livestock
Pre settlement	50,000 (estimate)	0	0
1851 (15 years after settlement)		77,345	391,000 cattle 6,590,000 sheep

Source: *State of the Environment Report 1988. Victoria's Inland Waters.*
Office of the Commissioner for the Environment. Government of Victoria.

5. Use the information in this table to write a paragraph or two describing how water use changed from pre European settlement to the mid 1800s (Clue: consider the quantity needed and how it was obtained). How did these changes affect the rivers?

Impacts on Victoria's waterways



The quality of water within a river basin is influenced by the local climate, the geology of the catchment and human activity.

The state of the rivers

European settlement has probably altered our waterways more than any other landscape feature:

- riverbank vegetation had been cleared
- hard-hooved stock have trampled bank sides
- exotic plants and animals have invaded river waters
- the physical conditions and form of streams have been modified
- wetlands have been drained and lost.

As a consequence of settlement, few of Victoria's catchments and their waterways remain in a natural, undisturbed state. Those that do are mainly in the mountainous, forested areas in Victoria's far north-eastern and far south-eastern catchments. In general the natural water quality in creeks and rivers is better in the east of the State than the west because more of East Gippsland is still forested. The quality of water in a river is generally higher in the upper reaches of the catchment. The river's water quality generally falls as the river flows downstream into the valley where it suffers the cumulative effects of naturally occurring and human influences.

The most severe river degradation has occurred in the State's central, north-western and south-western regions which are heavily cultivated for agriculture. The reduced quality of water and loss of their aquatic plant and animal life in these region's rivers is caused by:

- high levels of turbidity
- high levels of nutrient contamination
- high levels of salinity
- loss of riverbank vegetation
- streambank erosion.

The lack of water quality data is a major concern. Not enough monitoring occurs to identify existing water quality conditions and consequently the longer term trends for Victoria's waterways and wetlands.

Clearing of vegetation

Victoria's native vegetation is adapted to the region's physical and climatic conditions. This plant cover protects the soil from the impact of rain, traps sediment in run-off, reduces run-off, conserves soil moisture, and suppresses watertables through plant transpiration.

The impact on waterways of clearing native vegetation includes:

- erosion
- changes to water flow, including increased chances of flooding
- physical changes to a river's shape and form
- increased amounts of nutrients and sediment in the water
- increased levels of salt in surface and ground water
- removal of habitat and food and impacts of contaminants for native aquatic life
- the loss of wetland plants and the animals that depend on them

Erosion is the single most devastating impact of European land use on the quality of the aquatic environment.

Wetlands

More than 30% of Victoria's natural wetlands have been lost.

Wildlife

Native fish species especially have been adversely affected by human activities. Two species are extinct in Victoria. Of the remaining 44 fish species, 31 are endangered, vulnerable, restricted in distribution or of uncertain status.

Drinking water

Throughout the State, drinking water quality generally fails to meet World Health Organisation (WHO) bacteriological guidelines (commonly regarded as among the most stringent available). Rural drinking water is of particular concern. Melbourne's drinking water is relatively good quality - it meets the guidelines of the Australian Water Resources Council/National Health and Medical Research Council (AWRC/NHMRC), although still fails to meet more stringent WHO guidelines.

Sources: *State of Inland Waters Report*. 1988.
LCC Rivers and Streams Special Investigation 1989.

Spot the differences



Key Learning Outcomes

Level 4 Science: Living together

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

Biodiversity, change and continuity

Suggest why some species have become extinct.

SOSE: Place and Space

Explain different views of individuals & groups about issues related to the care of places.

Natural & social systems

Describe responses of different elements (including people) to change in natural systems.

Level 5 Science: Living together

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

SOSE: Place and Space

Compare natural and human environments and describe factors affecting them.

Explain how peoples' use of natural environments changes over time.

Health & Physical Education; Arts, English

Aims

- to develop visual skills in interpreting river quality
- to develop understandings of impacts on waterways
- to stimulate ideas about what can be done to improve river habitat and water quality

Materials

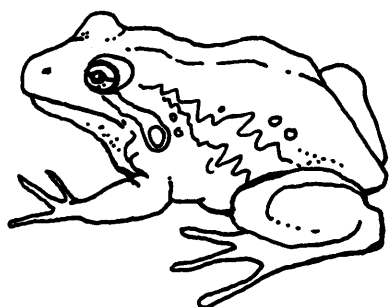
Blackline master 7A: Spot the rural differences.

Blackline master 7B: Spot the urban differences.

Blackline master 7C: Spot and Match cards.

Advanced preparation

1. Duplicate the required numbers of Blackline masters: 7A and 7B.
2. Duplicate the required numbers of Blackline masters: 7C, and cut up the cards.



Activity instructions

1. Working in small groups, students carefully review the 'How it was' and 'How it is' scenes. in Blackline master 7A: Spot the rural difference and/or Blackline master 7B: Spot the urban difference. They list the main differences between the waterway in the 'How it was' and 'How it is' scenes.
2. Compile a class list of these changes.
[Blackline master 7C provides sample answers.]
3. Distribute a set of Blackline master 7C cards to each group. Students match the cards to the correct 'How it was' and 'How it often is now' periods, and/or to 'Cause and effect' and/or to 'Actions to restore water quality and streamside habitat'.
OR
4. Students write a paragraph (or make a verbal presentation to the class) to describe why the river scene has changed after European settlement.
5. Compile a class list of possible reasons for these changes.
[Blackline master 7C provides sample answers.]
6. Students discuss and match the causes and effects of river pollution and habitat changes.
[Blackline master 7C provides sample answers.]
7. Review these as a class.
8. After reviewing the 'What we can do' and 'The future' scenes, list the ways the river has been improved. List the activities that people have undertaken to improve the degraded river.

Note

These Blackline masters can be used again in activities 24 and 25.

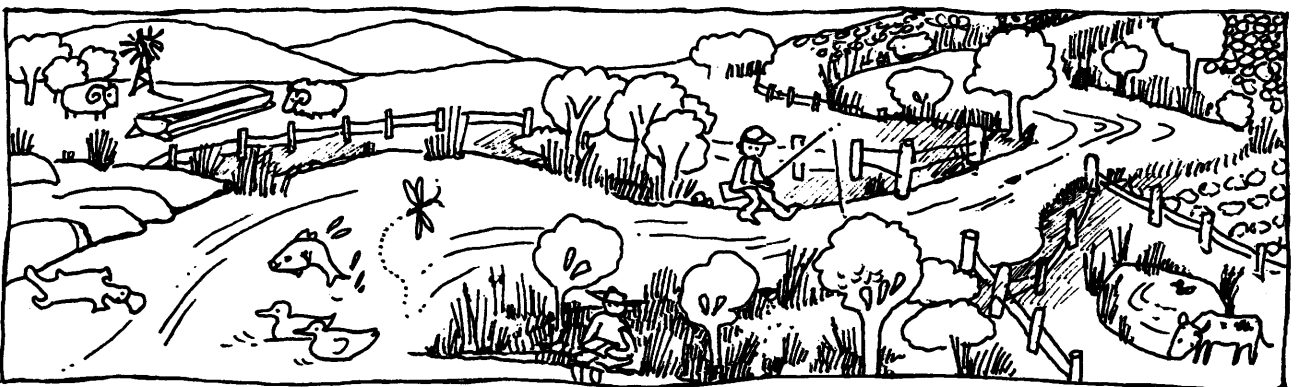
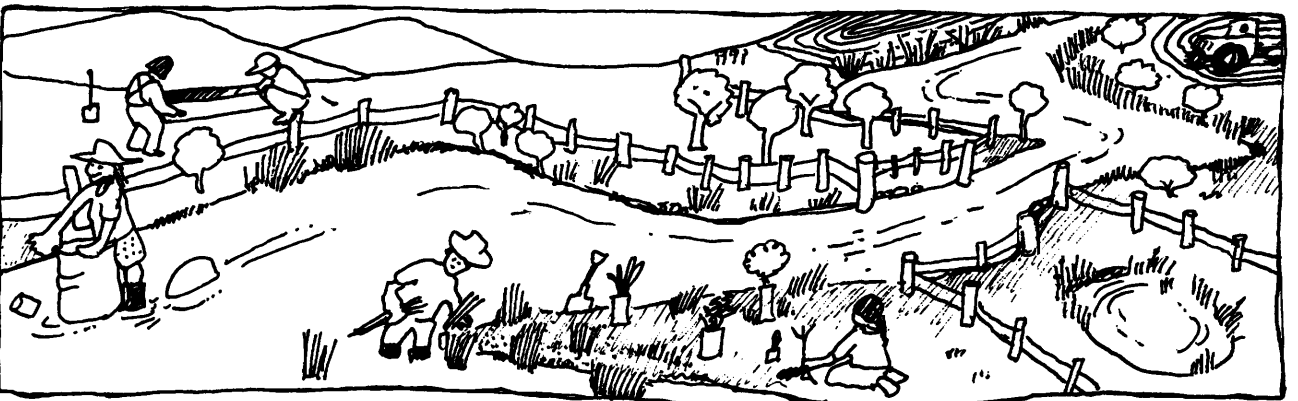
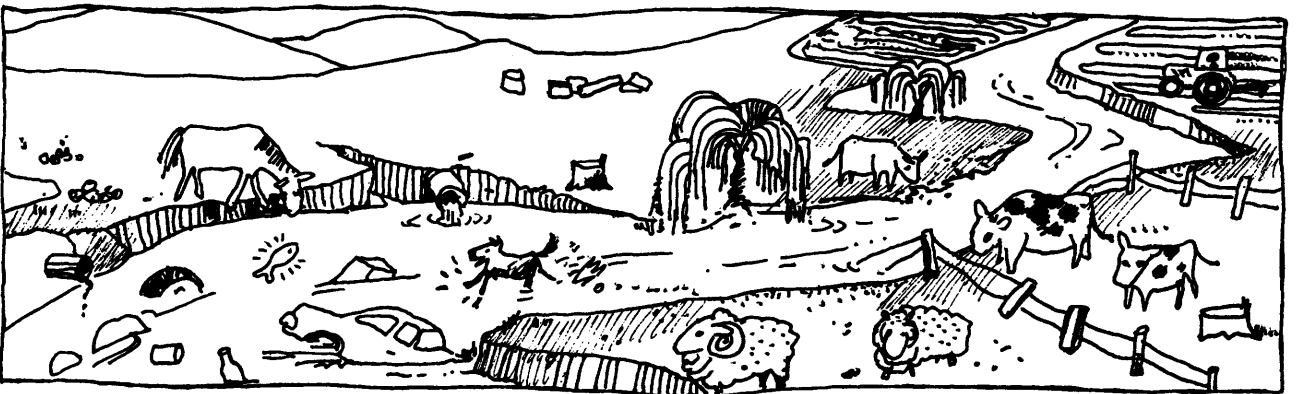
Extension ideas

Use Blackline masters 7A and 7B to stimulate student presentation, essays or art on:

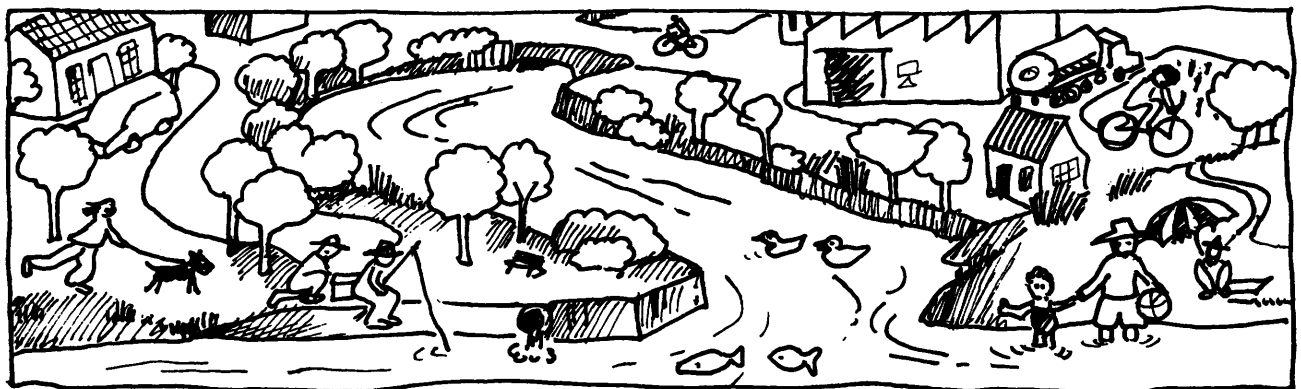
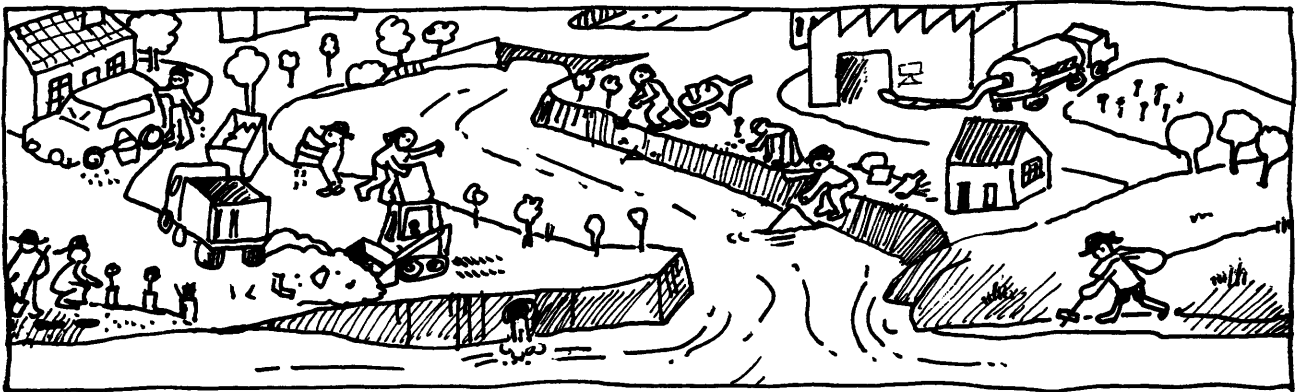
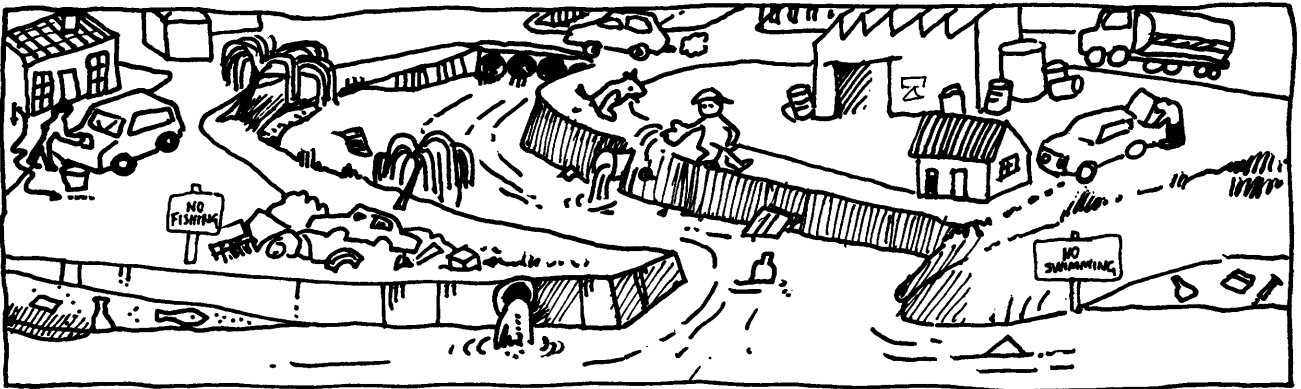
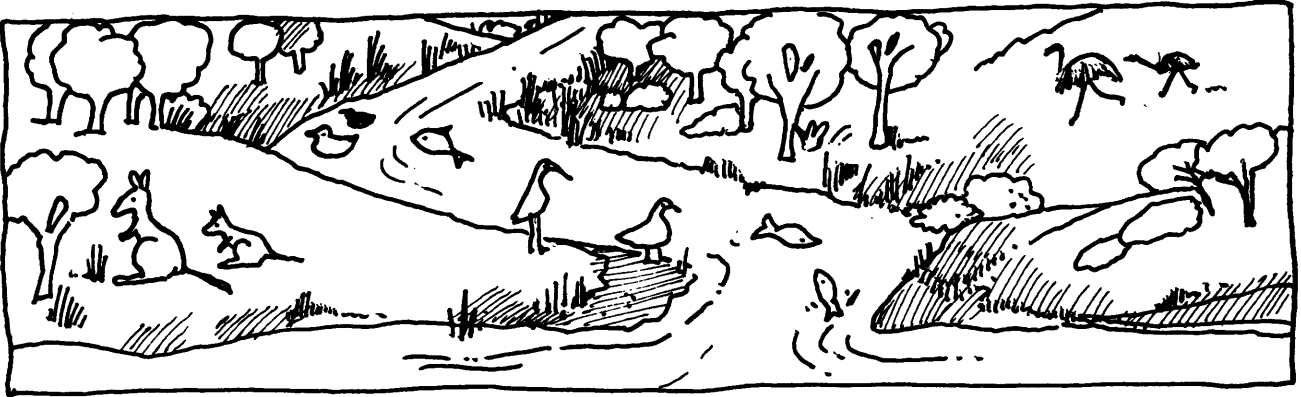
- Impacts on waterways and why they have caused some species to decline or become extinct.
- Different attitudes held by people about waterways at different times.



Spot the rural differences



Spot the urban differences



Spot and Match cards



	'How it often		The future' Restoring water quality and
<ul style="list-style-type: none"> River banks covered with native vegetation. 	<ul style="list-style-type: none"> Riverbanks bare and eroding. 	<ul style="list-style-type: none"> Eroding riverbanks means more soil enters the river, muddying the water. 	<ul style="list-style-type: none"> Replanting streamside vegetation including native trees, shrubs, grasses, rushes, sedges and reeds.
<ul style="list-style-type: none"> Many native animals; no sheep, cattle, dogs, cats. 	<ul style="list-style-type: none"> Many sheep, cattle, dogs, cats; Few native animals. 	<ul style="list-style-type: none"> Large numbers of livestock with unlimited access to the river means: <ol style="list-style-type: none"> riverbank vegetation is eaten or trampled, increasing erosion and muddying the water their manure adds too many nutrients to the river. Dogs, cats and foxes disturb and eat native animals. 	<ul style="list-style-type: none"> Fencing livestock from unlimited access to rivers. Providing water troughs instead of allowing livestock access to the river.
<ul style="list-style-type: none"> No rubbish in river. 	<ul style="list-style-type: none"> Rubbish in, and flowing into river. 	<ul style="list-style-type: none"> People throwing rubbish directly into rivers or places where it washes into rivers. Plastics can take over 100 years to decompose. Throughout this long period they are a danger to aquatic wildlife that may mistakenly eat it or become caught in it. Dumped cars leak oil and petrol into the water. 	<ul style="list-style-type: none"> Cleaning existing rubbish out of waterways and away from streamside areas. Preventing rubbish from entering waterways.
<ul style="list-style-type: none"> No pollutants in river. 	<ul style="list-style-type: none"> Pollutants wash into stormwater drains or directly into waterways. 	<ul style="list-style-type: none"> Cars parked on bitumen allow oil or cleaning detergents to run into waterways. Wastes from factories drain into waterways. 	<ul style="list-style-type: none"> People park their cars on grass when washing them and stop car oil leaks. Factories have their wastes carted away to treatment sites and/or discharge their wastes into the sewerage system or treat themselves on site.
<ul style="list-style-type: none"> Very little farming. 	<ul style="list-style-type: none"> Intensive, European style farming. Farmer ploughs 	<ul style="list-style-type: none"> right to river bank and does not follow contours, so encourages soil to wash into waterways. 	<ul style="list-style-type: none"> Farmer reduces erosion by ploughing along contour lines and planting streamside vegetation to reduce runoff into the river.
<ul style="list-style-type: none"> Few barriers to river flows. 	<ul style="list-style-type: none"> Many reservoirs and dams. 	<ul style="list-style-type: none"> Dams restrict the flow of water, changing river volumes from what they would have naturally been in summer and winter, and change water temperatures. 	<ul style="list-style-type: none"> Some water from reservoirs allocated to maintain environmental flows. Fish ladders installed in reservoir walls.

