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How to use this kit



This education kit provides information on water quality related issues and over 30 activities for upper primary and lower secondary level students. It accompanies *A Community Water Quality Monitoring Manual for Victoria* and is part of the Waterwatch program.

This unit of study provides schools with the means of teaching a coherent coverage of water quality within the Curriculum and Standards Frameworks (CSF) key learning requirements for Levels 4 and 5 Science and Studies of Science and Society (SOSE).

The materials have been designed and presented so that they can be used individually, as sub-units of study, or sequentially as part of the full unit of study.

Waterwatch Victoria

Waterwatch Victoria is part of a national community water quality monitoring program which began in 1993. Water is our most valuable renewable resource - we cannot live without it. Yet water quality is declining in some areas of Victoria as a result of land management practices, urban, industrial and rural development and the clearing of native vegetation. The Waterwatch program provides techniques for measuring and assessing the health of our waterways and catchments. This knowledge can guide us to take appropriate actions to improve those waterways identified as having fair, poor or degraded water quality, and to maintain the health of those with excellent and good water quality.

Barwon Water

Barwon Water is Victoria's largest regional water authority. It is responsible for the supply of fresh water and removal of waste water for over 250,000 Victorians living in the south-west. In addition, Barwon Water has a commitment to environmental enhancement with a particular focus on waterways' health.

By improving the health of waterway we improve the quality of the water reaching our water storages. This in turn means that the water needs less treatment before it is piped to households, farms and businesses. These cost savings can then be passed onto all these consumers.

Barwon Water believes the Waterwatch Program alerts school children and community groups to water quality issues and empowers the community to make a positive contribution to the improvement of our living environment through water quality improvement actions.

Ford Motor Company

The Ford Motor Company, as a major stakeholder in Geelong and a significant water consumer, has a commitment to the social well-being of the people of the region and to the region's environment.

Ford is pleased to demonstrate this commitment through sponsorship of the Waterwatch Education Kit and believes this education resource will stimulate enquiring minds, and equip them with strategies to enhance our lives.



The Waterwatch Education Kit



The first step in the process of improving and maintaining Victoria's waterways and wetlands is to understand how human activities are affecting them. The second step is to become part of the Waterwatch program and monitoring a local waterway. The third step is to take appropriate action to help look after your particular monitoring site.

Curriculum and Standards Frameworks (CSF)

This kit helps you with all three steps as well as fulfilling learning requirements from the Curriculum and Standards Frameworks. It provides learning experiences that apply science skills and knowledge to a real life practical application.

CSF Learning Areas for Levels 4 and 5 Science and Studies of Science and Society (SOSE) are identified for each activity in the Kit.

The kit contains a full unit of study covering 3 topics:

1. Understanding water quality and aquatic ecosystems
2. People and water
3. Looking after waterways and our catchment.

Teachers can teach the whole unit, or select topics or individual activities, according to their needs.

These activities can of course be modified by teachers to apply to other age levels. They allow skills to be applied or provide ideas for similar topics covered in other subject areas such as:

- Technology
- Mathematics
- Health & Physical Education
- Geography
- History
- English
- The Arts.

Kit organisation

The tabs divide the Kit into three sections.

Introduction

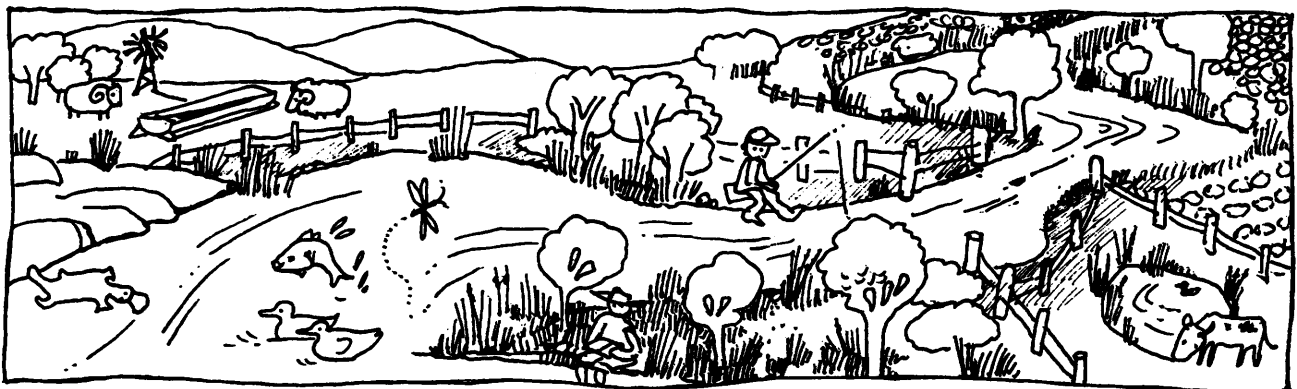
the educational background information for the Kit

Statewide

information and activities of Statewide relevance and application

Regional

information and activities specific to a particular Waterwatch Catchment Region. In this first edition of the *Waterwatch Education Kit*, the regional section covers the Corangamite Catchment region.



Scientific skills

Biological knowledge has been built up over the centuries on the firm base of direct observations and the careful recording of these observations.

The scientific process also often involves conducting experiments. Experiments need to be conducted so that only one factor at a time is varied. This allows the effects of changing that factor (called a variable) to be tested. A **variable** is anything that can differ in an experiment and so affect the outcome, e.g. temperature, light intensity, length of time.

A **control** is needed from which comparisons can be made. For example, in an experiment to test the affect of fertiliser of water, the control would be the jar that has no fertiliser added. The effect of fertiliser can be determined by seeing what happens in the jar with fertiliser added compared to what happens in the control jar that had no fertiliser added. Remember, both control and variable jar must be the same size and type, and both placed in identical situations for the same length of time.

Properly controlled experiments do not have just a single test and a single control as the one test result may be an atypical result. In the scientific process it is best to have **duplicate** or **multiple** test and control specimens and average the results of each before comparing the test to the controls' results.

Median or average figure?

When comparing and analysing some of the water quality readings taken over time, it is best to take the **median** rather than the **average** figure.

The median is the middle figure in a range of figures.

Example

	Test 1	Test 2	Test 3	Test 4	Test 5
Temp.	12°	13°	14°	15°	32°

Average = the sum of all 5 figure divided by 5 = 17.2°

Median = the middle figure (3rd) between 12° to 32° = 14°

For many Waterwatch monitoring tests, the median is a more accurate representative figure because an occasional atypically high or low reading will make the averaged figure too high or low.

The activities in this Kit, and the Waterwatch monitoring program, help students develop skills in:

- **observation**
- **recording**
- **conducting experiments**
- **interpreting and analysing results**
- **drawing conclusions from their findings**

Teacher notes for conducting experiments

When conducting the experiments in this Kit, make sure all the small groups:

- use the same size and type of jars or containers
- place all their jars or containers in identical situations (i.e. all left for the same length of time, all placed where they receive the same amount of sunlight)

If when you conduct the experiments in this Kit, you observe no changes, you could try changing one of the variables, e.g.

- extend the experiment time by leaving all the jars for a longer period to see if any results are then observable OR
- conduct the experiment again but increase the amount of the variable (e.g. add a larger quantity of fertiliser) OR
- place all the jars in a sunnier position OR
- use pond or creek water rather than tap water (tap water is treated water)

In some experiments, you may want to try reducing the amount of the added pollutant to be able to observe more subtle differences between different types of pollutants (e.g. if the algae growth is too rapid, add less than the suggested amount of fertiliser).





CSF matrix for Statewide section

Each of the following Teacher sheets listed in the matrix has accompanying Student activity sheets, and in some cases, Information sheets.

Science Level 4

Living together

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

Teacher sheet 1: The story of a river

Teacher sheet 2: Water: who needs it?

Teacher sheet 3: Introducing water quality

Teacher sheet 4: Measuring water quality

Teacher sheet 5: Interpreting sample data

Teacher sheet 6: Victoria's major rivers

Teacher sheet 7: River habitats

Teacher sheet 8: Life in our waterways

Teacher sheet 9: Freshwater macro-invertebrates

Teacher sheet 10: Choking our waterways

Teacher sheet 11: Please don't feed the river

Teacher sheet 17: Spot the differences

Teacher sheet 18: Mapping your catchment

Teacher sheet 19: One plus one plus . . .

Teacher sheet 20: The platypus

Teacher sheet 21: Monitoring with Waterwatch

Teacher sheet 22: Interpreting your results

Teacher sheet 24: Local action to improve stream habitat

Teacher sheet 25: A local action for water quality

Structure and function

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

Teacher sheet 8: Life in our waterways

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

Teacher sheet 8: Life in our waterways

Biodiversity, change and continuity

Suggest why some species have become extinct.

Teacher sheet 17: Spot the differences

Identify current endangered species and examine strategies to conserve them.

Teacher sheet 23: Introduced impacts





Science Level 5

Living together

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

- Teacher sheet 1: The story of a river
- Teacher sheet 4: Measuring water quality
- Teacher sheet 5: Interpreting sample data
- Teacher sheet 7: River habitats
- Teacher sheet 8: Life in our waterways
- Teacher sheet 10: Choking our waterways
- Teacher sheet 11: Please don't feed the river
- Teacher sheet 12: Oxygen and water quality
- Teacher sheet 17: Spot the differences
- Teacher sheet 18: Mapping your catchment
- Teacher sheet 19: One plus one plus . . .
- Teacher sheet 20: The platypus
- Teacher sheet 21: Monitoring with Waterwatch
- Teacher sheet 22: Interpreting your results
- Teacher sheet 23: Introduced impacts
- Teacher sheet 24: Local action to improve stream habitat
- Teacher sheet 25: A local action for water quality

Structure and function

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

- Teacher sheet 8: Life in our waterways

Biodiversity, change and continuity

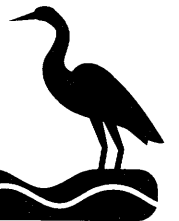
Identify features of living things that determine their classification into major groups.

- Teacher sheet 8: Life in our waterways
- Teacher sheet 9: Freshwater macro-invertebrates



SOSE Level 4

<p>Time, continuity and change <i>Describe ways of life of people in the past.</i></p> <p>Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 16: A daily chore</p> <p><i>Portray an event or occasion from a particular perspective.</i></p> <p>Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 15: Uses of water Teacher sheet 16: A daily chore</p>	<p>Place and space <i>Analyse how people's beliefs and practices influence the ways they interact with places.</i></p> <p>Teacher sheet 13: Victorian Aborigines' uses of water</p> <p><i>Explain the different views of individuals & groups about issues related to the care of places</i></p> <p>Teacher sheet 17: Spot the differences</p>	<p>Resources <i>Explain factors that affect resource use and development.</i></p> <p>Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 14: Victoria's drinking water supply Teacher sheet 15: Uses of water Teacher sheet 21: Monitoring with Waterwatch Teacher sheet 22: Interpreting your results Teacher sheet 25: A local action for water quality</p>	<p>Natural and social systems <i>Describe responses of different elements (including people) to change in natural systems.</i></p> <p>Teacher sheet 1: The story of a river Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 17: Spot the differences Teacher sheet 21: Monitoring with Waterwatch Teacher sheet 22: Interpreting your results Teacher sheet 23: Introduced impacts Teacher sheet 24: Local action to improve stream habitat Teacher sheet 25: A local action for water quality</p>
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SOSE Level 5

<p>Time, continuity and change <i>Portray an event or occasion from a particular perspective.</i> Teacher sheet 23: Introduced impacts</p>	<p>Place and space <i>Compare natural and human environments and describe factors affecting them.</i> Teacher sheet 1: The story of a river Teacher sheet 17: Spot the differences Teacher sheet 18: Mapping your catchment Teacher sheet 21: Monitoring with Waterwatch Teacher sheet 22: Interpreting your results Teacher sheet 24: Local action to improve stream habitat Teacher sheet 25: A local action for water quality <i>Explain how peoples' use of natural environments changes over time.</i> Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 17: Spot the differences Teacher sheet 15: Uses of water <i>Evaluate individual and group views on issues related to management of environments.</i> Teacher sheet 23: Introduced impacts Teacher sheet 24: Local action to improve stream habitat Teacher sheet 25: A local action for water quality</p>	<p>Resources <i>Describe how resources are owned and accessed.</i> Teacher sheet 13: Victorian Aborigines' uses of water Teacher sheet 14: Victoria's drinking water supply Teacher sheet 15: Uses of water</p>	<p>Natural and social systems <i>Compare features of natural systems.</i> Teacher sheet 6: Victoria's major rivers Teacher sheet 7: River habitats</p>
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CSF matrix for Corangamite section

Each of the following Teacher sheets listed in the matrix has accompanying Student activity sheets, and in some cases, Information sheets.

Science Level 4

Living together

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

Teacher sheet 3: Your local catchment

Teacher sheet 4: Monitoring Corangamite's waterways

Teacher sheet 5: Corangamite Region sample data

Teacher sheet 6: Catchment condition report

Science Level 5

Living together

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

Teacher sheet 3: Your local catchment

Teacher sheet 4: Monitoring Corangamite's waterways

Teacher sheet 5: Corangamite Region sample data

Teacher sheet 6: Catchment condition report

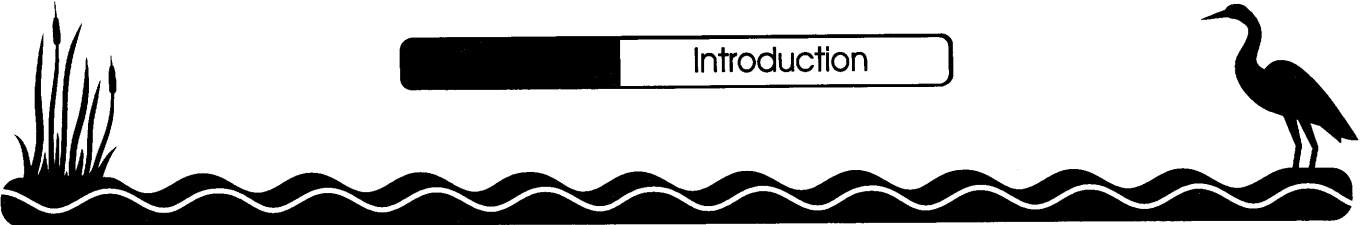


SOSE Level 4

<p>Time, continuity and change Describe ways of life of people in the past. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region Portray an event or occasion from a particular perspective. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region</p>	<p>Place and space Analyse how people's beliefs and practices influence the ways they interact with places. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region</p>	<p>Resources Explain factors that affect resource use and development. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region Teacher sheet 4: Monitoring Corangamite's waterways</p>	<p>Natural and social systems Describe responses of different elements (including people) to change in natural systems. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region Teacher sheet 3: Your local catchment Teacher sheet 4: Monitoring Corangamite's waterways Teacher sheet 5: Corangamite Region sample data Teacher sheet 6: Catchment condition report</p>
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SOSE Level 5

<p>Time, continuity and change Describe the ideas, people or events which changed a society. Teacher sheet 1: Wathaurong ways Portray an event or occasion from a particular perspective. Teacher sheet 1: Wathaurong ways</p>	<p>Place and space Compare natural and human environments and describe factors affecting them. Teacher sheet 3: Your local catchment Explain how peoples' use of natural environments changes over time. Teacher sheet 1: Wathaurong ways Teacher sheet 2: European settlement of the region Teacher sheet 3: Your local catchment Teacher sheet 4: Monitoring Corangamite's waterways Teacher sheet 5: Corangamite Region sample data Teacher sheet 6: Catchment condition report</p>	<p>Resources Describe how resources are owned and accessed. Teacher sheet 1: Wathaurong ways</p>	<p>Natural and social systems Compare features of natural systems. Teacher sheet 1: Wathaurong ways</p>
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Resources and contacts

The following list is not exhaustive but suggests some key readily available and relevant aquatic, wetland and catchment study resources.

Education materials

The **Gould League of Victoria** produce numerous inexpensive student and teacher materials, including:

Wetlands Wildlife. The nature of wetlands in southern Australia. *

An inexpensive guide with colour illustrations explaining different types of wetlands and their plant and animal life.

Freshwater invertebrates. *

Identification key with colour photographs of pond life.

Ponding. Activities for your local lake, pond or puddle *

Activities for mainly primary level students and information relating to aquatic life. Includes 4 sticker sheets.

Weeds Kit.

Activities and poster.

Inland waters. Bird field guide.

Colour illustrations of birds found on and near rivers and wetlands.

Environmental log book.

An illustrated log book to encourage the regular recording of environmental happenings.

Going bush.

A guide to caring for a local bushland remnant.

Feral peril.

Activities to help form values about wildlife conservation and the introduction of feral animals.

Frogabout boardgame.

Colour Stickers

Pond animals *

Waterbirds

Pond insects *

Frogs

Colour Posters

Pondlife *

Wetland birds

Fish of southern Australia

River life of Lower Murray

Billabongs

Frogs of Australia

Frogs and reptiles of Murray

For prices and an order form, contact:

Gould League of Victoria.

P.O. Box 117 or Genoa St, Moorabbin, 3189

Ph (03) 9532 0909 Fax (03) 9532 2860

* recommended resources to accompany this *Waterwatch Education Kit*.

Geography Teachers Association of Victoria

503 Burke Rd

Camberwell South, 3124

Ph (03) 9824 8355 Fax (03) 9824 8295

Produce a range of education materials including:

Land degradation - A catchment approach (4 teaching unit with slides)

Why worry about salt? (teachers guide, activities and slide set)

Victorian Association of Environmental Education

217 Church St

Richmond, 3121

Ph (03) 9428 9812 Fax (03) 9428 0313

Produce a range of education materials including:

Rivers, coasts and wetlands. An activity-based approach. J. Pobjoy. 1992.

Department of Natural Resources and Environment (DNRE) produce many education materials including:

LandCare for Kids.

A colourful cross-curriculum kit for middle to upper primary school. Contains nine frieze panels, a "Soil ain't Dirt" songbook and tape, and 2 work books on soil and water conservation, feral animals and weeds.

Our Land. Landcare activities for upper Primary. National Soil Conservation Program and DNRE.

LandCare Game.

A board game/poster. With the roll of a dice, students progress through an eroded "Muddy waters" to a well managed "Clear Lake".

Saltwatch. A resource book for schools.

Editions issued in 1997, 1995, 1990

Saltwatch curriculum materials.

Young Landcare Starters Kit.

A community water quality monitoring manual for Victoria.

T. Kruger and V. Lubczenko. Victorian Community Water Quality Monitoring Group. 1994.

The key instruction manual for the Waterwatch program.

For prices and an order form, contact NRE Information Centre:

8 Nicholson St, East Melbourne 3002

Ph (03) 9637 8080 Fax (03) 9637 8150

or your local office of DNRE.

Others

Living in a Catchment.

Video and activities book.

For price and an order form, contact:

School Support Centre.

PO Box 7577 Cairns QLD 4870

Ph (070) 518333 Fax (070) 518935



Resources and contacts cont.



Murder under the microscope. The case of the contaminated catchment.

Streamwatch 5-8. Sydney NSW. 1996.

An ecogame simulation, with video and teachers' handbook. For senior primary and junior secondary students. Schools must first register to play the game.

To register, contact:

Meaghan Hill, Project Manager

Ph: (02) 9715 8284

Fax: (02) 9715 8600

The water cycle.

J. Dart & M. Galletly. Barwon Water. 1993.

An education kit of activities and information pages for Preps to Grade 6. Developed for the Geelong area but many activities could be adapted to other area.

For price and an order form, contact:

Barwon Water

61-67 Ryrie St, Geelong, 3220

Ph (03) 5226 2332

Blue-green algae. A resource book for secondary teachers linking the water industry with schools. Industry and Education Consortium. Bendigo. 1993

For price and an order form, contact La Trobe University, Media Services.

Drains to the Bay. A water pollution kit.

Melbourne Water and Rotary. 1992

Suitable for years 3-6. This stencilling program involves identifying stormwater drains, and includes teacher instructions and student activities.

Available for the Gould League of Victoria.

Water in our environment.

Teacher information pack. Melbourne Water. 1993.

Primary and junior secondary level information leaflets. Sent to all school and municipal libraries.

Catchment Wise. Information for teachers and student activities. Issues in Land Management - Unit 11.

J. Keats. Department of Conservation and Land Management, NSW. 1994.



Information and materials

Environment Australia Biodiversity Group

GPO Box 636

Canberra ACT 2601

Ph (06) 2500 200 Fax (06) 2500 384

Their information sheets include:

Australian Waterfowl; Platypus;

Wetland types; Wetlands are important; Wetland

classification; the Ramsar Convention. Some of these can

also be downloaded from their website.

Riparian management fact sheets:

1. *Managing riparian land.*

2. *Streambank stability.*

3. *Water quality.*

4. *River ecosystems.*

5. *Land-based ecosystems.*

6. *Managing stock.*

Land and Water Resources. Research and Development Corporation. 1996.

Available from LWRRDC,

GPO Box 2182, Canberra, ACT 2601

Victoria's inland waters.

State of the Environment Report 1988. Office of the Commissioner for the Environment.

Rivers and streams. Special investigation. Land Conservation Council. 1989.

Water Victoria: An environmental handbook.

Department of Water Resources Victoria. 1989.

Water Victoria: A resource handbook.

Department of Water Resources Victoria. 1989.

The environmental condition of Victoria's streams.

P. Mitchell. Water Victoria. 1990.

The state of the rivers. Victoria, Australia.

Victorian Government. 1984.

Better rivers and catchments. Victoria, Australia.

Victorian Government. 1987.

Australian Platypus Conservancy.

PO Box 84

Whittlesea, 3777

Ph (03) 9716 1626 Fax (03) 9716 1664

Melbourne Water: Waterways and Drainage.

630 Church St

Richmond, 3121

Ph (03) 9235 2100

Frogwatch.

Ph (03) 9354 4718

Resources and contacts cont.

*Explore Melbourne's wetlands.*

S. Cowling. National Trust, Victoria. 1991.

Frogwatch field guide to Victorian frogs.

J. Hero et al. Department Conservation and Natural Resources. 1991.

Managing you wetland. A practical guide for landowners.

N. Oates.
Dept Conservation and Natural Resources and Victorian Wetlands Trust. 1994.

Waterplants in Australia. A field guide.

G. Sainty and S. Jacobs. Sainty and Associates. 1994.

Victoria's coastal vegetation. With information on coastal threats and restoration.

N. Tsernjavski, G. Mathieson. VNPA. 1996.

Physical and chemical quality of drinking water. Questions and answers.

Department Conservation and Natural Resources. 1995.
The information is presented in everyday terms.

Water quality. From wastewater to drinking water to even better and The dilemma of Watter Quandary.

J. Simpson and P. Oliver. Australian Water and Waste Water Association. 1996.

Aboriginal people in the environment.

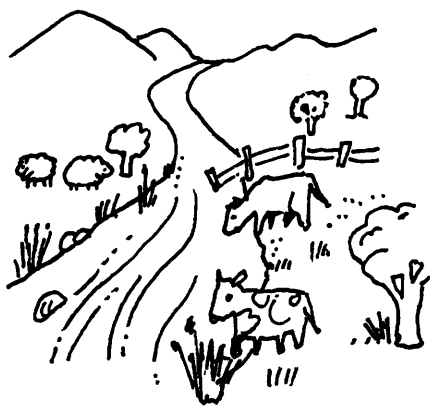
Anne Brown (Ed.) Aboriginal Affairs Victoria.
32 page booklet \$3.00

Aboriginal uses of water related resources.

Aboriginal Affairs Victoria.
16 page booklet. \$3.00

Order the above 2 books from:

Aboriginal Affairs Victoria
115 Victoria Pde
Fitzroy 3065
Ph (03) 9412 7777 and 9412 7498

**Videos**

Wetlands - Special Places. The biodiversity of Australia's wetlands.

For loan only, from Wetlands, Waterways and Waterbirds Unit of Environment Australia.

CD-Roms

Waterlines. Exploring the Barmah-Millewa forest in the Murray-Darling Basin.

Board of Studies. NSW. 1996.

Examines the ecology of this River Red Gum forest and the impact of river regulation.

Exploring the Nardoo.

Interactive Multimedia Learning Laboratory; Faculty of Education University of Wollongong and Dept Land and Water Conservation, NSW.

Interactive Multimedia Pty Ltd. 1996.

An imaginary inland river environment to investigate, maintain and improve.

Internet sites

Waterwatch

<http://www.waterwatch.org.au>

Wetlands, Waterways and Waterbirds Unit and Environment Australia home page

<http://www.anca.gov.au/index.htm>

Saltwatch

<http://www.saltwatch.org.au>

Snapshot data entry

<http://www.dse.vic.gov.au/water/>

ERIN (Environment Resources Information Network)

<http://www.erin.gov.au/erin.html>

Wetlands International

Asia Pacific Office

<http://ngo.asiapac.net/wetlands/>

Ramsar Convention Bureau

<http://w3.iprolink.ch/iucnlib/themes/ramsar/index.html>

GREEN (Global Rivers Environmental Education Network)

<http://www.econet.apc.org/green/>

Yarra Valley Water

<http://victoria.schnet.edu.au/yarrawater/Welcome.html>

includes information for water conservation and waste disposal, and activities for schools.



Waterwatch Co-ordinators

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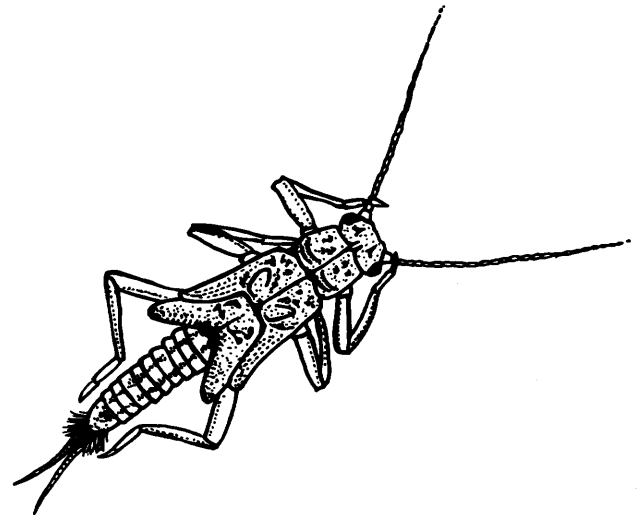
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Meniyan 3956
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Wimmera Waterwatch Co-ordinator
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Waterwatch Education Kit evaluation sheet

Your feedback on the Kit would be greatly appreciated and will help in the preparation of future education materials.

Please copy this page before completing it so that others may use it too. If more room is required for your response, please attach additional pages.

Name (optional): _____ School: _____

Address: _____

_____ Date: _____

1. How did you obtain a copy of this Kit? _____

2. Which student level(s) did you use the Kit with? _____

3. How did you use the Kit?

- A unit of study
- Selected activities only
- Mainly as a teacher reference

Other (please describe) _____

4. Which section(s) or activities did you use? _____

5. What was your overall impression of the Kit? _____

6. What did you like most about the Kit? _____

7. What did you like the least about the Kit? _____

8. Did you change any of the activities to make them more effective? Please give details. _____

9. What would you change, add or delete to improve the Kit? _____

10. Did you use this Kit to accompany water quality monitoring activities conducted by your class?

- Yes
 - No
- If so, which waterway or wetland did you monitor? _____

11. Do you plan to use the Kit again? Yes No

Please return to:
 Statewide Waterwatch Co-ordinator
 Department of Natural Resources
 and Environment
 P.O. Box 41, East Melbourne, 3002