NT WATERWATCH EDUCATION KIT CONTENTS

N.T. WATERWATCH
EDUCATION KIT

Introduction

NT WATERWATCH EDUCATION KIT

INTRODUCTION

A program of the Natural Heritage Trust

Northern Territory Government
Department of Infrastructure, Planning and Environment

Natural Heritage Trust
Helping Communities Helping Australia
A Commonwealth Government Initiative

NT Waterwatch Education Kit

Waterwatch NT promotes community involvement in the water quality monitoring of Northern Territory waterways. The program enables NT communities to work together to protect and rehabilitate waterways.

This Waterwatch Education Kit has been specifically designed in the Northern Territory, by Territorian scientists and teachers. The information and activities included in the Kit aim to increase awareness and understanding of water resources in the Northern Territory and the interdependence of natural and human systems. This Kit provides an opportunity for students to develop practical decision-making skills, while encouraging them to promote and apply innovative and sustainable environmental management practices.

Many of the activities are interactive, involve a variety of media, and encourage outdoor involvement in water quality monitoring. Every activity lists relevant links to the current Northern Territory Curriculum Framework, which makes the Kit easy to use and incorporate into existing schedules.

It is with pleasure that we make this Kit available throughout the Northern Territory and thoroughly recommend its inclusion into curriculum programs.

KON VATSKALIS
Minister for Lands and Planning

January 2003

SYD STIRLING
Minister for
Employment, Education
and Training

14/1/03.

January 2003

NT Waterwatch Education Kit. Introduction. Edited by Sue Bellette and Geraldine Lee.

Published by Department of Infrastructure, Planning and Environment (DIPE)
PO Box 30
Palmerston NT 0831
Tel: 08 8999 4456
Fax: 08 8999 4445
Website: www.lpe.nt.gov.au/waterwatch

The information in this publication has been published by DIPE to assist public knowledge and discussion and to help improve the sustainable management of water.

Publication data
Bellette, S., and Lee, G. (eds) 2003, NT Waterwatch Education Kit. Introduction, Department of Infrastructure, Planning and Environment, Darwin.

ISBN 1 920772 09 X (set of 7 vols)
ISBN 1920772 006 (Vol. 1)

Cover by Geraldine Lee

Funding provided by The Natural Heritage Trust and Department of Infrastructure, Planning and Environment.

TABLE OF CONTENTS

Acknowledgments

Production Coordinators:

Sue Bellette and Geraldine Lee

Graphic Design and illustration:

Geraldine Lee and Bern Schenkel

Kit Development

This Kit draws upon many educational projects that have been produced within Australia including:

- Victorian Waterwatch Education Kit;
- WA Water and Rivers Commission: Kimberly Landcare and Swan River Education Kits;
- Queensland Waterwatch Technical Manual;
- National Waterwatch Technical Manual;
- Draft Northern Territory Technical Manual;
- Waterwatch Tasmania Technical Manual; and
- Waterwatch Queensland Education Kit: Waterwatch and Your Catchment.

Thank you to the other Waterwatch Programs for their information sharing. Recognition must go to Vera Lubczenko, Susan Worley, Derek Foster, Carolyn Davey, Michael Cassidy.

Michael Mitchie - consultant for draft December 2000.

Special thanks goes to our indigenous consultant, Raymattja Marika, who provided invaluable information and knowledge and Yolngu Matha translations.

Waterwatch Facilitators and Regional Coordinators

Lesley Alford, Dianna Schembri, Jo Cruickshank, Geraldine Lee, Denise Spencer, Jan Powick, Joye Maddison, Liza Schenkel, Rebecca Solah, Robbie Henderson, Gerry Wood, Michelle Koulakis, Charlotte Beresford and Felicity Forth.

Education Kit Steering Committee

Kate Smith, Kerry Hudson, Di Koser.

Education

The following educators for their expertise and input into Kit structure, content, activities and how the Kit should be incorporated into the NT education system:

Early Childhood - Kerry Hudson, Katriona Houston, Robyn Mclean, Jan Powick and Heather Myers. **Primary -** Alf Murray, Bronwyn Ritchie, Jane Ellem, Jo Pyke, Leonie Read, Mel Phillips, Narrelle Williams, Peter Usher, Janet Lake, Meredith Pearson and Julie Andrews. **High School/Senior College -** Adelaide Church, Angela Flahive, Jo Vandermark, Bruce Garnett, Helen Pritchard, Marge Norton. **School of the Air -** Louise Gavin, Maggie Verco, Peter Oliver.

Department of Infrastructure, Planning and Environment

Many staff provided expert scientific input, natural resource information and editorial advice:

Anne Scherer, Armando Padovan, Cyrus Edwards, Dave Howe, Peter Brockelhurst, Diane Napier, Carly Steen, Ian Lancaster, David Hardy, Patrick Gray, Paul Jonauskas, Jane Hosking, Christine Bach, Joe Morrison, Judy Bartolo, Scott Wauchope, Libby Benson, Rod Applegate, Lynton Fritz, Steve Hester, Michael Lawton, Naomi Rea, Roana O'Neil, Vanda Lockley, Robyn McGillivray, Simon Townsend, Steve Tickell, Stuart Traynor, Tho Tien, Ursula, Zaar and Lesley Hill.

Extension Officers

Ann Grattidge, Jacinta Reeves, Nanet Pagsanjan and Steve Popple.

Introduction

The Vision for Waterwatch Australia: Healthier Waterways

The essence of *Waterwatch* is described in the following beliefs and principles.

- Everything that happens in a catchment can have downstream effects.
- Community participation is vital to ensure effective environmental management.
- Education is a fundamental element of environmental management.
- Monitoring by the community facilitates environmental action.
- Local cultural, historical and environmental knowledge is a valuable resource.

Kit Purpose

The Waterwatch Program provides an excellent medium for environmental education to be delivered. An excursion to a local river, creek, lake or waterhole can increase awareness of the importance of maintaining good water quality. Ideally raised awareness will result in students wanting to contribute to the formulation of Landcare and Waterwatch strategies.

The Kit aims to provide teachers and Regional Waterwatch Coordinators with a base document that they can use to present the aims of Waterwatch both within and outside the classroom. The Kit has been produced in a user-friendly manner that links to the most recent Curriculum Guidelines from the Department of Education, Employment and Training. The Kit covers natural and human processes influencing water quality, water management and information on how to assist in the maintenance and restoration of good water quality.

This Kit will assist students and teachers to develop an understanding of:

- the importance of water on Earth;
- physical, chemical and biological concepts as they relate to the health of the waterway and the ways in which they can be measured and investigated;
- waterbodies as ecological units consisting of interdependent living and non-living components;
- various pressures such as pollution and other forms of degradation that effect water bodies;
- scientific investigation and application to environmental issues through integrated catchment management processes;
- environmentally responsible values and behaviours, and a commitment to helping maintain and improve the health of aquatic ecosystems.

Project Brief

The NT Waterwatch Education Kit should:

- apply to the junior and secondary school students in urban and remote areas;
- provide practical methods of lesson preparation, delivery and student assessment;
- apply and readily link to the NT Education Curriculum;
- have a primary focus on water quality assessment, monitoring and management;
- encourage student creativity, working scientifically and independent thinking;
- encourage links between school activities and community catchment; and
- encourage links environmental events such as World Wetlands Day.

Aim

The aim of the Waterwatch Education Kit is to increase awareness and understanding of water resources, the natural environment, and the interdependence of natural and human systems. This Kit provides an opportunity for students to develop their practical and decision-making skills and also encourages them to promote and apply innovative and sustainable environmental management practices.

Objectives *(www.dwr.sa.gov.au/ww/watercareIII/teacehr/teachaim.htm)*

To demonstrate knowledge and understanding of concepts and terms concerning water resources;

To recognise the relationships and interdependence between human and natural systems and how these influence water management;

To identify human intervention in natural and built environments and how this impacts on water resources;

To recognise the differential demands by various groups on water resources and the management of those resources;

To identify causal effects of water resource use and development on issues such as wealth distribution, and industrial and political influence;

To apply knowledge and skills from other disciplines to key water resource issues;

To demonstrate research skills, such as locating and applying relevant information;

To learn practical skins, such as locating, linking and applying relevant information;

To develop skills in problem defining and solving, graphing and communication including written, oral and visual presentations;

To understand values and attitudes consistent with ecologically sustainable development;

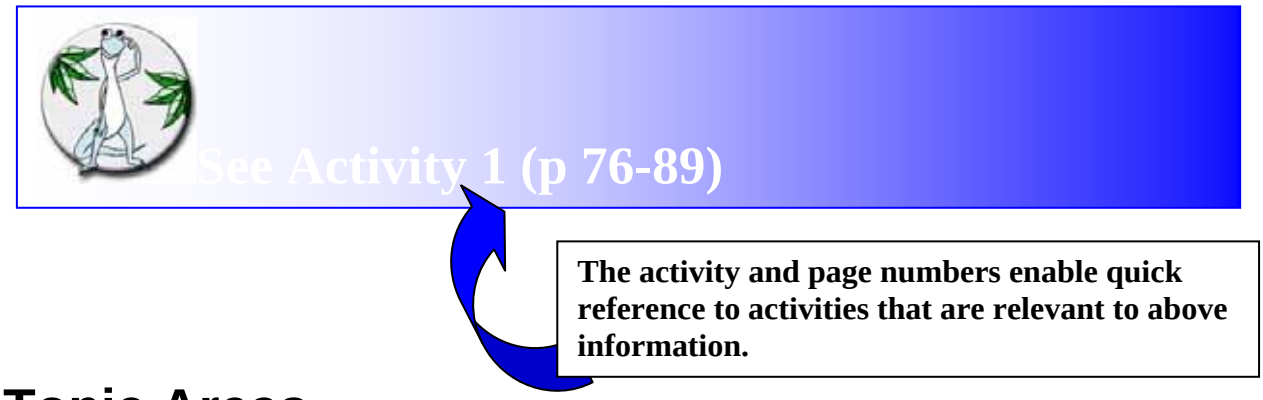
To learn how decisions affecting water resources are made in Australia;

To make informed and responsible decisions about water resources management questions; and

To participate as informed citizens in debates and discussions on water resources.

How to use this Education Kit

The kit has been arranged into six distinct parts, each outlining a topic area. Each topic is detailed in the teacher resource, where direct links are made to a broad range of activity sequences, which follow the social literacy model. An index is provided at the end of each part. A glossary has been provided later at page 24.



Topic Areas

1. The Water Cycle and Properties of Water.
2. Mapping Catchments.
3. Aquatic Ecosystems and Habitats.
4. Uses of Catchments.
5. Monitoring Catchment Health.
6. Waterwatch and legislation.

Bands

While the reference material within the kit is suitable for all teachers to utilise regardless of the Bands they teach, the activities have been subdivided according to three Band groupings:

1. Early Childhood / Junior Primary (Band 1)
2. Middle-Upper Primary (Band 2 to end of Band 3)
3. Junior Secondary (Band 4 to end of Band 5)

An activity with the above label is considered to be most suitable for Bands 3 to 5. It should be noted that many activities can be readily adapted for higher or lower bands.

Curriculum Links

Curriculum Links:
SOSE Environments / Natural Systems Env 3.3, Env 4.3
Science Concepts and Context / Life and Living CC 3.2

Relevant outcomes are listed at the start of every activity. This Education Kit provide links to the following curriculum areas:

Studies of Society and Environment Learning Area

- Social Systems and Structures
- Environments

Science Learning Area

- Working scientifically
- Concepts and Context

Social Literacy Model

Focus Question
To start the learning sequence by focussing on a concept.

Main Idea
To generalise about a concept, to answer a focus question, to state a learning outcome.

Consider
For teachers to present input (visual, oral, written, audiovisual, guest speakers).

Analysis
For students to develop appropriate language and conceptual understandings through student/student or student/teacher analysis of input. For teachers to model and jointly construct texts which students may later use. Several consider/analysis steps may be necessary.

Investigation
For students to individually investigate the validity of the Main Idea by applying the concepts in social research or action. Students may work in small groups to create new, unfamiliar texts. (Summative assessment of written, oral symbolic and visual products.)

Reflection
For students to evaluate their own understandings, (informal discussions, not assessable).

Student Sheets

Student sheets have been provided in each section, which can be used as black line masters. Sheet format varies, but can include information, case studies, diagrams, questions and activities. All student sheets relate to the preceding activity.

A list of all student sheets is included at the start of each part of the education kit. Each sheet is numbered in accordance with the part in which it occurs. For example Student Sheet 4.6 is the 6th activity in Part 4: Uses of catchments.

Waterwatch Assistance

Some activities will require the assistance of a Regional Waterwatch Coordinator, this will be shown by the Waterwatch logo. Please book assistance early to avoid disappointment remembering to allow additional contact time before and after the session.

Excursions

Some activities involve an excursion outside of school grounds. Where an excursion is either necessary, or can be incorporated into an activity a graphic (like the one below) is placed in the lower left hand corner of the page.

Resources in this kit

- A **CD-ROM** which contains digital versions of all reference material and activities and case studies. The Kit is to become available on the Waterwatch web site www.lpe.nt.gov.au/waterwatch.
- A **video** on how to undertake specific water quality tests for those who would like to take up water quality monitoring on a regular basis.
- A range of resources referred to in the education Kit are available for loan from the Regional Waterwatch Coordinators. See **Highly Recommended Resources** (p 10).
- A **Glossary of technical terms** (p 24).

What is Waterwatch?

Waterwatch Nationally

Waterwatch Australia is a national network of more than 50,000 people who share a vision of healthy waterways. Waterwatch promotes water quality monitoring as a tool to involve the Australian community in land and water management at the local and catchment scale. Through monitoring their local waterways, communities are geared into action to address water quality issues and work together to protect and rehabilitate waterways.

The Waterwatch program commenced in 1992, being initiated by the Federal Government in recognition of an increasing concern for water quality among Australian people. Funding to community groups has been made available through joint Commonwealth, Territory and community **Natural Heritage Trust** grants.

Community Water Quality Monitoring Programs started in the U.S.A. Australia has been liaising with the Americans in the development of its program. The National Waterwatch Program has also been assisting other countries to set up their own 'Waterwatch' type programs. In 2001 a project officer went to Indonesia to introduce the concept of community monitoring and this was very well received.

Waterwatch NT

The first Waterwatch project in the NT commenced in 1994 with the appointment of the Northern Territory Waterwatch Facilitator. Seven regions within the Northern Territory now employ regional Waterwatch Coordinators. The first regions to commence Waterwatch were Darwin and North East Arnhemland, followed soon after by Litchfield and Alice Springs, then Katherine, Mary River and most recently the Coomalie region.

What is monitoring?

Monitoring can be defined as people making observations, and preferably recording, change in something over time. The Waterwatch program specifically gathers information about the health of water bodies. It involves the observation of aquatic life and vegetation surrounding the water body, and collecting, processing and analysing samples of water from the water body.

This information is used to tell a story about changes to the water body over time. These changes may be natural, seasonal fluctuations or they may indicate a decline in the health of the water body. Waterwatch monitoring enables early detection of problems and through appropriate action, can reduce costs of rehabilitation.

How to get involved

There are many different activities Waterwatchers can be involved in, either individually or as group members these include:

- water quality monitoring using biological, physical and chemical tests;
- promoting the Waterwatch messages eg via press releases and local newspaper articles, creating displays and attending shows;
- training others how to monitor;
- taking school classes;
- creating reports from the data collected;
- writing letters to authorities when necessary;
- stormwater stencilling programs with schools;
- creating extension materials for public education;
- undertaking creek management in order to improve water quality eg revegetation to control erosion, weeding, litter removal; and
- seeking sponsorship and encouraging new volunteers to be involved.
- Where Waterwatchers identify a problem, they can develop strategies to deal with it. This may mean alerting the relevant authorities, launching a public awareness campaign, replacing vegetation or simply organising clean up days.
- How Waterwatch operates and the roles of the Facilitator and Coordinators is outlined on the NT Waterwatch web site. All staff facilitate community understanding of water quality management and community involvement in the monitoring of various water bodies.

NT Contact Details

Waterwatch Contact	Phone	Address
NT Waterwatch Facilitator	(08) 8999 4456	PO Box 30, Palmerston, NT 0831
Darwin and Litchfield	(08) 8981 1344	GPO Box 1604, Darwin, NT 0801
Katherine	(08) 8973 8114	PMB 123, Katherine, NT 0851
Alice Springs	(08) 8951 9225	GPO Box 1512, Alice Springs NT 0871
Coomalie	(08) 8976 0077	C/O Post Office, Batchelor, NT 0845
Gapuwu Mel'ngu Mala North East Arnhemland	(08) 8987 3269	PO Box 809, Nhulunbuy, NT, 0881

Related Community and Natural Resource Management Programs

The programs listed below are partnership programs established by the Commonwealth and Territory Governments to encourage improved natural resource management. Commonwealth support is from the Natural Heritage Trust (NHT) for the environment. For further details of all of the NHT programs, you can go to the following web site: http://www.nht.gov.au

Rivercare

Rivercare aims to ensure progress towards the sustainable management, rehabilitation and conservation of rivers outside the Murray-Darling Basin and to improve the health of these rivers. Focus is on inland rivers and does not include coastal or tidal areas. The expected outcome is to improve the water quality and ecological values of river systems.

Coastcare

Coastcare aims to support groups and individuals who want to become actively involved in protecting and managing coastal areas. Coastcare provides funding and resources for projects that help tackle problems affecting our coastal environments. Unlike the other (NHT) programs, Local Government is a signatory to the funding agreement. Waterwatch can undertake monitoring activities in coastal estuaries.

Landcare

Landcare is about community and government working together, to reduce land and water degradation and to develop sustainable land use**.** Waterwatch may be utilised to determine if land management practices are impacting on water quality. Waterwatch can assist in evaluating landcare projects that aim to restore riverine or other freshwater environments.

Bushcare

Bushcare is about community and government working together, to restore, conserve and protect native vegetation and the fauna it supports. Waterwatch can assist in evaluating Bushcare projects that aim to restore riverine environments.

Greening Australia

This is about remnant vegetation management and revegetation incorporating weed and fire management. Greening Australia supports as a host organisation and Greening Australia volunteers may also become involved in monitoring water quality.

Weedbusters

This initiative is run by the Department of Business Industry and Resource Development. Weedbuster's Week often involves the community in riparian/aquatic weed control. Waterwatch volunteers are may be involved in this event.

Highly Recommended Resources

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
VIDEO	3,4	Three	Window on the Territory No 5: River Flood Plains	Excellent material for teaching, includes activities.	Distributed to all schools
VIDEO	3,4	Three	Window on the Territory No 5: Freshwater Ecosystems	Excellent material for teaching, includes activities.	Distributed to all schools
VIDEO	3,4	Three	Australia's Living Deserts CCNT 1990 (26 mins)	Central Australia ecosystems from traditional perspectives. - also useful for food chain studies and adaptations.	DIPE Library Palmerston Tel: 8999 4508
VIDEO	3,4	One, Three	The call of Kakadu	Seasonal influences on Top End plants and animals. Useful info included on fire, food chains and adaptations.	Various Top End Tourist information centres $30
VIDEO	3,4	Three, Four	Kimberley: Land of the Wandjina	Top End ecosystems from water and traditional perspectives - also useful for food chain studies and adaptations.	ABC shop $30
VIDEO	3-5	One	What is Groundwater (12 mins) Living Groundwater (13 mins) Living on Groundwater (14 mins)	As per titles.	Water and Rivers Commission WA Tel: (08) 9227 9053
VIDEO	1-4	One, Four	Drains to the Bay –a water pollution kit Melbourne Water (10 mins) a 50 page teachers booklet is included	Demonstrates the need to ensure that only water goes down the drains to the creeks and beaches.	NT Waterwatch Facilitator Tel: 8999 4456

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
VIDEO	3,4	One	Big Wet or Met Bureau	Seasons in the NT.	
VIDEO	3-5	One, Four	A Civil Action	A movie about groundwater pollution and how it affects the community that uses the groundwater.	Local video store or libraries
VIDEO		One, Four	Enough is enough and Fresh Water	As per title.	Sydney Water
VIDEO		One, Two	Catchments	As per title.	Landcare Australia
VIDEO		Four	Integrated Catchment Management	As per title.	Waterways Commission WA
BOOK	1-3	Three	Wetlands, Tricia October	This book investigates the seasonal effects on animals in Top End wetland systems through a fictional story.	Book shops $20
BOOK	All	One, Three, Four	'Jilji – Life in the Great Sandy Desert', Pat Lowe and Jimmy Pike Magabala books ISBN 1 875641 18 1	This discusses indigenous use of water, dependence on it, sourcing it in the desert, rituals and creation of water sources, and examines change over time.	NT Department Education Library Winnellie-mail: library.ntde @nt.gov.au
BOOK	All	One, Four	'Yinti' – desert child Pat Lowe and Jimmy Pike Magabala books ISBN 1 875641 017	Indigenous uses of water; formation of water sources in the landscape; water cycle.	Book shops $25 or Taminmin Community Library
BOOK	1-4	Three	Frog book	Information on Australian frogs. Beautifully presented with habitat identification and distribution information.	Book shops ~$20

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
BOOK	3, 4	Three	Wetlands Wildlife. Gould League of Victoria.	Wetland ecology.	See Gould League web site
BOOK	3, 4	Three	Ponding, Gould League of Victoria.	Ecology of ponds.	As above
BOOK	4, 5	Four	Managing For Healthy Country In The VRD	Land management and relationship to indigenous land and water use.	Tropical Savannas CRC – NT Uni
BOOK	3 - 5	Three, Five	Freshwater Invertebrates: Ralph Miller 1996 Gould League of Victoria Inc Southern Biological Services ISBN 0 909858 49 7	Macroinvertebrate identification key with some colour photos and line drawings, habitat and distribution information.	See Gould League web site to order a copy
BOOK	3 - 5	Three, Five	Colour Guide to Invertebrates of Australian Inland Waters –John Hawking and Felicity Smith Identification Guide N0 8 CRC Freshwater Ecology and the Murray Darling Freshwater Research Centre 1997 Albury ISBN 1 876144 09 2	Macroinvertebrate identification key with colour photos and habitat and distribution information.	Book shops
BOOK	4, 5	Three	Water Plants in Australia - a Field Guide, G R Sainty and S W L Jacobs 1994 Royal Botanic Gardens Sydney ISBN 0 646 15939 9	Guide to identification and management of aquatic plants in Australia.	Book shops
BOOK	4, 5	Three, Five	Aquatic Insects 1994 D Dudley Williams and Blair W Feltmate CAB International ISBN 0 85198 782 6	Identification and ecology of aquatic insects in detail.	Any book shop will order the latest edition

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
BOOK	4, 5	Four, Five	Freshwater Algae in Australia Timothy J Entwisle, Jason A Sonneman and Simon H Lewis 1988 CRC for Freshwater Ecology and Royal Botanic Gardens Melbourne Sainty and Assoc. Publishers Aust ISBN 0 646 31408 4	Photos and information about algae in Australia relevant to the NT including identification, ecology and management.	Book shops
BOOK	4, 5	Three	Floodplain Flora – Flora of the coastal floodplains of the Northern Territory, Australia (2000) ID Cowie, PS Short and M Ostercamp Madsen Parks and Wildlife Commission NT Flora Australia Supplementary Series No 10 ISBN 0 642 56808 1	General floodplain background information relevant to the Top End of the NT and taxonomic key to plants in Top End Floodplains.	Tel: (02) 6250 9443 Or ask a bookshop to order it
BOOK	3-5	Three	The Water Birds of Australia –The National Photographic Index Of Australian Wildlife 1985 Angus and Robertson Publishers ISBN 0 207 15015 X	Identification, distribution and habitat information about water birds relevant to the NT.	Book shops
BOOK	3-5	Three	Freshwater fishes of the NT 1989 Helen K Larson and Keith C Martin NT Museum of the Arts and Sciences ISBN 0 7245 2513 0	Identification, distribution and habitat information about freshwater fish relevant to the NT.	Any book shop will order the latest edition

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
BOOK	4,5	Three	Australian Freshwater Ecology Processes and Management 1999 Andrew J Boulton and Margaret A Brock CRC for Freshwater Ecology Gleneagles Publishers ISBN 1 875553 05 3	Wetlands – chemical, physical and biological processes and management.	Any book shop will order the latest edition
BOOK	3-5	Three	Our Arid Environment: animals of Australia's Desert Regions, Keith Davey	Identification, distribution and habitat information about all fauna relevant to the arid zone of the NT.	It may be out of print – try obtaining it through your libraries
BOOK	3-5	Three	Tiwi Plants and Animals - aboriginal flora and fauna knowledge from Bathurst and Melville Island. Parks and Wildlife Commission NT and the Tiwi Land Council Darwin 2001	Identification, distribution and habitat information about fauna and flora and traditional uses of, relevant to the Top End of the NT - many colour photos.	A recent book launch - try ordering through your local book shop
BOOK	3-5	Three	Flora of the Darwin Region Vol 2 CR Dunlop GJ Leach ID Cowie1995 NT Technical Bulletin No 20 ISSN 0314-1810	Taxanomic key to the identification of plants in the Darwin region.	Available from DIPE, Ground floor Goyder Building Palmerston
BOOK	3-5	Three	Native Plants of Northern Australia John Brock 1993 REED publishers ISBN 0 7301 0407 9	General background information on plant communities in the Top End of the NT and taxonomic key to plants in Top End Floodplains.	Any book shop will order the latest edition

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
BOOK	3-5	Three	The Mammals of Australia 1995 Ed Ronald Strahan Australian Museum / REED books	Identification, distribution and habitat information about mammals relevant to the NT.	Any book shop will order the latest edition
BOOK	3-5	Three	Reptiles and Amphibians of Australia, Harold G Cogger 1996 REED books ISBN 0 7301 0088 X	Information about reptiles and amphibians relevant to the NT.	Any book shop will order the latest edition
BOOK	5	Four, Five	Indicators of Catchment Health – a technical perspective CSIRO 1996 ISBN 0 643 05881 8	Looks at indicators of catchment health from a landcare perspective with some emphasis on water monitoring.	CSIRO Tel: (03) 9662 7500 Email:sales@publish.csiro.au
BOOK	3-5	One, Three, Four	Water: The Drop of Life, Peter Swanson ISBN 1 55971 782 3	Series of international case studies which were covered in the television series of the same name.	Book stores
BOOK	3-5	Four	Global Warming, Terry Baldwin	Provides views on how global warming will impact the NT in the near future	Book stores
CD	3-5	One, Two, Four	Compilation of Darwin Stormwater	Maps showing the location of stormwater drains and their entry points. Direction of water flow can also be determined.	Darwin City Council for $50 or borrow a copy from the Darwin Waterwatch Officer
CD	3-5	Three, Four	CD ROM: East Arnhem Land water study (Video footage included)	Very useful for indigenous knowledge and western science about water resources in the East Arnhem region	DIPE – contact Ursula Zaar: Tel: (08) 8999 3616

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
CD	4,5	Four, Five, Six	National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 ANZECC and ARMCANZ	National Government Policy and guidelines for the management of water quality and its appropriate use.	Australian Wastewater Association Tel: (02) 9413 1288 or AFFA Tel: 1800 020 157 cost $136 includes CD
CD	3-5	Three	AAEE	This links a number of programs that relate to environmental education in the NT such as Frogwatch and Junior Rangers. Downloadable activities.	Distributed to all NT schools in 2001 Contact the AAEE NT Chapter:
CD	4,5	Four- (Katherine region)	Daly Data ERISS, (environmental research institute of the supervising scientist / DIPE	This provides catchment based natural resource and water management information incl. maps and reports.	Contact ERISS
CD	4,5	Four (Litchfield region)	Proposed Litchfield Planning Concepts and Land Use Objectives 2001, DIPE.	This provides catchment based natural resource information and water management information including maps and land use recommendations.	DIPE web page http://www.lpe.gov.au/PlanBuild/default.htm
CD	3-5	Four	Wurgle and Lecto Challenge, Power and Water Authority	This relates to the Education kit: Plugged in and Turned on.	Power Water
CD	3-4	Four	'Mission: Australia' production consultants: Garner MacLennon Interactives	Catchment based natural resource management and decision making. This is interactive on the computer and also has activity sheets, there is a significant section on stormwater.	A copy may be borrowed from the NT Waterwatch Facilitator Tel: (08) 8999 4456

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
CD	4-5	Four	Exploring the Nardoo	Catchment based natural resource management and decision making. Interactive CD-ROM includes a hypothetical water quality simulation model for independent or group research.	www.impty.com.au where a thorough description of what this package is outlined OR to order the kit (approx $100)
POSTER	3-5	Three, Five	Interactive Guide to Australian Aquatic Invertebrates CSIRO, Environment Australia, Land and Water Resources RDC 1996 (later additions may now exist) ISBN 0 643 06515 6	Taxanomic Key To Australian Aquatic Invertebrates.	John Williams, CSIRO Tel: 02 6246 5940
POSTER	All	Three, Four, Five	Save Our Waterways - weedbusters	Photos and information about aquatic weeds relevant to the NT.	Can be borrowed from Regional Waterwatch Coordinator see web page for details
POSTER	All	Four, Five	What scum is that?	Photos and information about algae relevant to the NT.	DIPE, Ground floor Goyder Building Palmerston
POSTERS	All	Three	Parks and Wildlife Commission NT: Central Ranges, Rainforests, Coastal Plains, Tropical Woodlands	Photos and information about ecosystems relevant to the NT.	As above

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
POSTERS	All	Three	Parks and Wildlife Commission NT: Bush Medicine, Bush Pandanus, Bush Timber, Bush Tucker, Calendar Plants, Colour and Strings, Mangroves	Photos and information about traditional uses of plants relevant to the NT.	As above
POSTER	3-5 and beyond	One, Four	Knuckey Lagoons surface and groundwater relationships including geology	Formation of the lagoon system and the interrelationship between ground and surface waters.	Dept of Infrastructure, Planning and Environment
POSTER	3-5 and beyond	Three, Four	Katherine Sinkhole Study	Formation of sinkholes in the Tindal formation and the interrelationship between ground and surface waters.	Waterwatch Regional Coordinators
BROCHURE	All	One, Four	Stormwater – Keep it Clean	Describes what stormwater is, why it needs to be kept clean and actions that people can do to keep it clean.	Tel: any Waterwatch NT contact
BROCHURE	All	Three, Five	An NT Guide to Macroinvertebrates, Waterwatch NT	Provides a basic macroinvertebrate sampling method to follow and interpret – initially best used with a Waterwatch Coordinator.	Tel: any Waterwatch NT contact
BROCHURE	All	Four	Fire in the Top End (2001) EA, CSIRO – Tropical Ecosystem Research Centre Darwin NT	This looks at the causes of fires in the Top End, the impact of fires and their management.	Tel: (08) 8944 8400 www.terc.csiro.au
JOURNALS	3-5	Three, Four	Tropical Savannas CRC for Tropical Savannas	General news on projects being undertaken, publications , related resources and grants for research.	www.savanna.ntu.edu.au, enter the password 'tropical'

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
JOURNALS	4,5	Three, Four	Savanna Links CRC for Sustainable Development of Tropical Savannas	Natural Resource Management in the Tropical Savanna across the Top End of Australia.	www.savanna.ntu.edu.au,
JOURNALS	5	Four	'Water' Journal of the Australian Water Association	Latest news on wastewater treatment and conservation, engineering solutions to water management.	Email: Info@awa.asn.au Tel: (02) 9413 1288
JOURNALS	4,5	Three, Four	'RIPRAP: River and Riparian Lands Management Newsletter', Land and Water Australia Canberra ISSN 1324-6941	Easy to read latest information about River and Riparian Lands Management in Australia.	Tel: (02) 6257 3379 www.lwa.gov.au
JOURNALS	4,5	Four	'Wetlands Australia – the national wetlands newsletter' Environment Australia and MDBC and 'WetlandLink bulletin	Tends to be more government focussed but provides information about what is being funded including international cooperation.	Environment Australia Biodiversity group-wetlands unit: (02) 6274 2479
JOURNALS	4,5	Three, Four	'Watershed' –CRC Freshwater Ecology	Easy to read latest information about River and Riparian Lands Management in Australia.	Email: Isealie @enterprise.canberra.edu.au
JOURNALS	4,5	Three, Four	'Rivers for the Future' Land and Water Resources (LWRRDC) ISSN 1325-1953	Full colour magazine with stories that apply the latest research findings on riverine ecology and management.	Tel: (02)6257 3379 Email: public@lwrrdc.gov.au
JOURNALS	4,5	Four	Australian Landcare – Australian Farm Journal ISSN: 1440-4397	Illustrates how NT can learn from its neighbours' mistakes.	Tel: 1800 061 022 to subscribe

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
JOURNALS	> 3	One, Four	'Stormwater News' Environment Australia http://www.ea.gov.au/coasts/pollution/usi/index.html#news	Variety of information regarding stormwater – nationally. Information provided in relation to the urban stormwater initiative in Australia.	Environment Australia GPO Box 787 Canberra ACT 2601
EDUCATION KIT	3-4	All	Waterwatch Education Kit: Waterwatch Victoria, Ford Australia and Barwon Water Oct 1997	Useful if you end up teaching in Victoria and still want to be involved in Waterwatch activities.	Waterwatch VIC Tel: (03) 9412 4663 $25
EDUCATION KIT	> 3	One, Four	ABC's of Groundwater Centre for Groundwater Studies, NHT, Dept of Water Resources SA Sept 2000	Excellent educational reference	Tel: (08) 8201 5632 or email: cgs.national@adl.clw.csiro.au $60
EDUCATION KIT	3-4	One, Four	Plugged in and Turned on – curriculum support package PAWA NT 1995	Discusses the conservation of Power and Water in the NT.	PAWA
EDUCATION KIT	3-4	Four	Kimberley Landcare: Know and Manage your environment – teachers resource kit National Landcare Program / Dept of Agriculture WA 1995 ISBN 0 7309 6811 1	Three chapters: 'The River', 'The Desert' and 'Station Country' are relevant to the NT – information and some activities – black line masters.	Copies available from Waterwatch Coordinators – © approved for educational purposes
EDUCATION KIT	3-5	All	Swan River Education Kit two units: SOSE and Science with a joint excursions booklet (1999)	Pre, during and post 'catchment crawl' activities have been set out in more detail than this education kit has been able to do BUT it is not generic, it is specific to the Sawn River region.	Water and Rivers Commission WA (Communications) Tel: (08) 9278 0300

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
EDUCATION KIT	1-5	All	Catchment Education Resource Book Natural Resources and Environment 1998 ISBN 0-7311-0909-0	Many other ideas for activities relevant to Waterwatch.	Vic Govt: Natural Resources & Environment Tel: (03) 9637 8080 $25
EDUCATION KIT	3-5	All	Waterwatch and your Catchment D Foster , J Robb, T. Yorkston 1995 Queensland Waterwatch, DPI QLD Govt. ISBN 0 7242 59252	Generic pre, during and post 'Catchment Crawl' activities have been set out in more detail than this education kit has been able to do.	Waterwatch Queensland: Tel: (07) 3896 9737
EDUCATION KIT	3-5	Threer	Monsoon Rainforests of the Top End – an educational resource kit for primary and junior secondary teachers Kerry Hudson *et al* Greening Australia	Monsoon Rainforest –what are they, their ecology and how are they managed – follows the Social Literacy model sequence.	Greening Australia Tel: (08) 8981 1344
EDUCATION KIT	3-5	Three, Four	East Mangrove Boardwalk – an educational resources kit for primary and junior secondary teachers Kerry Hudson et al Greening Australia	Mangroves - what are they, their ecology and how are they managed- follows the Social Literacy model sequence.	Greening Australia Tel: (08) 8981 1344
EDUCATION KIT	3-5	Four, Five	Waterwatch Australia Draft Technical Manual	Generic information about water quality testing and catchment health assessment.	Environment Australia: Tel: (02) 6274 2792
TECHNICAL MANUAL	3-5	All	Waterwatch Tasmania technical booklets	Water quality testing and catchment health assessment.	Waterwatch TAS: Tel (03) 6336 5254

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
TECHNICAL MANUAL	3-5	One, Four, Five	National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 ANZECC / ARMCANZ	National Government Policy and guidelines for the management of water quality and its appropriate use.	Australian Wastewater Association Tel: (02) 9413 1288 $136 incl. CD ROM
INTERNET	3-5	One, Four	http://www.lpe.nt.gov.au/advis/WATER/ground/DEFAULT.HTM	Groundwater information.	
INTERNET	3-5	Four	Report: Clearing moves North, John Brock. http://www.ecnt.org/land_clearing/landclearing_report.htm	Documents current threats to woodland habitats from land clearing in the NT.	
INTERNET	2-3, 4-5	Three	http://www.yvw.com.au/newed/juniors.html	Freshwater ecology information.	
INTERNET	3-5	Four	http://www.greenhouse.gov.au/pubs/gwci/furtherinfo.html	Greenhouse gas information.	
INTERNET	3-5	Four	http://www.cap.nsw.edu.au/teachers/global_warming/global_warming_workshop.htm	Global Warming information.	
INTERNET	3-5	One	http://www.csu.edu.au/weather.html	Climatic information.	
INTERNET	3-5	All	http://www.lpe.nt.gov.au/waterwatch/	Waterwatch NT program information.	
INTERNET	4-5	One, Six	http://www.ea.gov.au/water/quality/nwqms/index.html	National Water Quality Management Strategy information.	

Type of Resource	Bands Guide	Use with Part	Resource Details	Outline of content	Availability and cost (if any)
INTERNET	4-5	Six	http://www.affa.gov.au/docs/operating_environment/armcanz/home.html	National Water policy information.	
INTERNET	4-5	Six	http://www.lpe.nt.gov.au/advis/water/maryriver.htm	Application of the NT *Water Act.*	
INTERNET	4-5	Six	http://www.lpe.nt.gov.au/enviro/Fact/faq6.htm	Water allied/related NT Govt policies and legislation.	
INTERNET	4-5	Four	http://www.lpe.nt.gov.au/enviro/poldoc/npi/default.htm	Pollution inventory for Darwin Harbour.	
INTERNET	3-5	One	http://www.bom.gov.au/weather/nt/	Weather and climate information.	
INTERNET	3-5	Four	www.netc.net.au/enviro/fguide/soil1.html	Useful for soil/water relationship studies eg river bank erosion.	
INTERNET	3-5	Three, Four	www.epa.nsw.gov.au/soe/97/ch2/7_3.htm	Useful for soil/water relationship studies eg river bank erosion.	
INTERNET	3-5	Three, Four	www.weeds.org.au	Weeds information.	
INTERNET	3-5	Three, Four	www.weedbusterweek.info.au	Weeds information.	
INTERNET	2-5	Three	www.frogwatch.org.au	Frog information.	
INTERNET	1-4	Three	http://www.mesa.edu.au/friends/croc_kit/index.html	Crocodile curriculum materials and activities.	
INTERNET	4,5	One, Four	http://www.ea.gov.au/coasts/pollution/usi/index.html#news	Latest stormwater news.	Tel: (02) 6274 1684 for your hard copy

Glossary

Source: Draft National Waterwatch Technical Manual 1999

Accuracy - measure of how close repeated measurements are to the accepted or true value. Accuracy can be measured as a standard deviation.

Acid - a substance that releases hydrogen (H^+) ions in solution. Acid solutions have a pH value less than 7 units.

Aerobic - living or occurring in the presence of oxygen; organisms and processes that require free oxygen.

Algae - unicellular, multicellular, or colonial aquatic photosynthetic plants which do not have true roots, stems, or leaves.

Algal bloom - extensive growth of algae in or on a body of water which may occur from excess nutrients in waterbodies, or from particular climatic conditions.

Ammonia (NH3) - colourless gas consisting of nitrogen and hydrogen atoms which is very soluble in water.

Ammonium ($NH4^+$) - is the ionic form of ammonia.

Anaerobic - living or occurring without oxygen.

Anomalies - data values that deviate from the normal range but are accepted to be true.

Anoxic - conditions where oxygen is absent.

Aquatic - living in or on water.

Aquifer - any rock or soil layer capable of storing water and allows water to pass through.

Arable - land suitable for the economic production of crops, usually involving regular cultivation.

Autoclave - an apparatus used to sterilise objects by means of steam under pressure.

Autotroph - any organism able to use inorganic substances, e.g. carbon dioxide, to make their own chemical compounds using either sunlight (photosynthesis) or chemical energy (chemosynthesis).

Bacteria - single-celled microscopic organisms which break down organic material.

Baseflow - water that has sunk deep into the soil and met the groundwater which seeps into a creek.

Bank - sloping ground bordering a river, stream or lake.

Basin - area of land drained by a river and its tributaries.

Bedload - the sediment that moves by sliding or rolling along the bed of a channel due to the action of the water.

Benthic – plants or animals living in or on the bottom of a water body.

Best Management Practices (BMP's) - any engineered structure or management activity or combination that eliminates or reduces the adverse effects of pollutants.

Biochemical Oxygen Demand (BOD) - the amount of dissolved oxygen required for aerobic organisms to break down organic matter in a volume of water. BOD is an estimate of organic loads in water samples.

Biodegradable - compounds and materials capable of being decomposed by micro-organisms.

Biodiversity - the variety of living things that can be supported in a given area.

Biomass - the amount of living material existing at a given instant of time in a specified area or unit volume.

Biota - the living component of the environment.

Bore - a deep hole that reaches an underground water source and through which water rises due to hydrostatic pressure.

Brackish - water that contains dissolved salts in the range 800 -50 0001lS (500 –30, 000 mg/L, which is less than sea water (58,000 μS or 35,000mg/L).

Buffer – A substance dissolved in water which resists changes in pH.

Buffering capacity - the ability of a solution to resist a change in pH when an acidic solution is added.

Buffer zone - an area of vegetation surrounding a water body which protects it from the effects of human activity by minimising runoff and erosion.

Calibration blank - deionised water processed as a sample. It is the first sample analysed and used to set the meter to zero.

Calibration standard - solutions of known concentration used to calibrate a meter before running a test.

Carnivore - an animal that feeds on other animals.

Carrion – dead and decaying flesh.

Carrying capacity - the maximum number of animals that can be supported by an ecosystem without suffering deterioration.

Catchment - an area or basin of land bounded by natural features of hills or mountains from which all run-off water drains to a river, stream, lake, wetland or estuary. Also known as a watershed (American).

Channelisation - process of altering the channel of a watercourse by deepening, straightening, or lining the bed with cement or other materials to direct the flow of water or prevent flooding.

Chlorination - the addition of chlorine to wastewater or drinking water to disinfect the water.

Chlorophyll - the green pigment in plants that enables them to use the energy of the sun for photosynthesis.

Coarse particulate organic matter (CPOM) - food particles e.g. leaf fragments greater than 1 mm in size.

Coliform bacteria - bacteria found in the intestines of warm blooded animals that help in digestion. They are used to indicate faecal contamination in water quality analysis.

Combined Sewer Overflow (CSO) - sewer systems in which sanitary waste and stormwater are combined in heavy rains; common in older cities. Discharge from CSO is usually untreated and flows directly to streams.

Community - the assemblage of plant and animal populations inhabiting a given area.

Comparability – the degree to which different methods, data sets and/or decisions agree or are similar.

Completeness - a measure of the amount of valid data actually obtained compared to the amount expected to be obtained, usually expressed as a percentage.

Confluence - place where a tributary joins a river.

Contour bank - a constructed earth bank which follows the contour of the land and is used to direct water flow over the land to prevent erosion and drainage problems.

Culture media – a broth for growing bacteria.

Culvert - a covered channel or large pipe that diverts the natural flow of water.

Crustacean – A taxonomic class of invertebrate, which have two pairs of antennae, mandibles and pair of appendages on each body segment.

Data confidence level - data confidence refers to the reliability of data and is demonstrated by testing quality control samples; quality control results that fall within the designated tolerable error range for a parameter indicate that the monitoring data collected by a group can be treated with a high level of confidence.

Data confidence program - the total integrated program for assuring the reliability and accuracy of monitoring data: it includes quality control procedures

Data uses - the group(s) who will be applying the data for some purpose e.g. group members and government agencies.

Decomposition - breakdown of organic materials by micro-organisms.

Deionised water -water that has had all the ions (atoms and molecules) other than hydrogen and oxygen, removed. Sometimes called distilled water.

Designated uses - a formal list of desirable uses that a waterbody should support such as fishing, swimming and aquatic life.

Detection limit - the lowest concentration of a parameter that a given method or equipment can reliably determine and report as greater than zero.

Detritus - small pieces of dead and decomposing plant and animal material.

Diffuse-source pollution - contaminants that have originated from a widespread area or from various dispersed locations, such as roads, shopping centres and agricultural activity. Also known as non-point source pollution.

Discharge - release of liquid into a water body such as treated waste water from industrial plants, power plants and wastewater treatment plants; also refers to volume of run-off which enters water bodies.

Discharge zone - an area where the groundwater moves upward and escapes through natural springs, evaporation, transpiration and surface drainage.

Dissolved Oxygen (DO) - oxygen gas (0^2) dissolved in water.

Distilled water - water that has most of its impurities removed. Also known as deionised water.

Drift - the down-stream, free-floating movement of normally benthic animals in a flowing river or stream.

Duplicate sample – A duplicate sample is formed by dividing a sample in to two or more sub samples. They are used to determine the magnitude of errors.

E. coli (Escherichia coli) - a species of bacteria belonging to the faecal coliform group which is found in the intestines of warm blooded animals in large numbers. The presence of E.coli in water is considered evidence of fresh faecal contamination.

Ecosystem - a community of living organisms and their non-living (abiotic) environment functioning as one system e.g. a pond ecosystem.

Effluent - waste material such as sewage discharged into the environment.

Electrical conductivity – a measure of the inorganic materials and ions in water: as soluble salts form a major component of conductivity, it is used to measure salinity of water.

Electrode - an electric conductor through which current flows.

Emergent plants - plants rooted underwater but with their tops extending above the water.

Endemic - plants or animals peculiar to a particular geographical area.

Ephemeral stream – a stream that only flows for a short time e.g. after rain.

Erosion - the wearing away of the Earth's surface by running water, wind, ice or other geologic agent or process, including weathering, dissolution, abrasion and corrosion.

Error – How far the measurement could be from the true value for a specific sample.

Estuary - a body of water adjacent to the sea, typically at the mouth of a river, in which the tide ebbs and flows. At its mouth it meets the ocean but its upstream limit is marked by the extent of tides.

Eutrophication - enrichment of a waterbody by nutrients (mostly nitrates and phosphates) from erosion and run-off from the surrounding land. This process is natural but can be accelerated by human activities, e.g. sewage disposal and fertiliser run-off.

Evaporation - the process by which water changes its physical state from a liquid to a gas.

Evapotranspiration - the process of living plants transforming water into vapour that is released into the atmosphere.

Exotic species - an introduced non- native species, eg: weeds, feral animals.

External quality control checks (QC) - QC checks that are performed on Waterwatch monitoring samples by agency water quality officer or an independent laboratory.

Field blank - deionised water poured into a sample bottle which is used to gather samples from the waterway and analysed as normal; field blanks indicate errors in technique and dirty sample collecting equipment

Field replicates sample -a duplicate sample that is collected at the same time and place. It is used to measure precision of sampling and analysis.

Fauna - animal life.

Faecal - relating to animal or human excrement.

Fertilizer - any substance, natural or manufactured, added to the soil to supply plant nutrients for plant growth.

Field blank - deionised water treated as sample. Also known as a trip blank.

Filamentous - plant body of some types of algae, made up of thread like rows of similar cells.

Filter feeder - animal that filters microscopic organisms from water.

Fine Particulate Organic Matter (FPOM) - consists of fine food particles less than 1mm in diameter.

Fish kill - the sudden death of fish due to the introduction of pollutants and/or the reduction of dissolved oxygen concentrations in a water body.

First flush - initial flow of storm water run-off that often contains high concentrations of contaminants that have built up during the previous dry period.

Flagellum/flagella - a whip-like structure present in motile algae, which serves as an organ of propulsion.

Flocculant (floc) - mass of particles that form into clumps as a result of a chemical reaction.

Flood plain - a relatively level part of the valley that is covered by water during a major flood. It is formed from deposits laid down from previous flooding.

Flora - plant life.

Fluvial - belonging to or produced by a river.

Food chain/web - a chain/web of organisms, through which energy is transferred. Each organism in the chain feeds on and obtains energy from the one preceding it, and in turn provides energy for the one following it, eg: plant to herbivore to carnivore.

Genera (genus) – taxonomic group of closely related organisms. Only the species group contains more similar organisms.

Glide I pool - section of the stream with low velocity and with little or no turbulence on the surface of the water.

Grazer/scraper - animals that consume algae and associated material attached to the surface of submerged plants or rocks.

Groundwater - water that infiltrates into the earth and is stored in the rock and soil below the Earth's surface.

Habitat - preferred place or home for each species of plant and animal to live and reproduce.

Headwaters - upper tributaries of a stream.

Heavy metals - a metal whose specific gravity is approximately 5.0 or higher e.g. copper, cadmium, zinc, nickel, mercury and chromium. They are present in industrial, municipal and urban run-off.

Herbicide - a chemical substance used for killing plants, usually weeds.

Herbivore - an animal that feeds solely on plants.

Hydrograph - a graph showing the seasonal variation in the level. velocity or discharge of a body of water.

Hydrology - applied science concerned with the water cycle which includes precipitation, run-off or infiltration, storage and evaporation.

Impact site - a site located immediately downstream of a pollution source where the pollutant is completely mixed with the water.

Impervious surface - a surface that resists the penetration of water e.g. asphalt roads.

Impoundment - body of water contained by a barrier such as a dam.

Infiltration - the movement of water through the pores of soil or other porous medium.

In-stream cover - the amount of living space or hard substrate available for aquatic life. In-stream cover includes aquatic plants, snags, logs, rocks, branches and islands.

Integrated catchment management (total catchment management) - management of land, water and other biophysical resources and activities on a catchment basis.

Invertebrates - organisms without a backbone.

Ions - electrically charged molecules formed by the loss or gain of an electron.

Land use - purpose for which land is used; activities that take place on land such as construction, farming or tree clearing.

Larva (plural - larvae) - developmental stage of an insect in which it proceeds from an egg to larva to pupa to adult.

Leachate - water carrying impurities which has percolated through contaminated soil, e.g. from a rubbish tip or mine site.

Leaching - the process in which water percolating through the earth dissolves many substances and then carries them away in solution or suspension.

Limiting factor - a factor such as temperature, light, water or a chemical that limits the existence, growth, abundance, distribution or presence of an organism.

Load - volume or mass of a substance transported by a river, which is derived from multiplying the concentration by the flow rate over a specific period of time.

Macro-invertebrate - animal lacking a backbone and visible to the unaided eye.

Macrophytes - large aquatic plants that can be seen with the unaided eye.

Meanders - bends in the course of a river which continually curve from side to side in wide loops.

Metabolic rate - the rate at which an organism uses energy to sustain essential life processes such as respiration, growth and reproduction.

Metamorphosis - period of transformation from a larva to adult.

Micro-organisms - single celled microbes (plants, fungi, animals, viruses) that are invisible to the unaided eye.

ML - megalitre - one million litres (approximately the quantity contained in one Olympic- sized swimming pool).

mL - millilitre - one thousandth of a litre.

Molar - the amount of substance (moles) dissolved in a specified volume of solution.

Mystery samples - samples which are made up by a quality control lab; the concentrations of parameters are unknown to participants who test them using normal methods.

Motile - capable of motion, particularly locomotion in some algae through the beating of flagella.

Nitrate (NO_3) - main source of nitrogen for plants; fertiliser consisting of sodium nitrate or potassium nitrate is an agricultural and urban pollutant.

Nitrogen (N) - one of the major nutrients required for the growth of plants, it is usually present as organic nitrogen, ammonia, nitrate and forms of nitrite. Excess nitrogen can cause accelerated eutrophication in water bodies.

Non-point source pollution (NPS) - a source of pollution that cannot be pinpointed as it comes from many individual places. Also called diffuse pollution.

Nutrient - an element or compound such as nitrogen, phosphorus and potassium that is necessary for plant growth.

Nymph - young, sexually immature stage of certain insects which is usually similar to the adult in form and where partial metamorphosis is undertaken, ie: egg-nymph-adult.

Oligotrophic - water which is relatively low in nutrients.

Omnivore - an animal that eats both animals and plants.

Organic compounds -molecules that typically contain atoms of carbon and hydrogen. Oxygen and nitrogen may also be present. Largely produced by living organisms.

Organism - any living individual plant or animal.

Outfall - pipe through which industrial facilities and wastewater treatment plants discharge their effluent (wastewater) into a water body.

Overclearing - the removal of trees and shrubs, particularly from steep areas which results in accelerated erosion by wind and water and can lead to salinity problems.

Overgrazing - continued grazing of pasture or range land at a level that permanently and adversely affects vegetation and leads to land degradation.

Overstorey - woody plants greater than 5m tall, usually with a single stem eg: Eucalypt trees.

Parameter - a component of the environment that is being measured eg: temperature.

Parasitic - living off another organism (host).

Parts per million (ppm) - the number of parts by weight of a substance per million parts of liquid.

Pathogen – disease causing organism such as bacteria, virus or fungi.

Pathogenic - capable of causing disease.

Peak flow - maximum flow of a waterway.

Percolation - downward movement through the subsurface soil layers to groundwater.

Periphyton - plants and animals that are attached to submerged objects such as rocks, macrophytes and tree debris; often microscopic.

Permeability - ease with which water flows through soil or rock.

Pesticide - any chemical or biological agent that kills plant or animal pests. Herbicides, insecticides, fungicides and rodenticides are all types of pesticides.

pH - a measure of the concentration of hydrogen ions in a solution. The pH scale is a logarithmic scale that assigns values from 0 to 14 according to the levels of hydrogen ions; a value of 7 is neutral, values less than 7 are acidic and greater than 7 are alkaline; as the scale is logarithmic a value of pH 4 is ten times as acidic as pH 5 and 100 times as acidic as pH of 6.

Phosphorus (P) - a non-metallic element that is an important nutrient for all organisms. A deficiency is considered a major 'growth-limiting factor'. It is a common ingredient in fertilisers and cleaning agents. The Australian environment is adapted to very low levels of P in soils and water.

Phosphate (PO_4) - a non metallic element that can absorb light energy and then appear to glow in the dark; an important nutrient for all organisms.

Photosynthesis - process that occurs in the cells of green plants where solar energy is used to combine water and carbon dioxide to produce a simple sugar such as glucose. As a result of the process, plants release oxygen.

Phytoplankton - small animals and plants which float or drift in a water body.

Pipette - eye dropper-like instrument that can measure very small amounts of liquid.

Point source pollution - pollution that can be traced to a single point such as a pipe or culvert which discharges industrial or wastewater treatment plant effluent.

Pollution - any harmful or undesirable change in the physical, chemical or biological quality of air, water or soil as a result of the release of chemicals, radioactivity, heat or large amounts of organic matter.

Pollutant - any substance which causes pollution.

Potable - suitable for drinking.

Precision - the degree of agreement among repeated measurements of the same characteristic on the same sample, or separate samples, collected as close as possible in time and space. It tells you how consistent and reproducible your field and lab methods are to each other.

Predator - an animal that kills and eats other animals.

Pristine - an environment which remains untouched and undeveloped.

Productivity - production of organic material.

Protocol - defined procedure.

Quality Assurance (QA) - a broad plan for maintaining quality in all aspects of the program eg: training, keeping written records, quality control and reporting.

Quality Control (QC) - those activities you do to ensure accuracy and precision of your monitoring/surveys. A QC program aims to ensure that the data are good enough for their intended use.

Pupae - developmental stage of an insect between larva and adult.

Reagent - substance or chemical for use in a chemical reaction.

Recharge zone - area of land where surface water from rain, irrigation or streams moves downward and infiltrates an aquifer.

Recovery site - a site located well downstream of a suspected pollution source which is monitored to see how far the pollution impact extends.

Reference collection - a standard set of plants or animals that is used to verify identification eg: macroinvertebrates.

Reference site - a site located immediately upstream of the potential pollution source and is unaffected by the pollution source.

Regulated river - a river in which structures have been built to control or divert the flow of water.

Relative standard deviation –standard deviation expressed as a percentage.

Relative percent difference - compares how close the result from a water sample is to the true result. Expressed as either a positive difference (the sample result is higher than the true value) or a negative difference (the sample result is lower than the true value).

Replicate sample - two or more separate samples taken from the same site at the same time using the same method and independently analysed in the same manner; replicate samples are used to measure natural variability of the stream as well as the precision of sampling and analytical method

Representativeness - the extent to which collected data actually represents the conditions you are monitoring. It is most affected by site location.

Respiration - a process in which animals and plants absorb and use oxygen from the surroundings and give off carbon dioxide.

Riffle - fast flowing area of a stream where shallow water breaks over boulders, rocks and gravel.

Riparian - transition habitat between water and land.

Riparian vegetation - vegetation found on the banks of a river or stream that is directly influenced by the presence of water. Occurs between a normal river level and the edge of the flood plain.

Riprap - rock used on an embankment to protect the bank against erosion.

Run - fast flowing area of a stream where shallow to deeper water flows over boulders, rocks and gravel where the water's surface is not broken.

Run-off - rainfall, melted snow or irrigation water, that flows across land's surface instead of soaking into the ground. Run-off may pick up and carry a variety of pollutants.

Salinisation - a process in which the concentration of salts in the root zone of the soil increases. This is often caused by the capillary rise of saline moisture from a shallow water table.

Salinity - concentration of salts, measured in milligrams per litre (mg/L) or microsiemens per centimetre (μS/cm).

Salts - compounds that dissociate in water to yield a positively charged ion and a negatively charged acid radical ion.

Saturation - a point at which a solution contains enough of a dissolved solid, liquid or gas so that no more will dissolve into the solution at a given temperature and pressure.

Scavenger - animal that feeds on dead organic material.

Sediment - insoluble material suspended in the water that consists mainly of particles derived from rocks, soil and organic materials. It is a major non-point source pollutant to which other pollutants may attach.

Sedimentation - the transport and deposition of sediment particles by flowing water or wind.

Seepage - the process by which water percolates downwards and/or laterally through the soil, often emerging at ground level lower down a slope.

Sensitivity - related to detection limits. It refers to the capability of a method or instrument to discriminate between two samples that have very similar concentrations.

Sewage - domestic or commercial wastewater that contains human waste.

Sewerage system - a complete and contained pipe system that facilitates the collection, transportation, treatment and discharge of waste-water (sewage).

Shock-loading - the sudden introduction of pollution to a water body that severely impacts on aquatic life.

Silt - fine particles of mud or clay in a water body.

Siltation - the deposition of silt carried by flowing water.

Soil degradation - decline in soil quality, commonly caused through its improper use by humans. Examples are loss of organic matter, decline in soil fertility, decline in structural condition, erosion, adverse changes in salinity, acidity or alkalinity and the effects of toxic chemicals, pollutants or excessive flooding.

Soil salinity - characteristic of soils relating to content of water-soluble salts; such salts predominantly involve sodium chloride, but sulphates. carbonates and magnesium salts may occur. High salinity adversely affects the growth of plants and therefore increases erosion hazard.

Soluble - dissolves in a solution, usually water.

Split sample - one sample that is divided equally into two sub-samples. Split samples are used to measure precision.

Standard deviation - a statistical measure used to compare how closely three or more results are clustered around the average value. It is expressed as a + or - from the average value.

Storm flow - that portion of rain that leaves a drainage area in a comparatively short time; also called excess rainfall, surface run-off.

Stratification - formation of layers where different conditions eg: temperature, light, nutrients, prevail in a body of water, eg: thermal stratification.

Stream bank - zone forming the margin of a stream channel which results from erosion and deposition of the stream; stream banks are identified right bank or left bank looking downstream.

Stream reach - a length of stream that has relatively similar features eg: numerous riffles.

Submergent plants - plants that live and grow fully submerged underwater.

Substrate - refers to surface. It includes material comprising the streambed or the surfaces that plants and animals attach to or live on.

Surface run-off - water originating from rain or snow that flows across land surfaces instead of soaking in.

Suspended sediment - the sediment that is being transported by water or air while held in suspension.

Taxon (taxa – pl.) - any named group of organisms; level of classification within a scientific system that categorises living organisms based on their physical characteristics.

Taxonomic key - reference guide used to identify organisms.

Through flow - flow of water through the ground. Water which has been absorbed into the top soil then moves downhill to a water body.

Titration - addition of small, precise quantities of a reagent to a sample until the sample reaches a certain endpoint. which is usually indicated by a colour change.

Tolerable error range - the range of error in results that can be tolerated and still satisfy the monitoring goals.

Tolerance - the degree to which an organism is able to endure normally unfavourable environmental conditions.

Topographic map - a map that shows the surface features of a region such as hills or valleys.

Topography - the representation of surface features of a region on maps or charts.

Total dissolved salts - dissolved salts in water.

Toxic - being harmful, destructive or deadly to humans, animals or plants.

Toxic chemicals - any chemical that causes death or harm to humans, animals or plants.

Trace metals - naturally occurring metals found in minute quantities in the environment.

Transpiration - the process by which water taken up by plants from the soil, is evaporated from tiny pores on the leaf surfaces to the atmosphere.

Tributary - a smaller stream that flows into a larger one.

True value - a true value has been sufficiently well established to be used in the calibration of instruments or the assignment of values.

Turbidity - the cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter.

Understorey - the zone consisting of shrubs, herbs and grasses growing underneath trees. Understorey shrubs are woody plants less than 5 m tall, frequently with many stems near the base.

Unknown (mystery) samples - solutions made up by a quality control lab. The concentrations of particular indicators are unknown to samplers.

Verge - the area commencing at the top of the bank and extending from the bank to the next major vegetation or land use change.

Water quality criteria - maximum concentrations of pollutants that are acceptable if waters are to meet water quality standards.

Watercourse channel - having a defined bed and banks which surface water flows on a permanent or intermittent basis under natural conditions eg: creeks, springs, streams and rivers.

Water cycle - movement of water from the atmosphere to the earth and back to the atmosphere through precipitation, run-off, infiltration, percolation, storage, evaporation and transpiration.

Water logged - the condition of a soil saturated with water and lacking most or all of the soil air. The condition may be caused by excessive rainfall, poor soil drainage or excessive irrigation.

Water pollution - any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature.

Watershed - a dividing ridge between two catchments. Also a North American term for catchment.

Water table - upper surface of the zone of groundwater saturation.

Wetland - areas featuring permanent or temporary shallow open water. Land which is regularly or occasionally covered with water that is still or flowing, fresh, brackish, or salt, including areas of marine water which does not exceed a depth of six metres at low tide. Includes billabongs, marshes, swamps, lakes, mud flats and mangrove forests.

Woody debris - branches or roots of dead or living trees that have fallen into the stream.

Zone of saturation - the underground area above an impermeable layer where water fills all open spaces between rock, sand and soil particles.

References and Bibliography

Andersen, A.N. (1999) Fire Management in Northern Australia: Beyond Command and Control, Australian Biologist, 12: pp.63-70.

Australian Water Association (2002) We All Use Water, Australian Water Association, Artarmon.

Australian Water Resources Council. Australian Water Weeds. Series of fact-sheets.

Australia/New Zealand Standard (1998) Water Quality Sampling Part 1: Guidance on the Design of Sampling Programs, Sampling Techniques and Preservation, and Handling of Samples.

Boulton, A.J. and Brock, M.A. (1999) Australian Freshwater Ecology: Processes and Management, Glen Eagles Publishing, Glen Osmond.

Brock, J. (1988) Top End Native Plants, John Brock, Darwin.

Brocklehurst, P. & Edmedes, B. (1995) The Mangrove Communities of Darwin Harbour, Department of Lands, Planning and Environment, NT.

Centre for Appropriate Technology (1999) Our place, Centre for Appropriate Technology, 9th edition, Alice Springs.

Clesceri, L.S, Greeenberg, A.E., and Eaton, A.D. (eds) (1998) Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association & Water Environment Federation, Maryland.

Commonwealth Government of Australia (1997). The Wetlands Policy of the Commonwealth Government of Australia

Cowie, I. D., Short, P. S., and Osterkamp Madsen, M. (2000) Floodplain Flora A Flora of the Coastal Floodplains of the Northern Territory, Australia, Australian Biological Resources Study (Flora), Canberra.

Dates, G., and Byrne, J. (1996) Benthic Macro-invertebrate Monitoring Manual (Draft) River Watch Network, Montpelier.

Davey, K. (1983) Our Arid Environment: Animals of Australia's Desert Regions, Reed Pty Ltd, Sydney.

Department for Water Resources (2000) ABC's of Groundwater, Centre for Groundwater Studies, South Australian Government, Adelaide.

Department of Environment and Land Management (1997) Map Reading Handbook, Department of Environment and Land Management, Tasmanian Government, Hobart.

Department of Industry, Technology and Resources (1987) Groundwater Victoria, Melbourne.

Department of Infrastructure, Planning and Environment (2002) Series of fact-sheets.

Department of Lands, Planning and Environment (1998) Mary River Integrated Catchment Management Plan, Department of Lands, Planning and Environment.

Farris Lapidus, D. (1990) Collins Dictionary of Geology, Collins, Glasgow.

Gray, B. 1996. What Lies Ahead for Tropical Savannas? Industry and Management Regimes, In A. Ash (ed), The Future of Tropical Savannas: An Australian Perspective, CSIRO, Townsville, pp 149-158.

Great Barrier Reef Marine Park Authority (1988).Project Reef-Ed, Great Barrier Reef Marine Park Authority, Queensland.

Green (1992) Water Studies for Younger Folk

Holmes, J. H., and J. J. Mott. 1993. Towards the Diversified Use of Australia's Savannas. Pages 283-317 in M. D. Young and O. T. Solbrig, eds. *The World's Savannas: economic driving forces, ecological constraints and policy options for sustainable land use*. UNESCO Paris and Parthenon Publishing Group, Paris.

Hunt, J.S. (1992) (ed) Urban Erosion and Sediment Control, Department of Conservation and Land Management, Sydney.

Jones, V., and Welch, C. (1995) Where Rivers Meet in Global Issues, a supplement to Australian Geography, Teacher Association Journal.

Karp, D. (2002) Land Degradation Associated with the Sinkhole Development in the Katherine Region, Department of Infrastructure, Planning and Environment, Technical Report No 11/2002, Darwin.

Knox, B, Ladiges, P. and Evans, B. (1994) Biology, McGraw-Hill Book Company, Sydney.

Lacey, C. J. (1979) Forestry in the Top End of the Northern Territory, Search 10:174-180.

Land & Water Resources Research Development Corporation (LWRRDC) (1999) Riparian Land Management Technical Guidelines – Volume 1. LWRCC, Canberra.

LeGras, C. (1999) A Compendium of Information for Managing and Monitoring Wetlands in Tropical Australia (Eds. C.M. Finlayson and A.G. Spiers), Northern Territory University, Darwin.

Mastaller, M. (1997) Mangroves: The Forgotten Forest between Land and Sea. Tropical Press Sdn. Bhd., Kuala Lumpur.

McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J., and Hopkins, M.S. (1998) Australian Soil and Land Survey Handbook, Department of Primary Industry and Energy and CSIRO, Canberra.
Miles, G. (1999) A Compendium of Information for Managing and Monitoring Wetlands in Tropical Australia (Eds. C.M. Finlayson and A.G. Spiers), Northern Territory University, Darwin.

Miller, R.W and Donahue, R.L. (1995) Soils in our Environment, Prentice Hall Inc., New Jersey.

Mitchie, M. (2000) Go with the Flow. Draft version of the Northern Territory Waterwatch Education Kit – unpublished.

Odum, E. (1959) Fundamentals of Ecology, Saunders, New York.

Parks and Wildlife Commission of the Northern Territory, Help Halt the Cane Toad, Government Printer of the Northern Territory, Darwin.

Power and Water Authority (1996) Plugged in and Turned on: Curriculum Support Package.

Sainty, G.R. & Jacobs, S.W.L. (1988) Waterplants in Australia, G-Line Productions, Sydney.

Segar, D.A. (1998) Introduction to Ocean Sciences, Thomas Nelson Australia, Melbourne.

Smith, N.M. (1995) Weeds of Natural Ecosystems: A Field Guide to Environmental Weeds of the Northern Territory, Environment Centre NT Inc., Darwin.

Serventy, V.N. (ed) (1985) The Water birds of Australia, Angus and Robertson Publishers, North Ryde.

Strahan, R. (ed) (1995) The Mammals of Australia, Reed Books, Chatswood.

Taylor, J. A., and Braithwaite, R. W. (1996) Interactions between land uses in Australia's Savannas - It's Largely in the Mind! In A. Ash (ed), The Future of Tropical Savannas: An Australian Perspective. CSIRO, Townsville, pp 102-118.

Tothill, J. C., and Gillies, C. (1992) The Pasture Lands of Northern Australia, Tropical Grassland Society of Australia, Brisbane.

Tennessee Valley Authority (1992) Teacher-Student Water Quality Monitoring Network Workshop – Teacher Guide USA.

Tyler, M.J. & Davies, M. (1986) Frogs of the Northern Territory, Government Printer of the Northern Territory, Darwin.

Water & Rivers Commission Western Australia (1999) Swan River Education Kit. Water & Rivers Commission Western Australia, Perth.

Waterwatch Australia (2000) Waterwatch Reference Manual Field Test Draft

Waterwatch Queensland (1995) Waterwatch and your catchment: Involve me and I'll understand. Department of Primary Industries, Brisbane.

Waterwatch Queensland (1994) Waterwatch Technical Manual: Involve me and I'll understand. Department of Primary Industries, Brisbane.

Waterwatch SA (1996) Catchment Care and Water Quality Monitoring Manual for South Australia, Department of Environment and Natural Resources, Adelaide.

Williams, R. J., Duff, G. A, Bowman, D. M. J. S., and Cook, G. D. (1996) Variation in the composition and structure of tropical savanna and soil texture along a large-scale climatic gradient in the Northern Territory, Australia. Journal of Biogeography 23: 757-756.

Williams, D.D., and Feltmate, B.W. (1992) Aquatic Insects,
CAB International, Oxon.

Woinarski, J. C. Z. (1993) Australian tropical savannas, their avifauna, conservation status and threats. In C. P. Catterall, P. V. Driscoll, K. Hulsman, D. Muir, and A. Taplin (eds), Birds and their habitats: status and conservation in Queensland, Queensland Ornithological Society Inc., Queensland, pp45-63.

http://www.nt.gov.au/dbird/dpif/fisheries/environment/pestman/index.shtml
http://www.lpe.nt.gov.au/advis/water/ground/USES.HTM
http://www.lpe.nt.gov.au/advis/water/ground/Goyder.htm
http://www.nt.gov.au/paw/parks/berry.htm
http://www.dbird.nt.gov.au/mines_index.htm
http://www.nt.gov.au/pawa/html/newsinfo/info_wat1.html
http://www.iwr.msu.edu/edmodule/water/cycle.htm
http://www.frogwatch.org.au
http://edo.org.au/edonsw/publications/factsh/fact2000main.htm
http://www.nt.gov.au/dbird/dpif/general/industry/
http://www.nt.gov.au/dbird/dpif/pubcat/agnotes/agnotes.shtml
http://www.ea.gov.au/water/wetlands/publications/policy.html