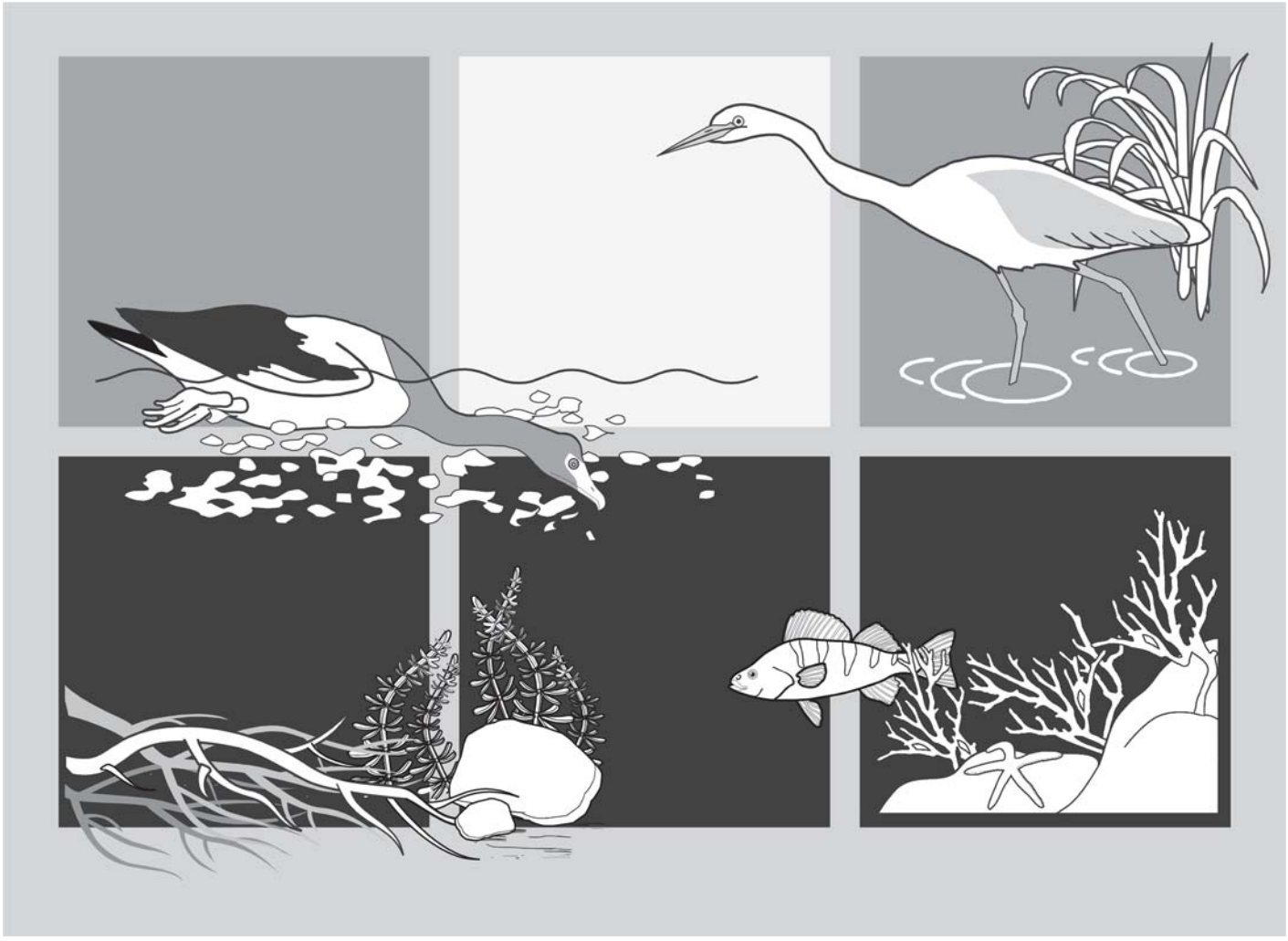
WETLANDS REEF Beat

A Great Barrier Reef Marine Park Authority Initiative



Australian Government

Queensland Government

Introduction

Reef Beat

Reef Beat – Wetlands is a product of the Great Barrier Reef Marine Park Authority.

Reef Beat – Wetlands provides students and teachers with information about the connectivity between wetlands and the Great Barrier Reef. Activities and posters included in this resource enable students and teachers to learn more about their local wetlands and the Great Barrier Reef, while also helping them to become involved in the recovery of our precious wetland and reef communities by assisting to improve the quality of water entering the Reef.

The posters can be cut, marked on and pasted by even very young students. While for older students they help to develop independent reading skills, improve vocabulary, enhance comprehension and critical thinking and increase their knowledge about wetlands and the Great Barrier Reef.

The charter of the Great Barrier Reef Marine Park Authority's Education Unit is to deliver education programmes and activities about the Great Barrier Reef Marine Park and World Heritage Area throughout Australia.

To meet this charter, the education unit has developed a range of new programmes and educational activities that deliver key Great Barrier Reef Marine Park Authority messages. These can all be found online at ***www.reefed.edu.au***.

For enquiries about the *'Reef Beat'* resource please contact:
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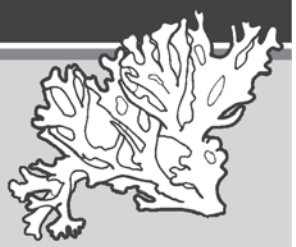
THE RATIONALE



While most Queenslanders know something about wetlands and what they look like, many are unaware of their immense value to our environment, our lifestyle and the economy.

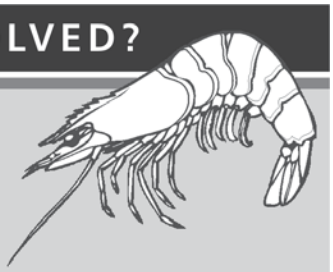
Wetlands occur in many different forms but can be broken down into two categories, saltwater wetlands and freshwater wetlands. Each has its own unique ecosystems of plants and animals that depend on the wetland for food, water and shelter.

In Queensland, wetlands are vital waterways that reflect the health of catchments. They are an essential part of the corridor linking the catchments with the coast and can be areas of great beauty where people enjoy the scenery and gather for recreation.

However, wetlands are under pressure. Many have been altered or destroyed for land uses such as urban development and agriculture. Surface water runoff contaminated by pesticides, fertilizers, herbicides, detergents and petroleum products are changing the natural balance of wetlands.

To protect and conserve wetlands we need to understand them and learn how to manage them wisely. Much work is already being done to conserve and manage wetlands in Queensland.

WHY GET INVOLVED?



Caring for wetlands, water quality and better wetland management is essential to the survival of the Great Barrier Reef. The Great Barrier Reef Marine Park Authority and its partners promote the appreciation and sustainable use of wetlands through education and research.

Reef Beat — Wetlands is a timely and exciting opportunity to provide immediate and ongoing support for schools in assisting young people to become aware and actively involved in a most important challenge: to care for, and improve the quality of our wetlands.

HOW TO USE THIS RESOURCE

You can use this resource to plan, provoke, stimulate, support and inspire your teaching and learning programme. The activities within this resource can support you:

- When planning learning activities which focus on wetlands, water quality and connections to the Great Barrier Reef Catchment.
- To give students opportunities to see how we use, value and manage wetlands.
- To take an active role in teaching about wetlands and the Great Barrier Reef.
- To contribute to the responsible development of our future citizens and the relationship with both wetlands and the Great Barrier Reef.
- To empower students to take positive action for sustainable reef management, and to support the principles of ecological sustainability.

Please note that activities separated into Primary and Middle Schooling have been linked to grade levels using indicators such as (4–6) or (6–10).

Activities for use with Poster 1: *'What is a wetland?'*

Activities for English, SOSE and Science
Primary and Middle Schooling

Read and view the feature poster. Talk with students about wetlands as land areas that are either temporarily or permanently covered by water. (4-10)

Introduce students to the concept of a wetland. Read fictional titles including, *A Wetland Home*, *Where the Forest meets the Sea,* and/or *The Smallest Frog in the World.* List wetland features as described in the stories. (4-7)

Pose some questions to students to focus their thinking on wetlands in the local area.

Introduce the following question grid.

What is?	Where/when is?	Which is?	Who is?	Why is?	How is?
What did?	Where/when did?	Which did?	Who did?	Why did?	How did?
What can?	Where/when can?	Which can?	Who can?	Why can?	How can?
What would?	Where/when could?	Which could?	Who would?	Why would?	How would?
What will?	Where/when will?	Which will?	Who will?	Why will?	How will?
What might?	Where/when might?	Which might?	Who might?	Why might?	How might?

Explain that questions they ask can be answered in different ways. They could be answered by:

- Asking.
- Looking/Observing.
- Experiencing.

Use the following technique to enable students to answer their questions.

1. Students generate a question using the question grid.
2. Question may be about animals, plants and people (see below for example). Animal questions relate to animals, plant questions to plants and people questions to ways people interact with the environment.
3. Students find the answer to the question by looking/observing, asking or experiencing.
4. Students record the answer. (4–10)

Animal questions	***Plant questions***	***People questions***
What types of animals live in wetlands?	*Why are plants important to wetlands?*	*Who might enjoy wetlands?*

Sketch/draw or write about local wetlands. Talk about drawings or writings, explaining the content. (4–7)

Make a class mural depicting a local wetland. (P–4)

Make word associations. List key words, names, animals, plants, habitats, views of a wetland, uses of wetlands, and make links between them. (P–4)

A–Z of wetlands — Make a list or picture book of wetland-related terms beginning with a different letter of the alphabet. (P–4)

Create a concept map. Give each student ten cards. On the first card they write 'wetlands' as the subject for the concept map. On the remaining cards each student writes or draws other words/ images they think are important in relation to the topic. Next, individually or in pairs, place cards on a big sheet of paper and move them around until students are satisfied with the arrangement. Encourage them to link their ideas by drawing lines or arrows through related ideas. Encourage students to write words or connecting phrases on the arrows or lines to help convey meaning. (4–7)

Visit a wetland. Find a place to sit quietly and listen for the sounds of the wetland. Focus on the natural sounds. Focus on the artificial or people-made sounds. Investigate where the sounds are coming from. (4–6)

If unable to visit a wetland, **videos and picture books** are available. Some include:

- *Billabong and Waterhole* Educational Media *Australia, 1978*
- *Receding Wetlands* Australian Broadcasting Corporation
- *The Wetlands Problem* Educational Media Australia
- *Longneck's Billabong* Macmillan 1987
- *The Frog and the Pelican* Fontana 1981
- *Black Duck and Water Rat* Collins 1988.

Read and discuss picture books, fiction, and web based information and non-fiction materials with a wetland or wetland setting. (P–5)

Summarise what is known about wetlands by using a mind map or sketch. Summarise why they are important.

Make a collage of a wetland using images from the Reef Ed website www.reefed.edu.au or magazines and books. (4–10)

What do wetlands do?
Investigate how a sponge might reveal an important wetland function.

You will need:

1 cup of water, a damp sponge and a sink.

Procedure:
Investigate how sponges are like a wetland and can capture, store and slow the movement of water through them and can reduce downstream flooding. (4-6)

Investigate what a strainer and coffee filter can demonstrate about wetlands.

You will need:

A jar with a lid
Water
Pebbles
Dirt
Coffee filter
Kitchen strainer.

Mix pebbles, dirt, and water in a jar, close the lid and shake. Using the strainer, coffee filter and sediment load explore the similarities between these items and what a wetland does.

Reflect on the investigations and summarise why wetlands are important. (4–6)

Make your own wetland using an aquarium or small children's wading pool, some rocks, soil or gravel, water plants, water, a water purifier, suitable water creatures such as tadpoles, yabbies, water beetles (if collected from a wetland, return at the end of the activity), filter and sunlight. Encourage students to design their version of what it could look like and what could be in it. Display students' designs and select popular features. When the wetland environment is complete, agree on rules for its maintenance.

N.B. Check State regulations on keeping animals in the classroom before undertaking this activity.

Using students' knowledge of their local area, compare and contrast the wetland images on the Reef Beat feature poster with the area in which the students live. Discussion questions might include:

- What is our wetland like?
- What wetland types can be found in our catchment? How does the quality of these vary?
- What does the wetland look like?
- What places use the water in the wetland before us?
- What types of animals live in our wetland?
- How do they survive?
- What types of trees, shrubs, grasses etc are there?
- What surrounds the wetland (land types)?
- Why is the wetland important?

Prepare a short description of the landscape features of the wetland in the local area.

Prepare a report in the form of a poster or written report and present to the class. (6–10)

Discuss with the class what they think the differences are between a healthy and an unhealthy wetland. See poster 4. (6–10)

Assess the condition of the land around the wetland in your local catchment. (6–10)

Site Evaluation
Using the table below, students should evaluate the condition of the local wetland and add other headings to the list as they go. (6–10)

Create slogans that promote involvement in managing wetlands, in a manner that will ensure the conservation and sustainability of catchment resources and their uses. (6–10)

Write to lead agencies about measures being taken to reduce land degradation and rehabilitate wetlands. (6–10)

Devise a community newsletter encouraging involvement in the development of a wetland management plan to ensure that the vital resources are conserved for the future. (6–10)

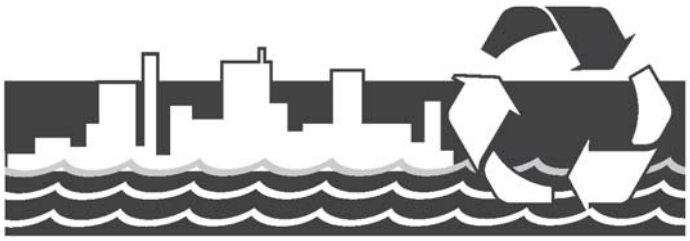
Investigate Reef Guardian Schools who are concerned about the sustainable management of our land, water, vegetation and marine resources. See www. reefed.edu.au/guardians and see how they care for wetlands and wetland issues. (6–10)

Site:					
Date:	***Excellent***	***Good***	***Fair***	***Poor***	***Very poor***
Grass/pasture cover					
Health of trees/shrubs					
Tree cover					
Humus* content of soil					

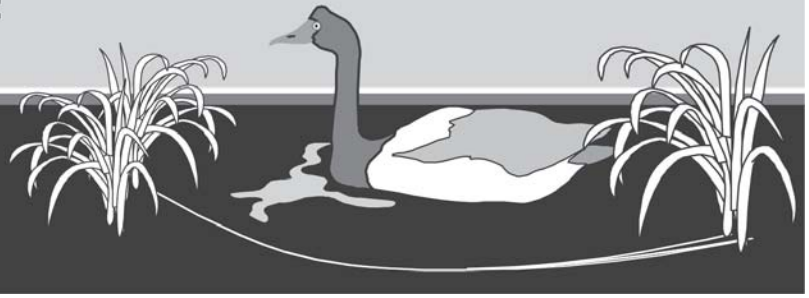
**Humus is partially or wholly decayed vegetable or animal matter that provides nutrients for plants and increases the ability of the soil to retain water.*

Using class meetings discuss and decide upon how the school can help others know about wetlands, wetland care and their role in it. Decide on how the school might also get actively involved. For example:

- Set a goal and objectives; identify why the wetland is important.
- Form a wetland group and promote a whole-school approach where policies, programmes, cleaning practices and so on reflect living sustainability in the catchment.
- Develop reduce, reuse and recycle projects.
- Adopt a wetland and get involved in bank stabilisation, revegetation, creek and wildlife studies, stormwater quality monitoring and management actions.
- Present public environmental education displays and performances to inform and involve the local community about how they can avoid adding wastes to the water flowing into wetlands.
- Form a Waterwatch group and implement a water quality monitoring programme.
- Develop action plans for identified sites, as well as the needs of the local wetland and set in motion an environmental programme for the care of the wetland. (6–10)



Activities for use with Poster 2: *'Wetland diversity'*



Activities for Science, SOSE and Geography

Primary and Middle Schooling

Read and view the second feature poster illustrating the diversity of wetlands. Discuss special parts of different types of wetlands (saltwater, freshwater).

Talk with students about wetland types and ask questions like:

- What is this wetland type?
- What is this place like?
- Where is it?
- How is it used?
- What might be happening at this place at this time?

Predict and list features students think would be the most common in saltwater and freshwater wetlands. Test these by counting the number of times the feature is suggested by students. Make a class graph of results.

Collect/download photographs of wetlands. Students share these and talk about features and activities they recognise. Identify things that these wetlands have in common and things found in only one or a few wetlands.

Prepare a class chart of things students know about wetlands, e.g. freshwater wetlands and saltwater wetlands. Students also prepare questions they will investigate.

Place incomplete statements on cards for students to finish:

Wetlands are more than…

Saltwater wetlands produce food and shelter for…

We picnic and play…

Wetland plants…

Wetland animals…

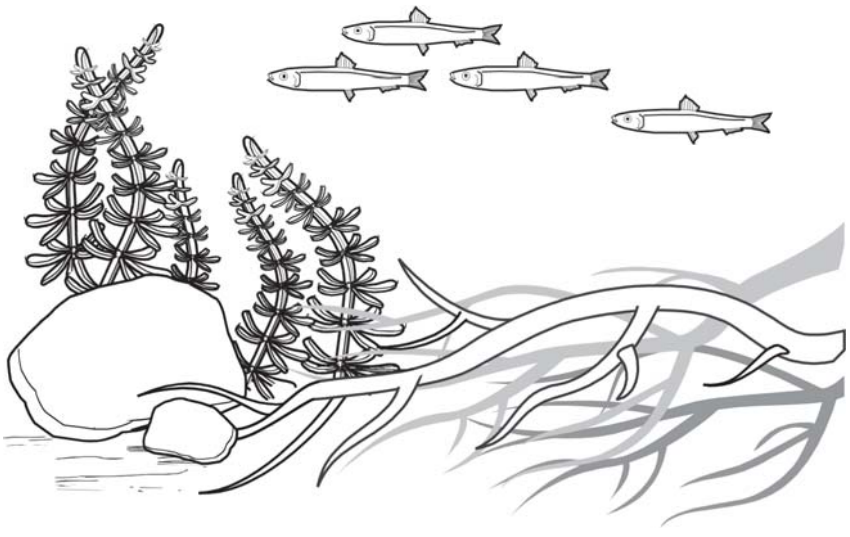
Freshwater wetlands are . . .

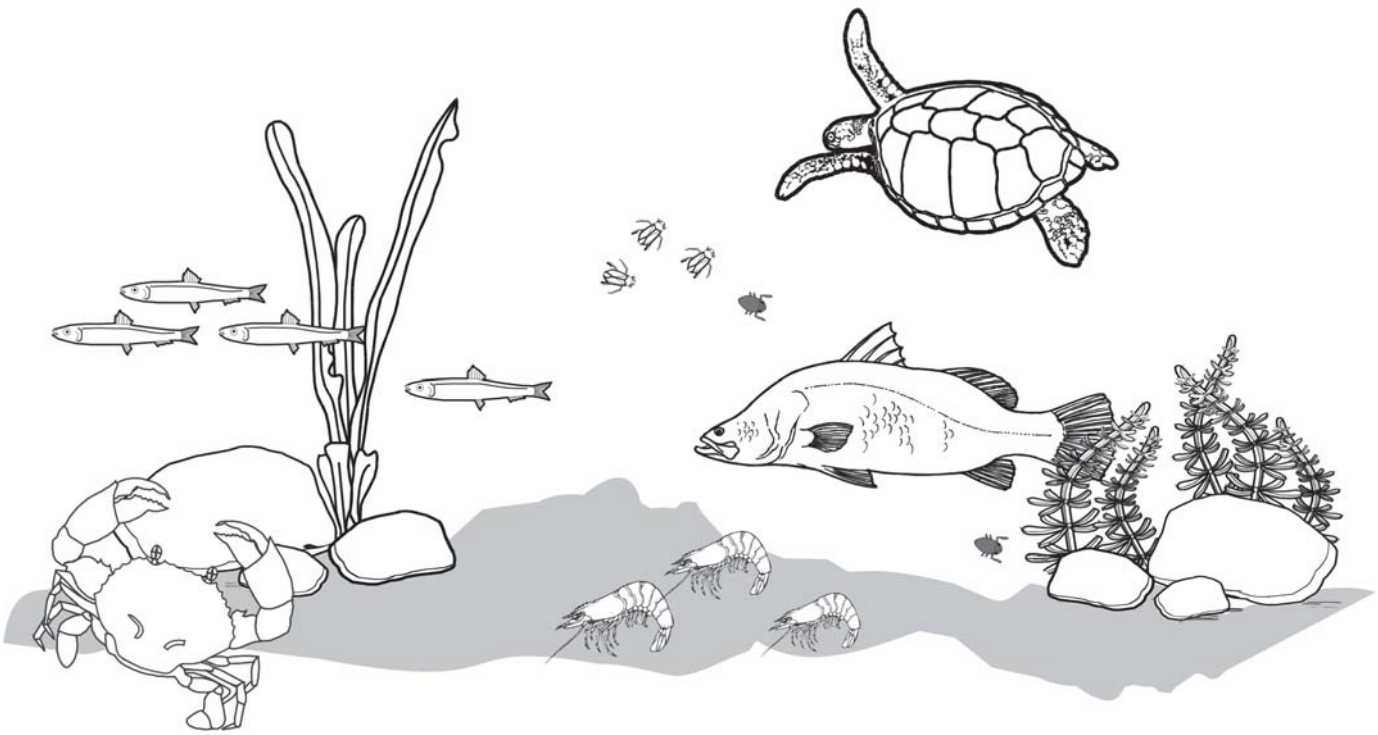
Establish students' knowledge by asking questions such as:

- What things would you expect to find in a saltwater/freshwater wetland?
- Who or what uses saltwater/freshwater wetlands?
- What use do people make of saltwater/ freshwater wetlands?

Brainstorm ways wetlands can contribute to the protection the Great Barrier Reef.

Design communication tools such as brochures, newsletters, drink coasters, etc. to share these ideas with a wider audience.





Activities for use with Poster 3:
'Urban and farm wetlands'

Activities for English, SOSE and Geography
Middle Schooling

View the third feature poster. Talk with students about urban and farm wetlands. Discuss how they capture, store and slow the movement of water through them and help to improve the quality of water in wetlands downstream and in the Great Barrier Reef. (4–10)

Prepare a class database and record information about wetland types. For example:

	Uses	*People who use it*	*Types of plants*	*Types of animal life*	*Other natural features*	*Problems or neglected areas*
Saltwater wetland						
Freshwater wetland						
Farm wetland						
Urban wetland						

Discuss the role these wetlands play in contributing either directly or indirectly to the quality of water, habitat and biodiversity.

Using a wetland of your choice as the basis of your study, report on how the local environment has changed from its original state prior to European settlement, to the present day. Consider how the land was undisturbed before settlement and cleared after settlement for production and development. (7–10)

Analyse the human impact on the waterways in the local catchment and the consequent impact on the Reef. (7–10)

Discuss the role of urban and farm wetlands in sustainable catchment management, using the local area's Water Management Plan as a guide**.** (7–10)

Research the history of the site exploring the management options and reasons for the final decision to construct the wetland. A cost/benefit analysis should be included. (7–10)

Investigate the urban or farm wetland site. Include the following information in a report:

Catchment area of the Wetland. Select the relevant map and point out major features and land use, (does your wetland lead to the Reef?), highlighting them on the map.

Location of the Wetland. Refer to the map selected and explain why the wetland is situated where it is in the area. Select a map that shows the location of the wetland on a broader scale within the catchment and explain its location.

Description of the wetland complex. Select the relevant map and give details about the key features of the complex, highlighting them on the map.

Description of water test site/s. Include a map which shows the location of your test site/s as well as the class group test site/s. Explain your choice of test site/s.

Management of the Wetland. Research and describe the parties responsible for the daily management, their specific roles and ongoing costs. (7–10)

Undertake water sampling at the urban or farm wetland site
Explain your approach (whether individual, paired or grouped) and the purpose of your monitoring. Include the following details:

- Date.
- Time.
- Weather on the day / during the previous week.
- Include temperature and rainfall statistics. (7–10)

Using the Queensland Department of Natural Resources and Mines *Waterwatch Manual* as a guide and the relevant equipment, conduct the following tests:

Biological survey — "Abundance and diversity of aquatic invertebrates indicates the health of the water body."

Conductivity — "Amount of dissolved salts in the water (salinity level)."

Dissolved oxygen (DO) — "Amount of oxygen in the water which is essential for the survival of most organisms."

pH — "Acidity or alkalinity of the water which affects the survival of aquatic life."

Phosphates — "Amount of phosphate in the water indicates the nutrient status, organic enrichment and consequent health of the water body."

Nitrates — "Amount of nitrates in the water indicates organic enrichment and consequent enrichment of the water body."

NB. You may negotiate with your teacher to conduct further tests of your choice from the Waterwatch Manual:

Biological oxygen demand (BOD) — "Amount of oxygen consumed by decomposition of organic wastes e.g. sewage. It measures the load of organic pollution in the river."

Temperature — "Average temperature and temperature changes of the water affects the survival of aquatic life."

Faecal coliforms — "Numbers of faecal coliform bacteria present which may indicate the presence of other disease-causing bacteria, viruses and parasites."

Water flow — "Volume and speed of water flow affect pollution loads and the survival of aquatic life."

Habitat survey — "The habitat and health of the riparian vegetation affects the health of the water body." *(Water quality assessment information courtesy of Queensland Department of Natural Resources and Mines.)*

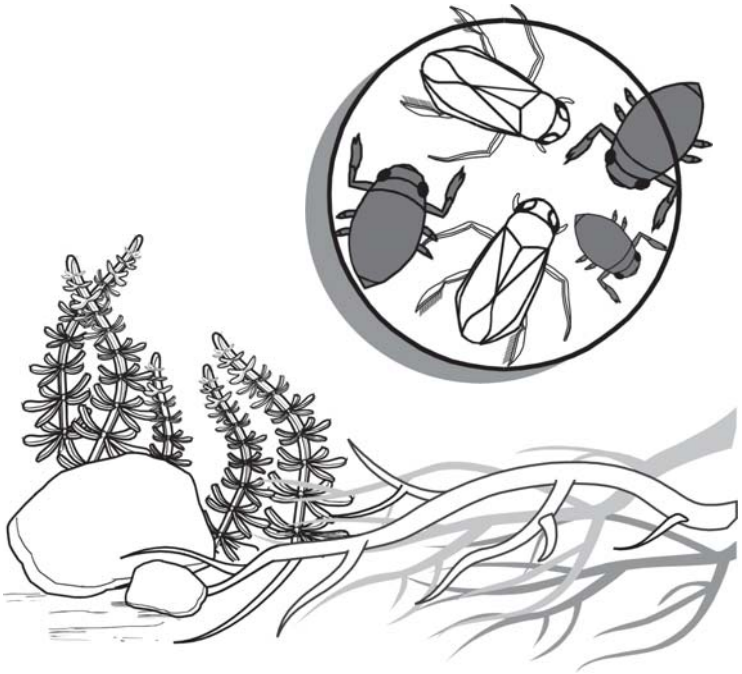
Design charts to record your results. Include the following headings for all tests: Site, Date, Time, Result, and Comments.

Collate the class results. Ensure that the class develops a test site map and an overall chart that is common to all students.

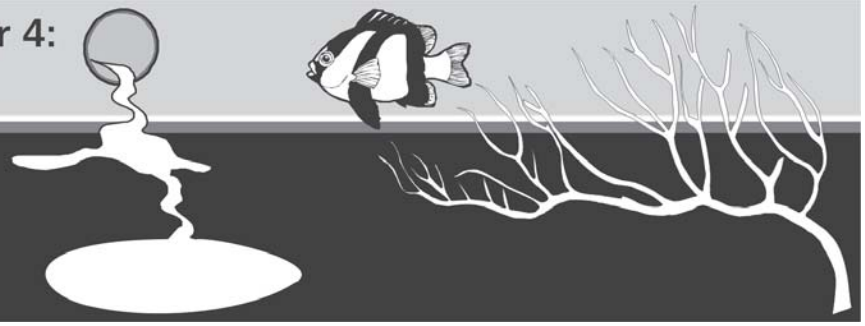
Write up each test using the following criteria:

1. Discuss the significance of each test.
2. State the result of each test and interpret what it says about the quality of the water in the wetland.
3. Outline influences on this test result (i.e. evaluate each test result). (7–10)

Evaluate the quality of water in the wetland (or wetland of your choice) based on your analysis of the results in the earlier activities. Make a collective generalisation and evaluate it by discussing the limitations of your data collection. Summarise and evaluate the role of urban wetlands in sustainable catchment management. (7–10)



Activities for use with Poster 4: *'It's all connected'*



Activities for English, SOSE and Geography
Primary and Middle Schooling

View the fourth feature poster. Talk with students about nutrients and sediments. Discuss how they can affect the quality of the water in wetlands and the Great Barrier Reef. Discuss daily activities that may increase the levels of nutrients and sediments being discharged to the Great Barrier Reef, polluting its waters. (4–10)

Describe and list what affects excessive amounts of nutrients and sediments would have on the plants and animals in watercourses, wetlands and the coral communities of the Reef. (4–10)

Draw before and after pictures of the plants and animals in watercourses, wetlands and coral communities affected by excessive amounts of nutrients and sediments. (4–6)

Make predictions about the interactions that could be found in the waterway and wetland. (6-10) (Consider also the barriers for species entering wetlands e.g. water quality, dams, weirs, road culverts).

Make a directory of common excessive nutrient and sediment effects. Describe symptoms and cures. (4–6)

Write directions for preserving a wetland and coral community from the effects of excessive amounts of nutrients and sediments. (4–6)

Make predictions about the types of materials, sediments and nutrients that could be found in waters that discharge into the Great Barrier Reef. (4–6)

Do an active survey of a waterway near your school. Survey for materials and test for nitrogen and phosphorus. (6–10)

Trace the path of one element from its point of source to the time it ended up in the waterway, wetland and waters surrounding the Reef. (4–6)

Look at industries and services, both city-based and rural and investigate their possible effect on waterways, wetlands and the Reef. (6–10)

Consider how:

- a stormwater drain
- an irrigation outlet
- cleared land on a riverbank
- grazed land near the waterway
- a gully
- an effluent pipe
- an eroded riverbank
- a weir/dam
- a road culvert

could directly or indirectly contribute to the interactions depicted in the diagram on feature poster four. (6–10)

Focus on discharge points and drains that can be found in the poster and imagine collecting water samples here. Confirm predictions by investigating similar outlets in your local area and collect water samples. Test for phosphorus, nitrogen, and sediment. (6–10)

View the poster and consider the interactions depicted. Draw flow charts to show the links between areas of degraded land, poor land management, degraded areas of the natural environment and poor water quality. (4–6)

Tell the story of Dougy-Dirt-Particle as it moves from the over-cleared, overgrazed area of land, across the hillside, through the farm, down the gully, over the levee bank and into the river. Who and what does it see on its way? Who joins it? What happens to the water quality? (4–6)

View feature article four and:

- **Draw similar scenes** that highlight the nutrient and barrier issues described.
- **Locate information** about nutrient issues and how they affect waterways, wetlands and the Great Barrier Reef.
- **Discuss** what people do to change environments.
- **Discuss** what changes can occur to environments due to nature's forces.
- **Identify** changes nature and people have made to the environment. Consider the effects these changes have had on the water entering waterways, wetlands and the Reef.
- **Make a display board** of land and marine environmental changes. Divide the board into two classifications — changes caused by nature and changes caused by people. (4–6)

Consider your local area and identify where land remains in its original state; where land is being changed with an emphasis on food production; where land is being changed with an emphasis on urban development; and where people are using the land irresponsibly. Consider whether excessive sediments and nutrients might be entering waterways, wetlands and the waters surrounding the Reef as a result. Discuss your choices and give reasons for them. (4–10)

Imagine you are a camera lens and zoom in on sites of the local region where people are restoring the landscape to stop excessive nutrients and sediments from entering waterways, wetlands and the waters surrounding the Reef. (4–10)

Collect and interpret data and build an understanding and awareness of the effects of excessive amounts of nutrients and sediments being discharged into our waterways and the Reef. Using Waterwatch activities, investigate the influence of humans on aquatic and marine ecosystems. Select sites and test for turbidity, pH, total dissolved solids, total suspended solids, nitrates, faecal coliforms, microscopic life and dissolved oxygen. (6–10)

Note: Procedures for these investigations are available in publications put out by Waterwatch (QLD), Waterwatch (SA), Ribbons of Blue (WA), Streamwatch (NSW), Waterwatch (ACT), Waterwatch (VIC) and Waterwatch (TAS).

If you can not get out to your local wetland your class can participate in a virtual field trip as part of the Exploring Wetlands web quest. Visit www.reefed.edu.au/students.

Using data collected, prepare reports. Include:

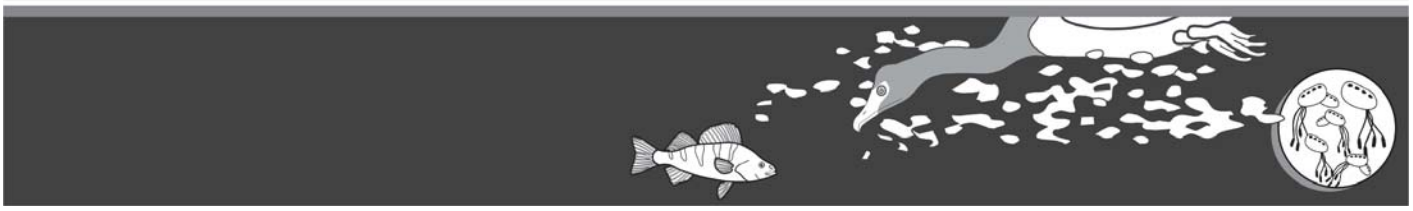
- Description of the environment; e.g. location of site; sketch map; photographs – labeled and explained, sketches of plants and animals, data tables, water sample tests undertaken and results.
- Description of the water quality, landscape quality and plant/animal diversity.
- A personal assessment of the environmental quality of the site. (6–10)

Using the results, discuss the range of human activities that could have contributed to the results collected. (6–10)

Construct concept maps to show the causes and effects of excessive amounts of nutrients and sediments in marine areas. Ask questions that look at the ecological, social and economic side of wetlands. Consider the tables and lists generated previously:

- What is the problem?
- How does the problem occur?
- What are the consequences of the problem? (6–10)

Activities for use with Poster 5:
'Aquatic food webs and the connectivity between fish habitats'



Activities for Technology and SOSE

Primary

Read and view the fifth feature poster. Talk with students about aquatic organisms that live in waterways and wetlands. Brainstorm other types of animals that live in, under or on these waters. Make some of these in the technology activities suggested below. (4–7)

Context 1

Macroinvertebrates live in waterways and wetlands (e.g. dragonfly, caddis, damsel and mosquito larvae) — why are these important?

Task
Design and make your own macroinvertebrate using recycled materials.

Requirements
Your macroinvertebrate must have a:

Head with eyes, mouth and feelers
Thorax with wings and legs
Abdomen

Investigate
Look at macroinvertebrates under a microscope or at pictures in the Waterwatch manual. Identify and list body parts. Identify the feature of each part.

Devise solutions
Draw some macroinvertebrates you may like to make. Select one and do a large, colourful drawing of it. Label the body parts. Look at the materials available and make what you need

Produce
Make your macroinvertebrate.

Evaluate
Does your macroinvertebrate have a head, thorax and abdomen? What does it eat? Where does it live? Write a story… a day in the life of… (4–7)

Context 2

At local wetlands many different types of insects can be identified, why are these important?

Task
Design and produce a model of one of these insects. It must have moving parts.

Requirements
Materials — Pop sticks, straws, dowel, pipe cleaners, wire, egg cartons, rubber bands, paper fasteners, split pins.

Tools — hand saws, scissors, drills, hammers, pliers, wire cutters, vice, clamps, glue guns, cork blocks.

Investigate
Investigate the types of insects that live in and around wetlands. Select an insect that you wish to make and draw a diagram of its life cycle. What stage will your model represent? Look closely at the joints of the insect. How do they move?

Devise solutions
Name the insect you are making and accurately draw the insect and label each part. Decide which material you will use and label them on your drawing.

Produce
Make the insect of your choice.

Evaluate
Write a paragraph about this task. Include details on the quality of your planning and your finished model, how well you worked with others and if you enjoyed this work. (5–7)

Context 3

A diversity of insect life is often an indicator of a healthy environment. To investigate, identify and study waterborne insects. We need to be able to catch them without damaging any of their parts.

Task
Design and produce a net suitable for catching waterborne insects.

Requirements
Materials — a wire coat hanger, a length of wooden broomstick, stocking or pantyhose, plastic flywire, fabric net.

Investigate
The most effective design of a dip handled net to use in sampling waters in a wetland.

Devise solutions
Neatly draw two different designs for your net and label parts. Select your best design, giving reasons to justify your selection.

Produce
Make your net.

Evaluate
Use your net. Was it successful? How could you improve on it? (4–7)

Context 4

The presence of frogs in a wetland will signify a healthy environment.

Task
Select a species of frog and make a model of it using pneumatics or hydraulics to create the jumping movement.

Requirements
Cardboard, pencils, paints, textas, syringes, plastic tubing, masking tape, scissors.

Investigate
Research frogs to find out what types are found in wetland areas.

Devise solutions
Draw two different designs for your frog. Work out how a jumping movement can be created in your model. Complete a neat labelled drawing of your selected design.

Produce
Design your jumping frog and label the model with the frog species name.

Evaluate
Does the frog look like the species it represents?
Does the jumping action work repeatedly?
Do you need to modify the design? (4–7)

Context 5

The presence of fish in the wetland will signify a healthy wetland.

Task
Make your own wetland

Requirements
An aquarium, or small wading pool, rocks, soil or gravel, native water plants, e.g. fast growing azolla, water, suitable water creatures such as tadpoles, yabbies, water beetles, filter and sunlight

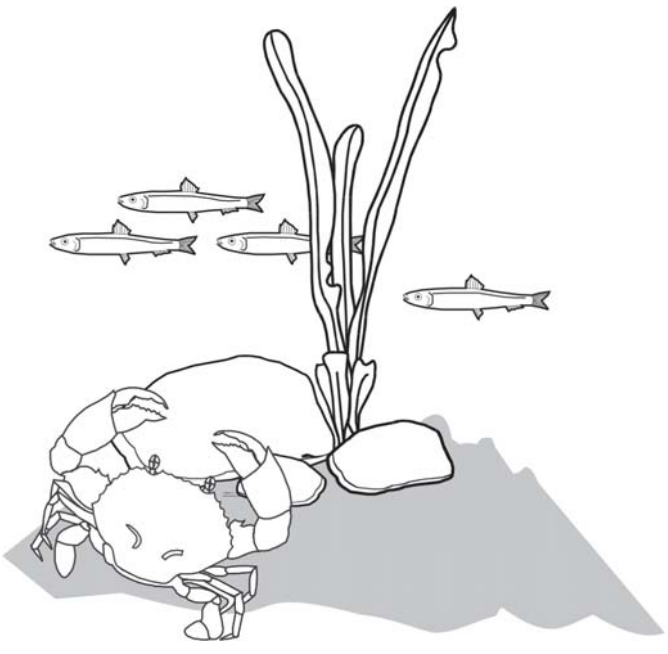
Investigate
Investigate the types of fish found in a wetland and recreate the wetland in a model form with native fish, plants and insects depicted.

Devise solutions
Before constructing the wetland, design a version of what it could look like and what could be in it.

Produce
Make the wetland. Decide upon rules for its maintenance.

N.B. Check your State's regulations on keeping animals in the classroom before undertaking this activity.

Evaluate
Write a paragraph about this task. Include details on the quality of your planning and your finished model. (5–7)



Go bird watching. Find a spot near the wetland and spend time just watching. Sketch birds seen. Note their size and colour. Look at the beak and feet that the bird has. Find evidence of where the birds have been along the banks of the wetland by looking for tracks, feathers, or droppings. Note what the bird is doing. Make notes about what you see. (4–6)

Look for tracks of animals in the mud or near the water's edge where they may have come to drink. Sketch tracks that are spotted. (4–6)

Although the wetland may not at first glance appear to be teeming with living things, it is almost certain to have small macroinvertebrates within it.

Using a long-handled dip net, place a flat side of the net on the bottom of the wetland so that the current flows into the net. Disturb the rocks and stones immediately near the net by brushing or stirring so that the animals clinging to the rocks are dislodged into the net. Empty the contents of the net into a white tray that contains 2cm of water and observe macroinvertebrates collected. Draw macroinvertebrates found. (4–6)

Please note: Only do this once, as a class can be very destructive in a given area.

Talk about the habitats of these tiny creatures. Draw picture maps to show where some of the creatures might be found.

On returning from the visit or after viewing and reading videos and books, summarise data collected about wetlands. (4–6)

Create a mural of animals within wetlands. Label the mural when complete. (4–6)

Compare and contrast saltwater and freshwater wetlands. Compile a retrieval chart comparing the animals within the two types of wetland environments.

	Animals	*Plants*	*Human uses*	*Threats*
Environment 1: Saltwater wetlands				
Environment 2: Freshwater wetlands				

Using information from the retrieval chart, write generalizations about the four aspects. Ask, 'what does the chart tell us?' (4–6)

Middle Schooling Activities

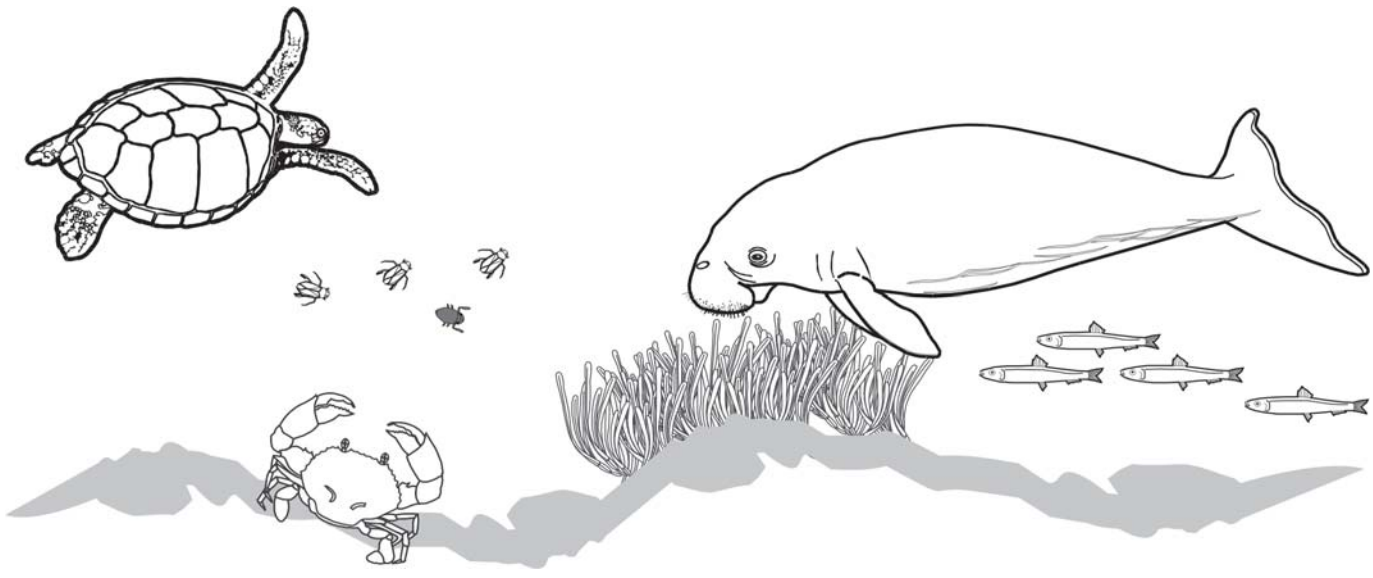
Visit a local wetland or view photographs or a video about wetlands. Read the feature poster for information about wetlands, their value and uses. (6–10)

After reading the poster, visiting a wetland area or viewing wetlands in a video, encourage students to undertake some of the following analysis activities:

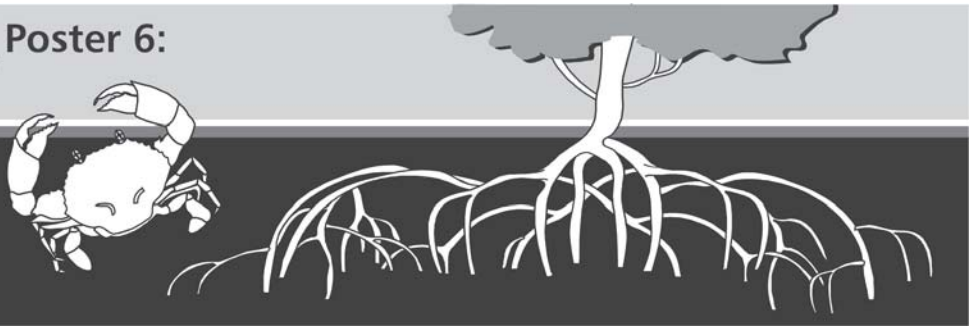
- Identify the community of a saltwater and freshwater wetland.
- List the components that form the wetland environment.
- Describe two issues that the wetland ecosystem may face, because of human activities and natural occurrences.
- Predict the consequences of negative human and natural impacts on saltwater and freshwater wetlands. (6–10)

Read the feature poster again for information about why the protection of wetlands is critical to help ensure the survival of the Great Barrier Reef. Discuss findings and record the role they play in the protection of the Reef. (6–10)

Find out if there are any local community projects being implemented in your area to help raise awareness of the role wetlands play. Promote these and get involved.



Activities for use with Poster 6: *'Wetland values'*



Activities for SOSE, Science and Geography

Primary and Middle Schooling

Read and view the sixth feature poster. Talk about the benefits of wetlands from an ecological, social and economic view. (4–10)

Discuss how wetlands in the catchments along the coast next to the Great Barrier Reef Marine Park are vital for the long-term protection of the Great Barrier Reef and for those who use it (recreational, commercial and cultural). (6–10)

Reflect on how freshwater and saltwater wetlands provide habitat, breeding and nursery areas for different species. List and draw these species. (6–10)

Wetlands have been called nature's kidneys because of their capacity to filter out nutrients. **Identify** wetlands in your local area that play an important role in protecting water quality in the Great Barrier Reef Marine Park by helping to filter the sediments, nutrients and other pollutants from waters that enter the Great Barrier Reef. (6–10)

Identify wetlands in the local area that play an important role in improving the quality of water entering the Great Barrier Reef. Draw a labelled sketch of the wetland and show how it achieves this. (6–10)

Brainstorm: discuss what wetlands in the local area are significant for Aboriginal and Torres Strait Islanders and those that provide for recreational and tourism opportunities. (6–10)

Visit a local wetland and examine its important characteristics. Students might:

- Identify what the land is used for upstream and surrounding the wetland.
- Draw a field sketch of the wetland and its immediate surroundings, labelling all features.
- Map and label areas that provide tourism and recreational opportunities.
- Indicate habitats of plants, birds and animals.
- Identify the local traditional owners. (6-10)

On returning to the classroom, students can **create a report** including:

- A location map of the wetland.
- A scale map of the wetland.
- A description of the wetland and what the surrounding land is used for, i.e. farming or national park.
- Photographs to show the important roles it plays.
- Data collections.

Talk with students about the role of wetlands in the landscape and ask students to describe their local wetlands and the role they play. Discuss whether they:

- Act as a buffer between land management practices and waterways.
- Preserve cultural heritage (access by traditional owners).
- Filter out fine sediments and nutrients.
- Buffer the effects of floods by holding excess water.
- Provide habitats for plants, birds and animals.
- Act as aquifer storage or groundwater recharge basins.
- Provide water for farming and urban use.
- Are visited by fish from the marine environment.

Read the feature poster for a listing of different roles wetlands can play in the landscape. Compile types onto a chart. Divide students into groups and investigate the integral part they play in catchments and their total water balance. (6–10)

Organise a visit to a wetland or view photographs, slides or a video. Talk with students about the role of wetlands in the landscape. For example, wetlands:

- Provide storage and drainage areas for water.
- Act as a flood mitigation basin.
- Provide water for irrigation of land and crops.
- Have an ability to 'recycle' waste if not overloaded.
- Provide scenic value, visual contrast and enhance the quality of the landscape.
- Support unique and diverse animal and plant populations.
- Are breeding grounds for animal and plant species.
- Are essential habitats for migratory and nomadic birds.
- Contribute substantially to the food chains of animal and plant species.
- Provide recreational places in communities.

(Consider the list on page 6 of the 'Wetlands Policy of the Commonwealth Government of Australia', which notes why wetlands are important)

Using questioning, make connections between what has been experienced, read and was already known about the role of wetlands in the landscape. Encourage reasoning by asking questions such as:

- How does…relate to…?
- What evidence can you give for…?

Revisit the functions and uses already identified. In groups, sort these into categories. Talk with the students about how the wetland's resources are important to plants, animals, catchments, water quality, people, education and research.

Using a circle formation, students describe what they already know about wetlands, including what they do, how they are structured, the role they play in protecting the Reef, and why they are important.

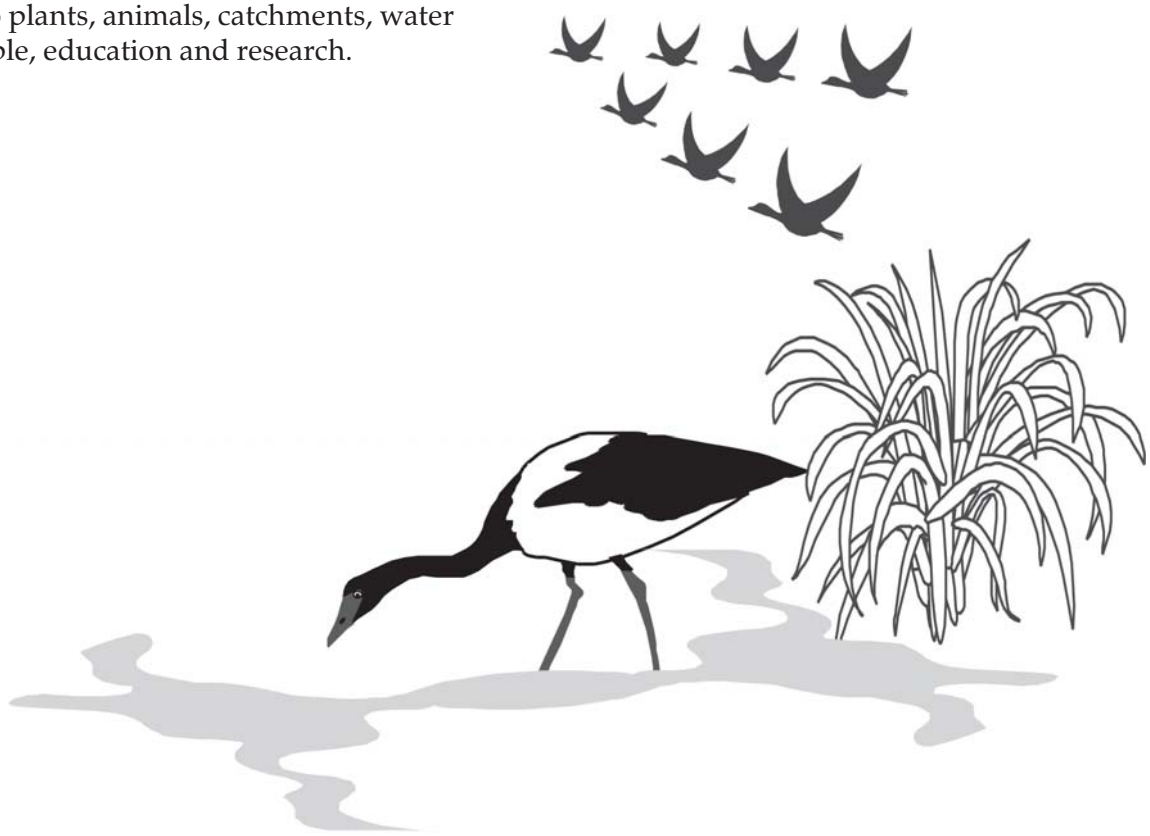
Record information on cards and sort responses using a PNI where information is sorted into three categories:

- Positive things about wetlands.
- Negative things about wetlands.
- Interesting things about wetlands.

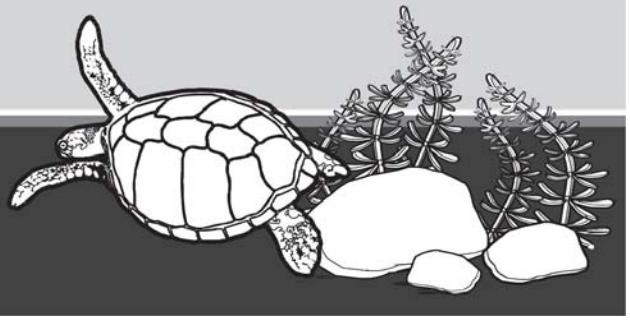
For example:

Positive	*Negative*	*Interesting*

Ask students what they think are the most important things we need to know and do if we are going to ensure we have healthy saltwater, freshwater, farm and urban wetlands.



Activities for use with Poster 7:
'Cultural values of wetlands'



Activities for English and SOSE
Primary and Middle Schooling

Read the seventh feature poster as a starting point to explore the relationship between cultures and wetlands. Use the story to highlight the importance of wetlands for indigenous people. Discuss the close relationship between Indigenous people and wetlands and how this relationship enables them to find sources of food, water and shelter. (4-10)

Encourage students to respond personally to the story on feature poster 7 by:

- Recreating their own version of this significant wetland area.
- Acting out the story.
- Using modelling clay to recreate the story setting.
- Making a series of pictures illustrating the wetland.
- Making individual books illustrating the story. (4–7)

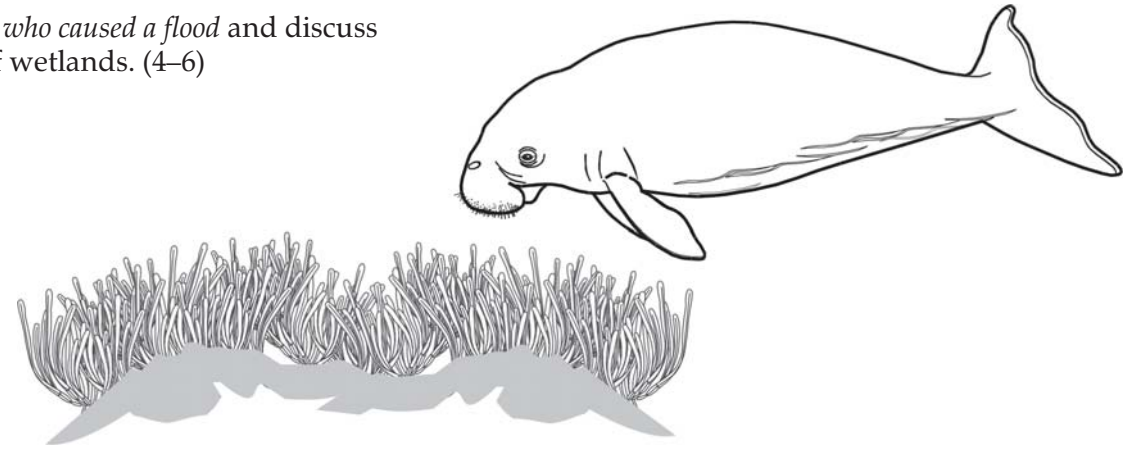
Talk with students about the Dreamtime, the basis of many Indigenous beliefs, and how wetlands presented a way of life, e.g. land, air, water, animals, plants and the colours and sounds of nature. (4–10)

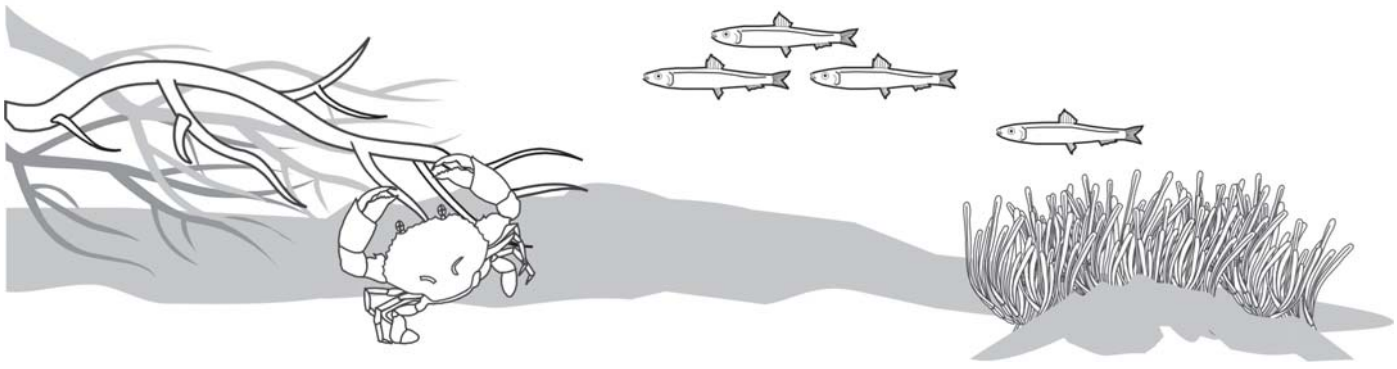
Find out about local Dreaming stories or contemporary Indigenous art or writing related to a local water environment or read Indigenous stories set in wetlands such as *Yakkin the Swamp Tortoise: The Most Dangerous Year.* (4–10)

Read *Tiddalick the frog who caused a flood* and discuss the seasonal nature of wetlands. (4–6)

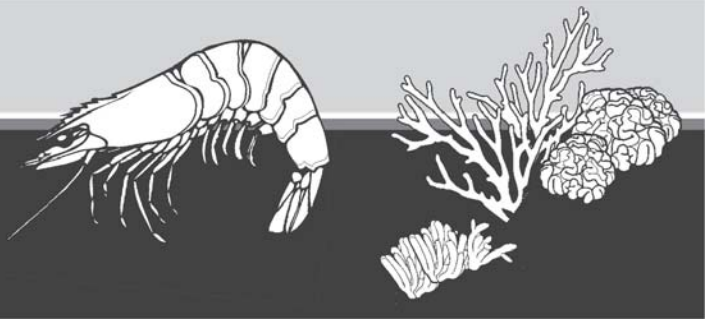
Research Indigenous art that focuses on water. The image of seven concentric circles carved or painted on a rock face can mean that there is a permanent water supply near that place. Concentric circles on body painting and in paintings used in ceremonies are symbols of water. Other meanings are also conveyed; e.g. we camp near water, we live in groups near water, and many people before us have lived near the water. The concentric circles refer to the history of Indigenous Australia. Indigenous people mapped the water resources of the country as they travelled, following birds and animals from water source to water source. (6–10)

Source: From a speech by Marcia Langton, Indigenous Anthropologist.





Activities for use with Poster 8: *'Disappearing wetlands'*



Activities for English and SOSE
Primary and Middle Schooling

View the eighth feature poster. Talk with students about how wetlands have been destroyed through degradation or lost since European settlement. (4–10)

Using the poster research the major issues facing wetlands. (4–7)

Brainstorm the biggest threats to wetlands. (4–8)

Describe and list what affects urban development, agricultural activities, aquaculture, man made barriers, ponded pastures and excessive amounts of nutrients and sediments would have on the plants and animals in wetlands and the coral communities of the Reef. (4–10)

Make predictions about these types of threats to wetlands and the interactions that could be found in the waterway and wetland. (6–10)

Make a directory of common threats to wetlands. Describe symptoms and cures. (6–10)

Write directions for preserving a wetland and coral community from the effects of such threats. (6–10)

Do an active survey of wetlands that have disappeared in your local area. (6–10)

Investigate threats, both city-based and rural and research their possible effects on wetlands and the Reef. (6–10)

Consider how:

- an urban development
- agrigcultural activities
- aquaculture
- man-made barriers
- ponded pastures
- pollution from a sewerage pipe
- a weed infestation
- introduced fish
- the removal of fringing wetland plants

could directly or indirectly contribute to the disappearance of wetlands as mentioned on feature poster eight. (6–10)

Read the poster and consider the threats depicted. Draw flow charts to show the links between these threats and their disappearance. (6–10)

Read feature article eight and:

- **Illustrate scenes** that highlight the issues described.
- **Locate information** about these issues and how they affect wetlands and the Great Barrier Reef.
- **Discuss** what people do to threaten the existence of wetlands.
- **Identify** changes nature and people have made to wetland areas and consider the effects these changes have had on the water entering wetlands and the Reef. (6–10)

Consider your local area and identify where land remains in its original state; where land is being changed with an emphasis on food production; where land is being changed with an emphasis on urban development; and where people are using the land irresponsibly. Consider whether there are threats from sediments and nutrients to wetlands and the waters surrounding the Reef as a result. Discuss your choices and give reasons for them. (6–10)

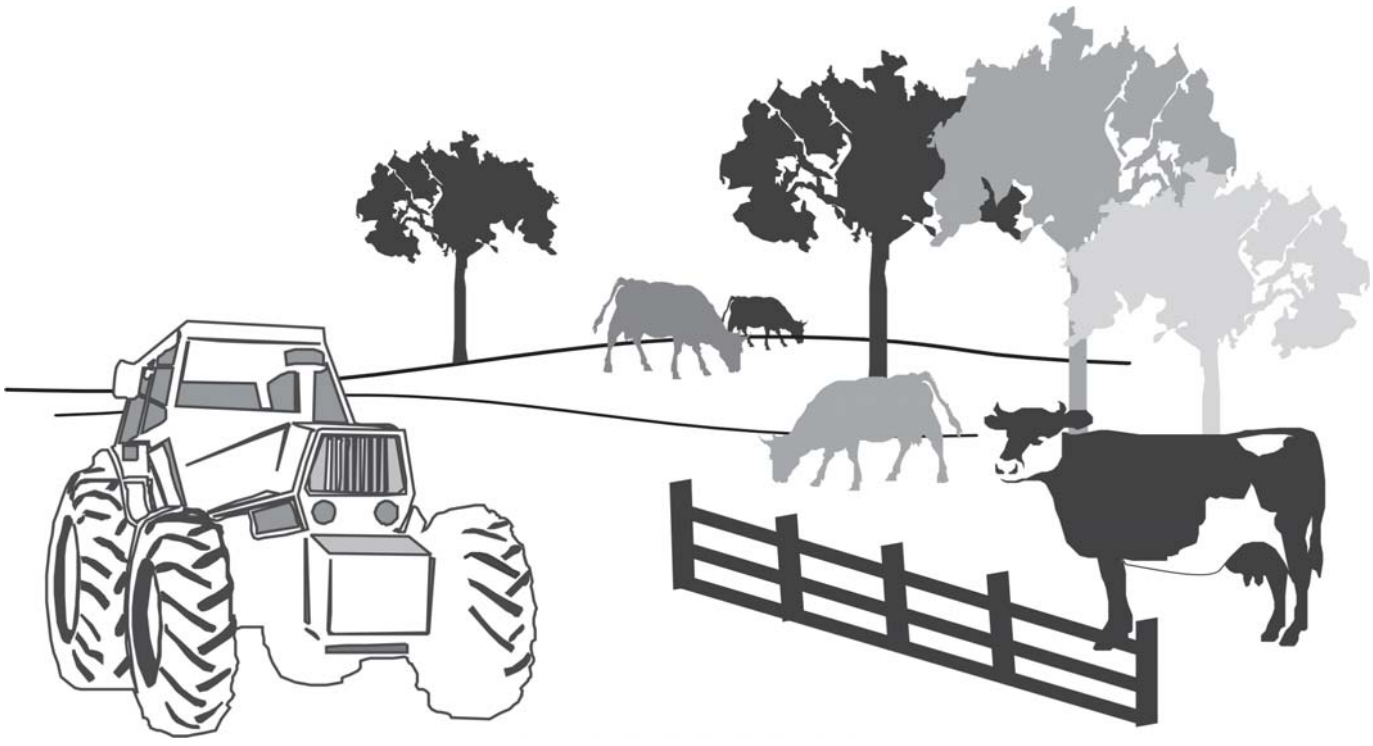
Research how human activities have impacted on our wetlands in your local community, Queensland, Australia and globally. (6–10)

Consider what will happen in the future if things continue as they are. (6–10)

Investigate what Ramsar sites are and why they are important to conserve. (6–10)

Research what government, business and industry are doing to address wetland issues in Queensland? (6–10)

Construct concept maps to show what we can do individually, or in our communities, to reduce our impact on wetlands. (6–10)



Activities for use with Posters 9 and 10: *'Protecting wetlands in Queensland'* and *'Doing our bit to look after it'*

Activities for English and SOSE
Primary and Middle Schooling

Read and view the feature posters. Talk with students about how communities, together with local, state and federal governments, are addressing the loss and destruction of local wetlands and working together to restore their natural beauty. (4–10)

Discuss how people are beginning to understand how their behaviours affect environments and are making practical everyday decisions to protect and improve environments. List every day changes that are being made at the individual level in the class. Consider families and the whole school community too. (4–10)

Reflect on and discuss the following statement…

> 'Our actions must also address the future. There is a need to plan, to understand cause and effect, to involve families and communities, and to translate immediate environmental improvement into long term environmental gain.' (6–10)

Consider your local community and locate people who are addressing soil, water, vegetation, wildlife, farming, and wetlands issues in a positive way. (4–10)

Discuss what they are doing and describe how their cooperative efforts can and will help local wetlands and the Reef environment. (4–10)

Consider the slogan, 'Doing your bit to look after it'. Illustrate ways we can all make a difference to help to ensure wetlands and the Reef's existence for generations to come. (4–7)

Make badges with slogans about helping to ensure the existence of wetlands. These slogans could describe things that can be done on the land to protect them. (4–10)

Find out how we can all affect the quality of the water entering wetlands on catchments along the coast next to the Great Barrier Reef. Discuss daily activities that may increase the levels of nutrients, sediments and chemicals being discharged to the Great Barrier Reef, polluting its waters. (4–10)

Read the feature poster again for information about why the protection of wetlands is critical to help ensure the survival of the Great Barrier Reef. Discuss findings and record the role they play in the protection of the Reef. (6–10)

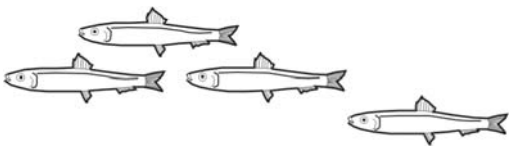
Find out if there are any local community projects being implemented in your area to help raise awareness of the role wetlands play. Promote these and get involved. (6–10)

Read the feature poster about different groups and individuals who are working together to help manage water quality and protect wetlands. In groups, talk about what is meant by 'water quality' and identify the locals and groups who are involved in managing water quality in your region. (4–10)

Discuss what they are doing and describe how their cooperative efforts can and will help manage the issue of declining water quality and protect wetlands. (4–10)

In groups, discuss the implications of people's actions and their affect on the environment and water quality issues. (4–10)

Research the actions governments, industries, landowners, Landcare, Waterwatch, Seagrass Watch and Catchment Management groups and communities are taking in your local area to address water quality and wetland related issues. (4–10)



Invite a guest speaker from different groups involved in improving the quality of water entering wetlands and the Great Barrier Reef to the class. Prepare questions to ask the guest speakers before the visit. (4–10)

Research programmes delivered by the Australian and Queensland Governments that conserve and manage wetlands in the Great Barrier Reef Catchment. (6–10)

Read about the Reef Guardian School Programme.

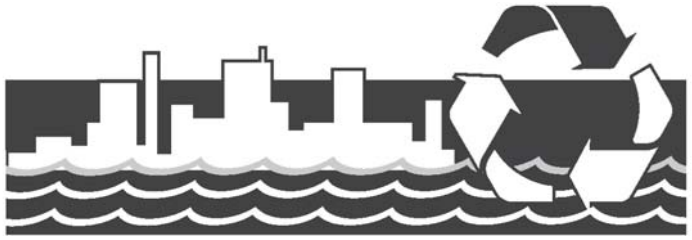
See www.reefed.edu.au/guardians. Investigate the projects and activities undertaken by schools to help manage issues affecting water quality and local wetlands. (4–10)

In groups, **talk about the actions and projects** that could be undertaken in your local area with others to help address issues of water quality. Consider projects such as:

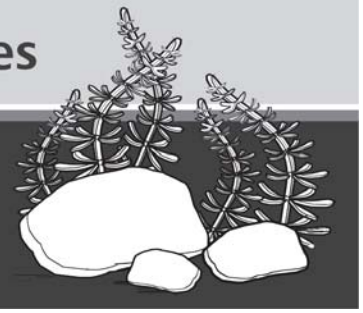
- **Maintaining stormwater drains,** keeping them free from litter and dirt.
- **Covering and storing rubbish** in areas where it cannot contaminate or pollute stormwater drains during rain.
- **Collecting fallen leaves** and composting them.
- **Cleaning all outdoor surfaces** using a broom, vacuum or shovel.
- **Handling all materials carefully** to prevent spills.
- **Keeping storage containers** properly covered and well away from stormwater drains.
- **Marking school and nearby stormwater drains** with suitable signage such as 'This drain leads to the Reef'.
- **Creating and placing signs** around the school and surrounding areas to remind others of ways to avoid pollution in the school and local area.
- **Participating in** local Waterwatch, Landcare, Coastcare and Seagrass Watch programmes within the community.
- **Conducting a water quality awareness programme** within the school community.
- **Placing articles** about water quality in the school newsletter and sharing ideas to reduce pollution in local waterways and the Great Barrier Reef.
- **Organising a display** about the school's water quality programme in the local shopping centre. (4–10)

Take action for wetlands by:

- Visiting a local wetland that may be littered and have a clean-up session.
- Mounting a campaign in the school or community to explain the importance of wetlands.
- Writing to local council about the protection or upkeep of a local creek or wetland.
- Remembering that everything we put down the drain may end up in our wetlands.
- Planting native plants that use less water and don't drop as many leaves that can pollute wetlands. (4–10)



Wetland References and (Other) Resources



Wetlands

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Environment Australia, Freecall Community Information Centre: 1800 803 772

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"*Field Activities for Coastal and Marine Environments*"
Available toll free: 1800 803 772 or www.environment.gov.au/marine/coastnet

(Annual) Seaweek Activities. Information from:
www.mesa.edu.au
Gould League www.gould.edu.au
Kids and Water (Marine Conservation and Safety) www.wetpaper.com.au/kids&water
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KLA Levels 5 and 6. Section 1: Introduction, Section 2: Background Information, Section 3: Student Activities, Section 4: Glossary, Section 5: References
Download www.nre.vic.gov.au Purchase customer.service@nre.vic.gov.au
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Websites

Coastcare: www.environment.gov.au/marine/coastcare

Conservation Volunteers Australia: www.conservationvolunteers.com.au

CRC Reef Research Centre: www.reef.crc.org.au Email: info@crcreef.com

Department of Primary Industries, Queensland, phone 13 25 23 (local call)
DPI Note — Mangroves, download from www.dpi.qld.gov.au (search "mangroves")
Nature's "Nautical Nurseries" for Upper Primary, www.dpi.qld.gov.au/extra/nnn/default.html
Fact Sheet Themes — Theme 1: Habitat Introduction, Theme 2: Food Chains, Webs & Pyramids, Theme 3: Connectivity

EDFISH resources, visit www.dpi.qld.gov.au/fishweb
Module Series includes: Mangrove, Seagrass, Freshwater Habitat
Seagrass Watch Information Email: seagrass@dpi.qld.gov.au Phone (07) 4035 0100 or 132 523

Estuarine Processes
Environment Australia has released "Environmental Water Requirements to Maintain Estuarine Processes". The report can be downloaded at: www.ea.gov.au/water/rivers/nrhp/estuarine/index.html

Fish Kills (Queensland)
Queensland EPA now has a good and useful record of fish kill incidents. The direct link is http://www.epa.qld.gov.au/cgi-bin/w3-msql/environment/science/water/msqlwelcome.html?page=fishkills.html all on one line or go to http://www.epa.qld.gov.au/ select Fish Kill Incidents, then Fish Kill Reports, then Fish Kill incidents

Gould League Catalogue Phone: 03 9532 0909
www.gould.edu.au Check "Coastal Photo Survey", "Australian Guide to Seashores", and more

Great Barrier Reef Marine Park Authority www.gbrmpa.gov.au, visit "Student Projects"
The Great Barrier Reef is a popular topic for school projects. The entire GBRMPA website is packed with fascinating information about the Reef. If you can't find what you need, please contact: info@gbrmpa.gov.au

Landcare & Catchment Management (Queensland): www.landcareqld.org.au

Land & Water Australia: www.rivers.gov.au

Land and Water's Rivers Arena (Fact Sheets, Guidelines, CDs). Email: public@lwa.gov.au

Local Marine Advisory Committees:
www.gbrmpa.gov.au/corp_site/management/consultation_community_involvement.html

National Land and Water Resources Audit's catalogue, "Australian Natural Resources 2002", is available free at: www.environment.gov.au/atlas The document is on-line, however, only for browsing, not download (http://audit.ea.gov.au/ANRA/data/docs/national/Data_Contents.html).
Copies may be obtained by faxing 02 6257 9518 or emailing: mailto:info@nlwra.gov.au.

"RipRap" (River and Riparian Lands Management Newsletter): www.rivers.gov.au

River Health Manual
Australia-wide assessment of River Health: Queensland AusRivAS Sampling and Processing Manual is available online at www.ea.gov.au/water/rivers/nrhp/manual-qld/index.html

Stormwater
www.ea.gov.au/coasts/pollution/usi/index.html (USI = Urban Stormwater Initiative)
www.stormwater.asn.au CRC Catchment Hydrology
http://www.catchment.crc.org.au/news/
EPA NSW (& you can download their excellent resource materials) www.epa.nsw.gov.au

Sugar Industry and Water Quality: www-sugar.jcu.edu.au/

Water Quality Targets
Environment Australia have included an online section related to water quality targets, which has been designed to assist regional groups identify the environmental values of water, and to set appropriate water quality targets for their catchments and regions. The site is located at www.ea.gov.au/water/quality/targets

Waterwatch
National: www.waterwatch.org.au
Queensland: www.qld.waterwatchorg.au

Fiction Book References

Baker, J. *Where the forest meets the sea,* Walker Books, London, 1987

Boddy, M. *The smallest frog in the world*, Lansdowne Press, Sydney, 1980

Kuchling, G. *Yakkinn the swamp tortoise,* Era Publications, South Australia, 1987

Kuchling, G. *The most dangerous year*, Chelonia Enterprises, Subiaco, 1995

Nunnes, S. *Tiddalick the frog*, Hodder & Stoughton, London, 1980

Small, M. *A Wetland Home*, Heinemann Education, New Zealand, 1994