Growing Mangroves

Level

3-8

Key question

How can mangroves be raised from seed?

Key outcome

To review the growth and development of mangroves.

Adapted from *Edfish*, DPI, Queensland, and from field notes of the Department of Education, Northern Territory.

You may be able to grow a mangrove from seed so long as the seed is not collected from a national park or marine park, or from Queensland, (where all mangroves and their seeds are protected). Educational centres may be able to obtain a permit in Queensland particularly if the centre has a shade house.

What you need

Spade
Seed raising mix
Plant pot
Seed pods or seedlings of mangroves

What you do

Seedlings of mangroves are produced while they are still on the parent tree. *Avicennia marina* (grey mangrove), the most widespread mangrove found in both tropical and temperate Australia, can hold onto seedlings until they are some 30 cm long. This process is called viviparity. Seedlings may drop off the tree, float in the water and then settle in fine mud. Or, some may be picked from the tree.

Seedlings can be dug up and replanted into a plant pot in fine, silty mud. Or, seeds of grey and other mangroves can be placed in a seed raising mix in a plant pot. The seedlings can be watered with freshwater (or left in the rain), and once a week, need a water with salt water. This should preferably come from the sea, but you can mix your own by dissolving two teaspoonfuls of table salt in a litre of water. If you place the plant pot in a bucket of semi-salt water, the mangrove seedling is more likely to develop aerial roots (pneumatophores) after at least six months.

The plants can be examined for salt crystals coming through the salt glands on the surface of leaves.

If the seedling is removed from the silt in the pot and carefully rinsed, the fine network of feeding roots can be observed.

Extension

The seedling can eventually be replanted in a mangrove forest.

In areas where collection of mangroves is not permitted, students can locate a suitable seedling, tag it using plastic ribbon and regularly visit it to observe and record growth. It can be watched for salt crystal development. The full flowering cycle may also be observed in the field.

Reference

Claridge, D. and Burnett, J. 1993, *Mangroves in Focus*, Wetpaper Publications, Ashmore.

Mangrove Fieldwork

Level

4-8

Key question

Why are mangroves important?

Key outcome

Identify and describe mangrove species and their environment.

These activities are a combination of several field trips to mangroves, some used during Seaweek 1996; many ideas were contributed in the Jervis Bay workshop of Mike Michie, Department of Education, Northern Territory.

Questionnaire derived from Claridge & Burnett (1993).

What you need

Field sheets (with key) on clipboard
Pencil

What you do

These activities are chiefly used in Queensland, Northern Territory and North Western Australia, where there are more than one species of mangrove. However, they can be useful in southern temperate mangrove areas, even if the Grey Mangrove is the only species available.

Students can work in small groups or pairs. Ensure you are familiar with hazards such as watching for the tide to come in, avoid stepping in soft mud, and not handling broken glass. In Queensland, all mangroves and their leaves, seeds and litter are protected unless the teacher-in-charge has an educational collecting permit. All states regulate the collection of plant material in marine or national parks.

Walk around a mangrove area, and complete the following questionnaire.

Question	Yes	No	Undecided
1. All mangrove trees are the same			
2. All mangrove areas are smelly			
3. Artificial waterways (canals) are the same as natural ones			
4. Tidal wetlands are important to bird and fish life			
5. Mangrove roots collect sediment and stabilize waterway banks			
6. Wetland areas are very rich in nutrient			
7. There are laws to prevent mangrove clearing			
8. Mangroves have to be cleared before you can build canal estates			
9. Mosquitoes and sandflies only breed in mangrove areas			
10. We should be more concerned about wetland areas			

Mangrove Fieldwork

Which mangrove is it?

Use the key (& also the accompanying ID & treasure hunt sheets).

Leaf comparisons

Find some different mangrove types and compare their leaves. What is the biggest leaf on a mangrove tree? The smallest?

Are leaves succulent, or shiny, or waxy in feel? Do they have hairs? Is this a sticky milky sap (do not touch the sap)? Would any of these features help the plant survive in salty mud and high temperatures?

Reproduction

What ways do mangroves have of reproducing? Can you find seeds and young plants? How did the seedling develop?

Other vegetation

What vegetation lives behind the mangroves on the inland side? Would these plants have salt tolerance too? What adaptations to the conditions can you see? Use the information sheet to assist.

While you walk

List the valuable things provided at this spot – nature's assets. Which of them could cause problems? Which are likely to be altered and lose their value with human influence?

Birds

Can you identify the birds you see or hear? Are they feeding in the mud? What would they eat? Are they sheltering in the mangroves? Would birds in wetlands like these need special features to help them live here? Use the bird pictures to help.

My senses

Shut your eyes and listen and smell for two minutes. Which sounds dominate? Which smells dominate? Which do you dislike?

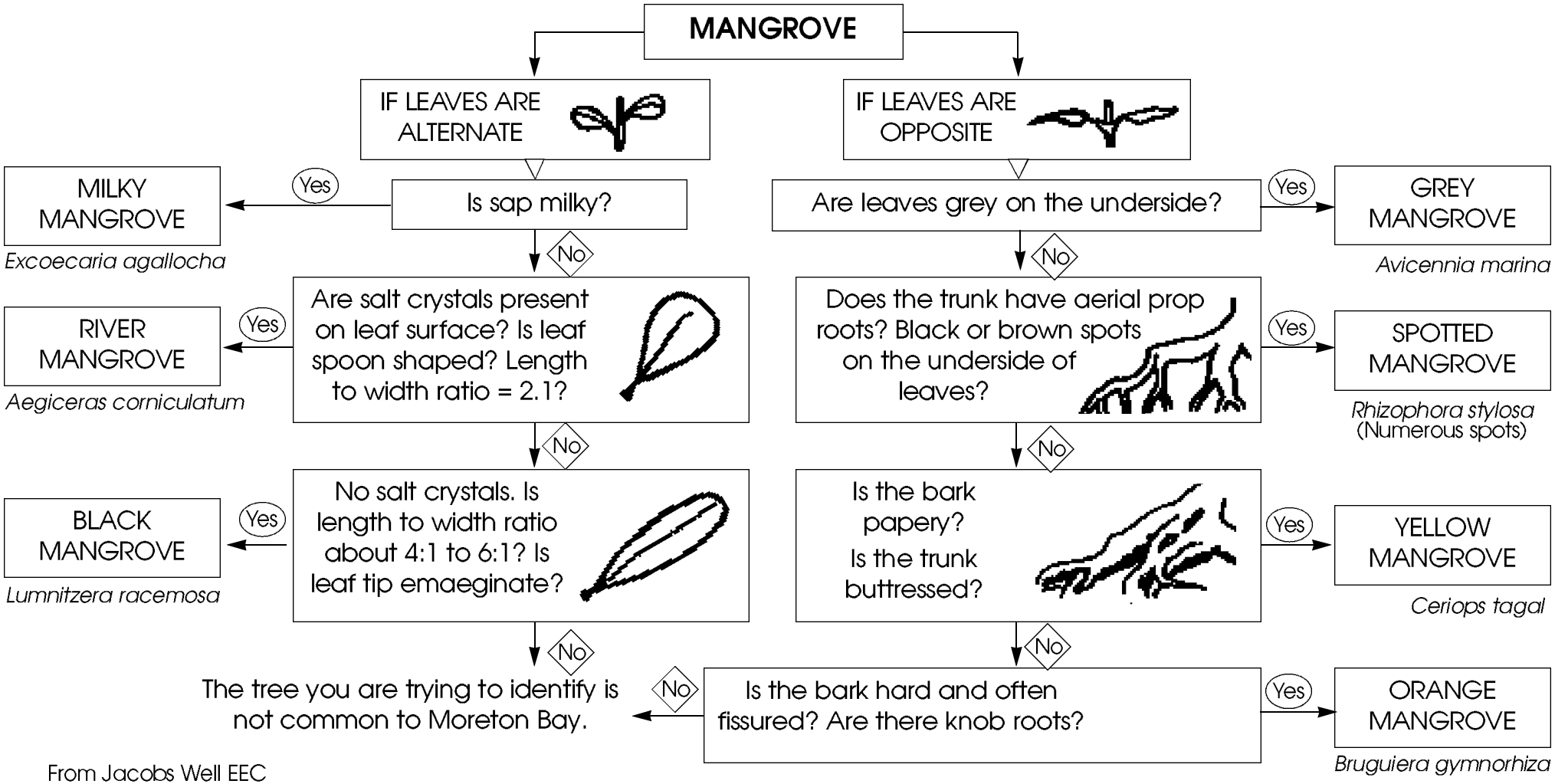
Mini trail

Pretend you are an ant in this area. Use your eyes or a magnifying glass to follow a short trail- what do you notice?

I spy

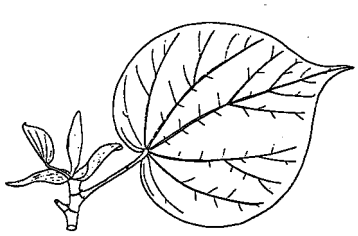
The group is divided into couples, who then wonder along shore or mud flats. Meet back at a central point. Each individual finds one natural item (animal, vegetable or mineral), and then describes it without stating what it is to the partner. You need to include some habitat description, some indication of major features (e.g. does it have a shell, is it moving, can it move, what colour). The partner has to locate the item and attempt an identification.

ID Kit for some common Mangroves

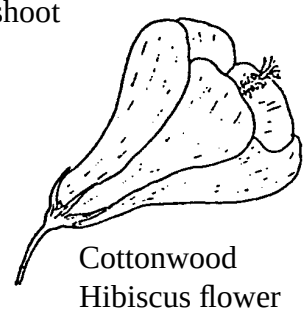


From Jacobs Well EEC

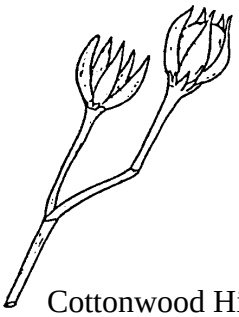
Mangrove Fieldwork



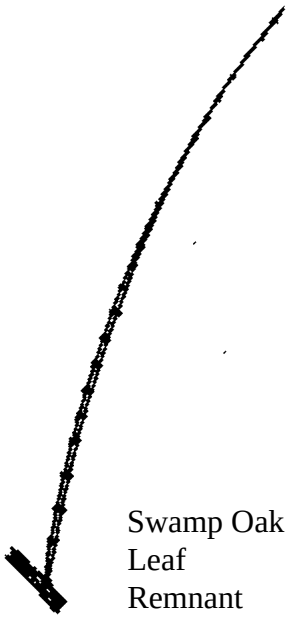
Cottonwood Hibiscus leafy shoot



Cottonwood Hibiscus flower



Cottonwood Hibiscus fruits



Swamp Oak Leaf Remnant

Plants fringing the mangroves

Cottonwood Hibiscus (*Hibiscus tiliaceus*)

This rounded-leaf dense shrub or small tree is common an the landward side of the mangroves often being found near the Orange Mangrove. The Aboriginal people actually told a story explaining the imagined relationship between the two plants. The cottonwood's leathery leaves are wind and salt resistant, enabling them to colonise areas close to the beach. The large yellow flowers open early morning, turning orange by about midday and closing by mid afternoon.

Aborigines had many uses for the tree. Young leaf shoots, flower buds and roots were eaten raw or after cooking. The bark was stripped off and sucked. This bark was also highly favoured for its strong fibre to make rope and thread. Fire sticks were also made from the wood at times.

Swamp Oak (*Casuarina glauca*)

A tall fir-like tree often found close to mangrove trees but not as tolerant of salt water. The word *Casuarina* comes from the bird Cassowary and refers to the stringy leaves which look like the straggly feathers of the Cassowary of North Queensland.

The Swamp Oak has no true leaves. The narrow twiggy 'leaves' are actually stems. The leaves are almost microscopic and have been almost lost through millions of years of evolution. This adaptation stops the trees losing water through the leaves by dehydration by the sun. Plants of salty coastal areas need to retain as much moisture as possible to keep salt concentration within plant tissue low.

Casuarinas have the ability to put nitrogen back into the soil. Attached to their roots are microscopic fungi which form nodules (small lumps). These fungi produce nitrogen for the plant to use to grow, and also for the surrounding soils.

Treasure Hunt (record sheet)

Something underneath something else	
Something between two things	
Something above something else	
Something in an empty place	
Something you can count	
Something you can't pick up	
Something in a dark place	
Something in a wet place	

Something young	
Something growing under difficulties	
Something growing well	
Something dried or parched	
Something damaged or injured	
Something old	
Something dead	
Something rotting	

Something with a pleasant smell	
Something quiet	
Something ugly	
Something pretty	
Something unpleasant to touch	
Something you can't photograph	
Something you have never seen before	
Somewhere you would like to sit	

Sea Plant Bingo

Find a sea plant that fits the description in the spaces below.

Draw or list your

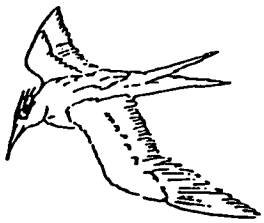
red	long & thin	partly eaten	attached to a shell	slippery	yellow

flat & broad	green	smelly	attached to a rock	purple	attached to another plant

Mangrove Fieldwork

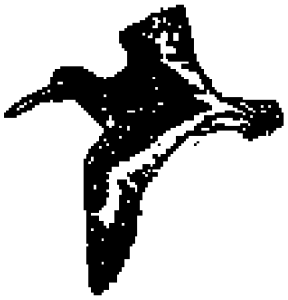
Birds of the wetlands

Crested Tern



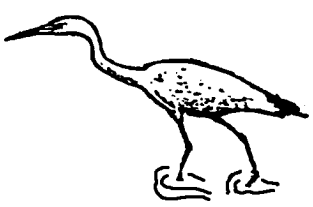
Silver Gull

Pled Oyster Catcher



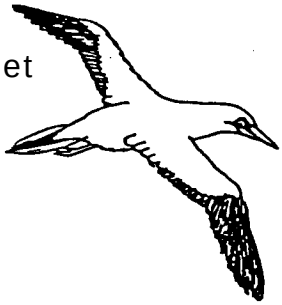
Pled Cormorant

Great Egret



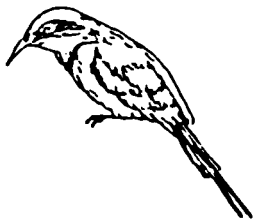
Mangrove Honeyeater

Australian Gannet

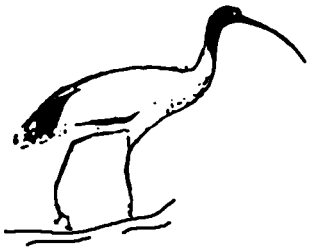


White-cheeked Honeyeater

Rainbow-bee Catcher



Sacred Ibis



The Mangrove Ecosystem

Level

5

Key questions

Do algae and organic detritus form the basis of mangrove food chains? What do herbivores and carnivores eat in a mangrove community? What are the other roles played by mangroves?

Are different groups of animals found in the mangroves at various times as the tide and season changes?

Key outcomes

Recognise the importance of mangroves in a marine system. Identify links between animals, plants and tides.

Adapted from East Point Mangrove Boardwalk, An educational resource kit for primary and junior secondary teachers, Greening Australia Northern Territory.

This is usually a pre-visit activity in the classroom but could be partially completed before a field visit to a mangrove community.

What you need

Large pieces of paper
Pencils/crayons
Cards with species drawn/pasted on, with description of what the species eat, and where it lives (see below).

What you do

Inquiry/investigation in the classroom

Investigate photosynthesis. Construct a diagram.

What happens to the animals when the tide comes is? What comes in with the tide?

Create a tide-in chart to display all those animals that come and go with the tide.

Discuss where all the permanent inhabitants go.

Creative writing in groups or whole class

Negotiate a narrative based on the fact that the tide is somehow held back. What is the chain of events that would follow? Story ends with tide being let in.

Reflection

Infer what might happen to an animal in the mangroves if the trees were not there? In groups discuss, investigate and report on your conclusion.

Discuss the importance of each element of the mangrove ecosystem and their interrelationships.

Examine a range of food chains

Explain how the parts are linked.

Talk about how the energy flows.

Where does the energy come from?

Identify the herbivores/carnivores.

Who eats what?

Examine the cards (double-sided) labelled 'I eat ...'

Distribute one card per student. Each card has an animal/plant/organism with a brief description of what it eats.

Students must link themselves up to the person displaying the label of what they eat.

- What does the outcome look like?
- Is it a food chain or food web?
- Discuss and draw a diagram.

Look at the other side of the card 'I live ...'

Discuss who lives where. Why?

Distribute one card per student, where each card has an animal/plant/organism with a brief description of where it lives.

Students must attach cards to the large wall chart of the mangroves with the tide out.

What should happen to those student with cards unable to be placed? Is one wall chart enough?

In the field

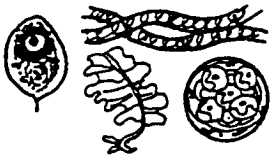
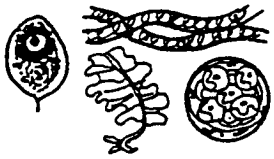
Undertake one of the mangrove field studies ('Mangrove Community', 'Marine Trailing' or 'Comparing Plant Communities').

Extensions

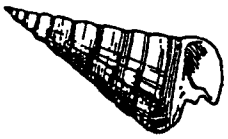
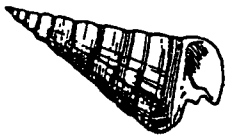
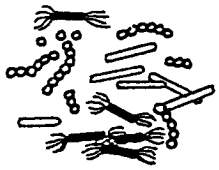
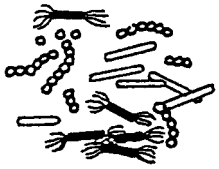
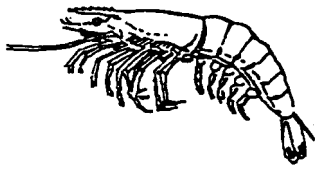
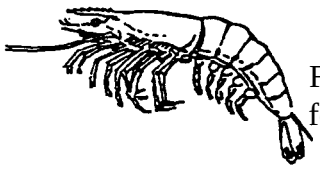
Look back at the concept maps, lists and investigations and use the information to draw a large wall chart of the mangroves with the tide-out.

Identify and describe the links between animals, plants, and other organisms that live or visit the area.

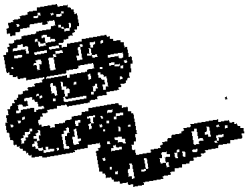
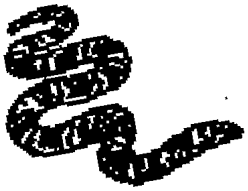
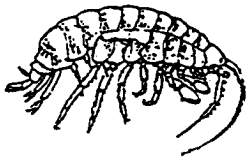
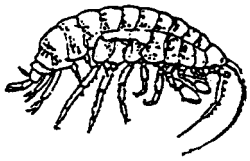
The Mangrove Ecosystem

I Live		I Eat	
	**Algae** Mostly microscopic single celled plants. Largest are the green seaweeds Base of many food chains.		**Algae** Green algae is a plant, it makes its own food
	**Black flying fox** Lives in huge colonies within mangroves		**Black flying fox** Food: nectar from blossoms of native trees and fruit
	**Mudskipper** Superbly adapted to its tidal habitat		**Mudskipper** Food: small crabs, insects, amphipods and marine worms
	Mangrove plants live between the highest and lowest tidal zones		Mangrove plants photosynthesize, they make their own food
	**False water rat** Builds nest among roots of mangrove trees, mound of leaves and mud 60		**False water rat** Food: crabs and other hard shelled aquatic life
	**Acorn barnacle** Lives on tree roots, rocks and mud in the mangroves		**Acorn barnacle** Food: feed on plankton that drifts by with the tides

The Mangrove Ecosystem

I Live	I Eat
 ***Polychaete* worm** Lives in a tube in the mud made of mucus and small particles of debris	 **Polychaete worm** Food: detritus, algae, protozoa
 **Mud whelk** Lives on the mangrove mud	 **Mud whelk** Food: graze on algae on the surface of the mud
 **Fiddler crab** Lives amongst the mangrove roots	 **Fiddler crab** Food: extracts algae and other organic matter from detritus
 **Bacteria** Unknown number of species present in water, mud and plants	 **Bacteria** Food: plays an important role in breaking down plant debris and in the decay process of dead animals
 **King prawn** Part of life cycle spent in the mangroves	 **King prawn** Food: detritus feeder
 **White-bellied sea eagle** Common in many Australian coastal habitats	 **White-bellied sea eagle** Food: fish, carrions, small birds, flying foxes

The Mangrove Ecosystem

I Live	I Eat
 **Mullet** Free swimmer, common in mangrove lined rivers and creeks	 **Mullet** Food: detritus, algae
 **Little file snake** Common in coastal habitats	 **Little file snake** Food: small fish, other crustaceans
 **Zooplankton** Microscopic animals which drift in water	 **Zooplankton** Food: microscopic plants, algae
 **Amphipod** Common name 'beach hopper', one of the smallest crustaceans in marine habitats	 **Amphipod** Food: vital food chain link between microscopic protozoa and small fish
 **Little egret** Common in many Australian habitats	 **Little egret** Food: stalks fish in shallow waters
 **Thais** Lives on tree roots, rocks, and mud in the	 **Thais** Food: microscopic plants and algae