biodiversity for kids

Stage 2 Science - Teacher's Guide

a project initiative under the NSW Biodiversity Strategy

BIODIVERSITY
Life's Variety


BIODIVERSITY
PRIMARY SCHOOL
GROWTH CHART
SEASONS
INSECT SPECIMENS
BIODIVERSITY
SCHOOL
BUS
STOP
Neil Stanners

Acknowledgements

This resource is an initiative of the NSW Biodiversity Strategy and has been developed by NSW National Parks and Wildlife Service in collaboration with the Department of Education and Training.

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Foreword

This resource is an initiative of the NSW Biodiversity Strategy and has been developed by NSW National Parks and Wildlife Service in collaboration with the Department of Education and Training. Other Agencies that have contributed to the development of this resource include the Department of Land and Water Conservation, NSW Agriculture and State Forests of NSW.

Biodiversity for Kids is an environmental education resource that provides a range of suggestions for achieving Stage 2 learning outcomes of the Science and Technology K-6 syllabus, and complements the sample unit of work, 'Mini-worlds'. This resource will assist students to achieve many of the objectives of the Environmental Education Policy for Schools. The resource will also provide support to the Sustainable Schools Program.

The teaching and learning in this resource involves developing understanding of biodiversity and its importance. A substantial practical component of the resource is based on a plant and animal survey of the school grounds. The results of the survey and the class's proposed 'biodiversity action plan' become important inclusions in the School Environmental Management Plan (SEMP).

Contents

About this resource

Intended audience

This resource is intended for teachers of students in Years 3 or 4 working towards Stage 2 outcomes in the Science and Technology (S&T) K–6 syllabus. The unit complements the sample unit of work 'Mini-worlds'. The activities included in the unit assist students to achieve outcomes in the Living things, Built Environments strands, and in the learning processes strands Investigating, Designing and making, and Using technology.

The resource

Biodiversity for kids provides a range of suggestions for achieving Stage 2 learning outcomes in S&T and the objectives of the Environmental Education Policy for Schools. The teaching and learning is based on a plant and animal survey of the school grounds. The results of the survey and the class's proposed action plan will become useful information for the School Environmental Management Plan (SEMP).

Some of the indicators for the activities may be found in the syllabus; others have been created specifically for this unit. Teaching and learning activities can be modified to suit the local needs of students. A variety of extension activities have been included. The activities are suggestions only and other activities can be used to replace them.

The resource comprises teaching and learning activities and a range of supporting materials including posters and a video.

Outline of the resource

The package comprises the following resources:

- A cartoon poster about biodiversity in the school yard

- A series of full-colour posters on different ecosystems

- Web of life for kids video

- Teaching and learning activities

- Students factsheets and worksheets

- Teacher's notes


PLANT PROJECT TEAMS

Lesson Plans

Lesson 1

Introducing the term biodiversity

Overview

Students create a biodiversity collage and discuss the meaning of biodiversity.

Resources

- dictionaries
- 'biodiversity' letters on cardboard
- magazines, newspapers, travel brochures, old calendars

Preparation

Using the letters from the word biodiversity, draw A4 sized letters on pieces of cardboard. Cut out each letter and mix. Don't let the students know what the word actually is.

Background information

Millions of years of isolation from other continents have resulted in the evolution of over one million distinctive kinds of native plants and animals in Australia. Most of these plants and animals can be found nowhere else in the world. What makes this even more amazing is the fact that the vast majority of our native animals are relatively unknown, partly due to their small size and nocturnal habits.

A native plant or animal is generally defined as one that is found naturally in an area or country. Most native plants and animals have evolved in Australia over many thousands or million of years. Among animals regarded as indigenous there are some more recent arrivals such as the dingo, which was brought to Australia by Aboriginal people about 4000 years ago.

In simple terms the word biodiversity can be described as the variety of plants and animals (species) and the places they live (ecosystems). In referring to schoolyard biodiversity you will be talking about all the different kinds of plants and animals found in the school.

An important aspect of biodiversity that is not always apparent is the interconnectedness between all species, in other words the way in which they depend on one another for survival. One way in which this can be presented is by food chains and webs.

The word biodiversity is relatively new. It is made up from the term 'biological diversity'. This diversity is the astounding array of plant and animal species that perform a vital role in the web of life.

Biodiversity is the variety of all living things, including plants, animals, microorganisms and their interrelationships. It is the genes they contain and the ecosystems they form.

Importance of biodiversity

Biodiversity is vital for supporting all life on Earth. It provides all of our food and many industrial products and medicines. Biodiversity also ensures clean air, water and fertile soils, it provides opportunities for recreation, tourism, scientific research and education, and it is a source of cultural identity for many Australians.

Biodiversity is the foundation of healthy, functioning ecosystems upon which all life depends. Biodiversity helps with:

- soil formation
- nutrient, nitrogen, oxygen and carbon cycling
- energy production
- flood and erosion control
- clean air
- clean water
- breaking down pollutants
- pest and disease control
- food and medicines.

Lesson 1

Teaching and learning activities

Working in pairs students are provided with a letter from the word 'Biodiversity'. At this stage don't tell them what the word actually is. Students create a biodiversity collage by covering each letter with pictures of native plants, animals and the places they live. Pictures can be obtained from newspapers, magazines, travel brochures and calendars.

Once complete ask the students to rearrange the letters from the collage to make a word. What words can they create? Will they be able to make the word 'biodiversity'? If the students are having difficulty you may need to provide clues like starts with a 'b' ends with a 'y' and so on.

In small groups students use a dictionary to discover the meaning of the word 'biodiversity'. The word may need to be separated into individual parts eg bio + diversity. Biodiversity is actually a contraction of 'biological' and 'diversity'. Students write down their own definition of the word.

Bio = a prefix meaning life (plants and animals)

Diversity = a variety of things (lots of different plants and animals)

Decide on a class definition for biodiversity. For example biodiversity could be described as 'the different kinds of plants and animals and the places they live'. Refer back to the 'Biodiversity' collage to illustrate the components of biodiversity that are described in the definition.

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.

- creates a definition for the word 'biodiversity'.

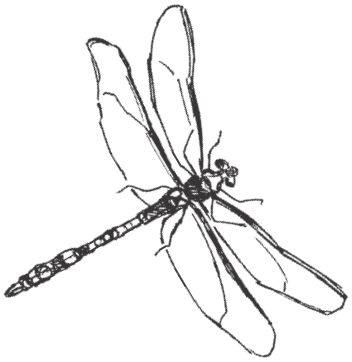
INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.

- uses a dictionary and the 'biodiversity' collage to create a definition of the word biodiversity.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:

- the nature and function of ecosystems and how they are interrelated (K1).



Lesson 2

Web of Life

Overview

Watch the Web of Life for Kids video and find out about biodiversity. Talk to an expert in biodiversity and conservation issues.

Resources

- *Web of Life for Kids* video
- *Web of Life* worksheet 1
- Biodiversity or conservation presenter

Preparation

Cut the *Web of Life* worksheet so that each group receives a few questions each.

Invite a biodiversity or conservation presenter to come to your school, for example, an appropriate person would be a park ranger, a council worker, a fisheries officer, a gardener, a forester, an Aboriginal person, a zoo or wildlife park worker, or a botanic gardens worker.

Background information

Teacher's notes section at the end of this book has answers to the questions on the *Web of Life* worksheet.

Lesson 2

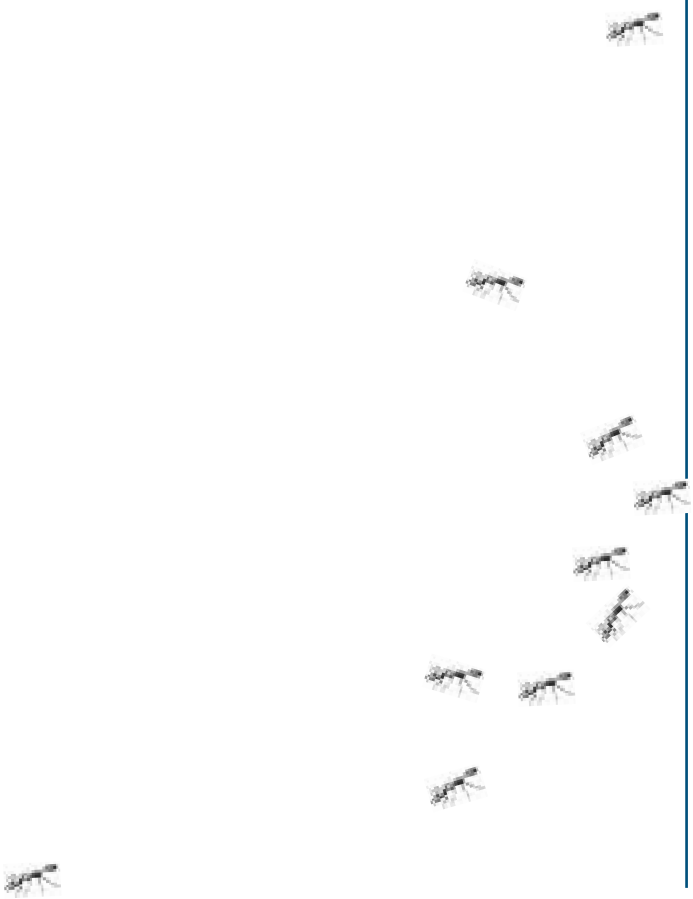
Teaching and learning activities

If possible allow two separate sessions for viewing the 12-minute *Web of Life for Kids* video. Watch the video once without questioning to allow the students time to digest the information provided.

Before the second viewing split the students into small groups. Allocate a few questions to each group. Some questions require the students to use general knowledge, as they won't be answered by the video. After viewing the video students present their questions and answers to the class. Alternatively, while working in small groups students write their own questions based on the video. These questions along with those on the *Web of Life* worksheet can be presented to the class in the form of a quiz. Students attempt to answer the questions in small groups.

Ask an 'Expert'

Invite a wildlife presenter, ranger or any other person who works in the conservation area to come to your school and talk about biodiversity and/or conservation. This may involve a talk or even the display of native plants or animals. This is an excellent follow up to the video as the students will be able to generate a range of questions to ask the presenter based on acquired knowledge. (See list of agencies in Teacher's Notes).



Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things as ways in which living things interact with other living things and their environment.

- observes and reports on specific issues related to biodiversity
- recounts specific information about biodiversity from a video.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:

- the nature and function of ecosystems and how they are interrelated (K1)
- the impact of people on environments (K2).

Lesson 3

Habitats and Homes

Overview

Students use a representation of their local area to develop an understanding of habitats and ecosystems.

Resources

- ecosystem posters
- A4 paper cut into quarters
- Blu-tack

Background information

This activity uses human settlement as an analogy to introduce the concept of habitats and ecosystems. In this case a home is a habitat and a town is like an ecosystem, ie it is made up of lots of habitats and people that rely on interaction with one another for survival.

A habitat is the specific place a plant or animal lives, eg under a rock, in a tree hollow, in a rotting log. An ecosystem describes a community of plants and animals interacting with each other and their surrounding environment eg a grassland ecosystem or woodland ecosystem.

Lesson 3

Teaching and learning activities

To begin this activity ask the students to close their eyes and visualise what their home looks like. How many windows does it have? What colour is it? What features does it have? etc. On a small piece of paper students draw the home they have just visualised. Once complete students label the top of the paper with 'My Habitat'. Emphasise that the word habitat is just a another word that describes the place a person or animal lives.
Habitat = Home.

Ask students why their home or habitat is important to them.

With blu-tack students attach their drawings to the board or large sheets of cardboard. Arrange these homes so that they represent a town. Discuss what other features should be added to the town to make it complete – roads, parks, schools, shopping centres, creeks, bus stops, plants and animals. Draw in the missing features.

Use the following discussion to help establish the analogy of a town operating like a natural ecosystem. Ask the students to describe the ways people and places interact in the town, ie.

- the habitats provide shelter and a safe place to live
- people move between habitats
- people move out of their habitat to find food
- people move out of their habitat to play
- some people have jobs that help other people
- some people have jobs that help keep the town healthy

Emphasise the fact that the people in the town need their habitats and each other to survive. This is similar to what happens between animals, plants and their habitat in natural areas.

Introduce one of the ecosystem posters of your choice. Discuss; we call some of the places we live town or cities, what do we call the place that plants and animals live? List these on the board. One word that can be used to describe the poster is 'ecosystem'. This word is used to describe natural places that have a variety of plants and animals that rely on each other and their habitats to survive.

Emphasise that our cities, suburbs and towns are home to native plants and animals as well as people. We live in an 'urban ecosystem'.

Outcomes and indicators

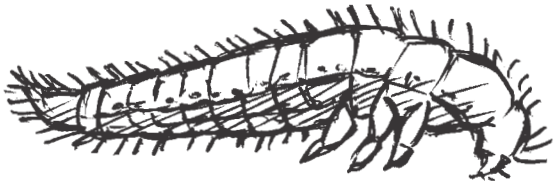
LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.
- identifies and describes their own habitat
- identifies and describes the similarities between their habitat and animal habitats
- describes different types of animal and plant habitats.

INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.
- identifies habitats of plants and animals in different ecosystems.

DMS2.8 Develops implements and evaluates ideas using drawings, models and prototypes at appropriate stages of the design process.
- creates a 2D representation of their local area with consideration for the interactions of living things.

Objectives of Environmental Education Policy for Schools
Students will develop knowledge and understanding about:
- the nature and function of ecosystems and how they are interrelated (K1).

Students will develop values and attitudes relating to:
- a respect for life on Earth (V1).



Lesson 3

Teaching and learning activities

Ask the students to imagine they are an animal eg a bird, lizard, insect, frog, fish or possum. Where would these animals fit into the displayed ecosystem poster?

- habitats for animals eg. bark, rocks, trees, lakes, rivers,shrubs, grasses, logs etc.

What kinds of habitats do the plants in the poster require?

- habitats for plants eg, next to a rock or river, on a hill, or on a branch, ocean floor etc.

Split the class into eight groups and distribute the remaining ecosystem posters between them. The ecosystems shown in the posters are: semi arid, grassland, woodland & forest, wetlands creeks and rivers, alpine, rainforest, coastal, agricultural and urban. These terms describe the type of ecosystem shown in the posters. Students examine their poster and identify plant habitats and animal habitats, then list these on butcher's paper. Below the lists, name one example of an interaction in the ecosystem, eg a kookaburra needs a hollow in a tree to nest in. These lists will be used again in Lesson 5.

Ask the students to describe some of the parallels between the interaction of plants and animals in an ecosystem, and their own interactions with their town, ie:

- Some animals move between habitats
- Some animals move out of their habitat to find food or play
- Some plants and animals help to keep the ecosystem healthy
- Animals eat plants and other animals

Develop a class definition for the words 'habitat' and' ecosystem'.

Outcomes and indicators

Lesson 4

Aussie Ecosystems

Overview

Examine ecosystem posters, make model ecosystems, and match drawings of animals to their appropriate ecosystem.

Resources

- ecosystem posters
- materials for model/diorama construction
- *Ecosystem research & design brief* worksheet 2
- *Aussie animals* worksheet 3

Background information

Location, altitude, rainfall, soil type and human activity are some of the factors that have influenced the development and distribution of ecosystems in NSW. The word ecosystem refers to a community of plants and animals and the interactions that occur between them and their surrounding environment.

A variety of factors make it possible (or not possible) for something to live in an environment. Rainfall, soil moisture and composition, temperatures, water availability, shade and light influence the distribution of plants and animals. For most plants and animals, the by-products of carrying out their daily lives, creates the conditions for another plant or animal to survive. An insect for example pollinates flowers when it visits to collect nectar; a worm helps break down decaying matter into a form that plant roots can take up. All creatures depend on interactions like these.

These interactions occur within and between ecosystems. Each ecosystem and the species within it are perfectly adapted to suit the conditions where they live. For example there are over 750 recorded species of wattle varying in size from tiny shrubs to large trees, all of which are adapted to suit the conditions where they grow. Most likely each wattle species also plays host to animal species that are adapted to feed on that particular wattle and so on.

NSW is blessed with a huge variety of different ecosystems, varying from semi arid areas to grasslands and rainforests, all of which have developed to suit their local conditions.
Refer to 'Types of ecosystems' in the teacher's notes for more information.

Note: some animals are found in more than one type of ecosystem.

Lesson 4

Teaching and learning activities

Ecosystem Research

Working in small groups students use the design brief work sheet and the photos and text from the ecosystem posters, to plan and then create a 3D model or a diorama of a selected ecosystem. The design should show as many features of the ecosystem as possible including appropriate plants and animals. Students should have access to a range of natural and non-natural materials, and decide which materials best represent the characteristics of their ecosystem. Limit the size of the models to A4 or less.

Student Design Brief

Your task is to:

– design and make a 3D model or diorama of an ecosystem to be used in an advertisement to tell people about biodiversity.

The model must include:

– important features of the ecosystem

– plants and animals found in the ecosystem

The design must:

– be maximum A4 size

– use a variety of natural and non-natural materials

When complete students report to the class on the main features of their ecosystem, how their model could be used to promote biodiversity, and the design process and materials they used.

Aussie Animals

Cut out the pictures from the Aussie animals worksheets and distribute to the students. Students read out their 'Aussie Animal' description and try to match their animal to the most appropriate ecosystem poster or to student models. Note that many animals can be found in more than one ecosystem type. The students should justify their choice of ecosystem on the basis of the drawing, clue and prior knowledge. Alternatively this could be used as an individual assessment task.

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.

- identifies a variety of Australian ecosystems
- presents information about a specific Australian ecosystem
- matches animals to their corresponding ecosystems.

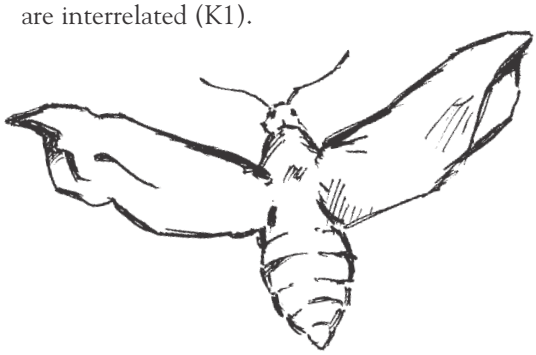
DMS2.8 Develops implements and evaluates ideas using drawings, models and prototypes at appropriate stages of the design process

- designs and makes a model of an Australian ecosystem.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:

- the nature and function of ecosystems and how they are interrelated (K1).



Lesson 5

Helpful Habitats

Overview

Examine and record habitat diversity in the school grounds.

Resources

- Plant and animal habitat lists created in Lesson 3
- *Habitat* factsheets 1 – 5
- *Woodlands & Forests* ecosystem poster
- *Healthy habitats* worksheet 4
- *Biodiversity school* poster
- *Bioschool* worksheet (found on the back of the biodiversity school poster)
- blindfolds, jumpers or equivalent
- large map of the school
- digital camera

Preparation

Copy a map of the school onto butcher's paper or cardboard: the bigger the better. Ask parents or other adults to help with the survey.

Background information

Plants are the foundation of most ecosystems. In Australia native plants support more native animals than introduced plants because they provide appropriate food and nest sites. In many ecosystems plants can be found in a number of layers. Layers describe groups of plants that are usually share similar characteristics such as multiple stems, single trunk, non-woody and similar height. The three most common terms for plant layers are trees, shrubs and ground covers.

In areas where certain layers have been removed it is likely the animals that depend on those layers will also be absent. For example, before the introduction of rabbits, bilbies were found in most of the drier regions of NSW. However the arrival of the rabbits led to a decline in ground cover plants. These ground cover plants were homes for numerous invertebrates. Invertebrates provide the main source of food for bilbies so with their removal the decline of the bilby was inevitable. Bilbies are now extinct in NSW but some small populations remain in some other states.

Some animals can survive with just one or two plant layers, while others require additional types of habitat for their survival. These include water, tree hollows or nest boxes, mulch or leaf litter, rocks, logs or fallen branches and flowering plants. These are habitat components that increase the likelihood of native animals and plants finding a suitable place to live. They are described in detail in the *Habitat* factsheets.

Note: (for the activity that examines plants in school grounds)
Species identification of plants if difficult for most adults let alone children, though if someone can identify the plants then this information should be used and shared. While it is useful to know the names of plants it is more important to know why plants are useful in the environment, that is the way they provide food and shelter for other species.

Lesson 5

Teaching and learning activities

Brainstorm 'What do native animals need to survive?' In general native animals need access to habitats and particularly plants. Refer back to the butcher's paper lists of animal and plant habitats created in lesson 3 'habitats and homes'.

Examine the plant layer pictures on the *Habitat* factsheets 1 – 2 to help illustrate importance and the differences between, trees, shrubs and ground covers.

• What are plant layers?

- Trees: usually has a single hard woody trunk.

- Shrubs: usually have multiple stems or trunks that begin close to the ground

- Ground covers: are non woody and rarely grow over 1m tall eg native grasses

• Why is each layer important?

• What kinds of animals would you expect to find in each plant layer? Refer back to Aussie Animals pictures for inspiration

• Are native plants better for native animals? Why?

- They provide more appropriate food and nest sites

Display the *Woodlands & Forests* ecosystem poster. Ask the students to identify each of the plant layers in the picture. Introduce the *Habitat* factsheets 3 – 5 and name the remaining habitat components: leaf litter, rocks, logs, tree hollows or nest boxes, water and flowering plants. In groups students read a habitat fact sheet and report back to the class on the value of that particular habitat component. Ask the students to try and locate an example of their habitat component in the poster.

Introduce the *Biodiversity School* poster and explain to the students that this is an example of a school that is doing good things to support biodiversity in school grounds. As a class identify the habitat components of the school that make it good for biodiversity. Using the *Bioschool* worksheet the students identify and colour the habitat components eg colour the tree layer blue, shrub layer red and the ground cover layer green, tree hollows yellow etc.

Outside the classroom test the students' recollection of each layer and the associated habitat components by asking them to point to the different layers and habitat components.

Outcomes and indicators

BES2.1 Creates, models and evaluates built environments reflecting consideration of functional and aesthetic factors.
- creates and labels a map of the school.
- evaluates the school's suitability for supporting biodiversity.

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.
- identifies different plant layers in the school grounds
- identifies different types of habitats in the school grounds.

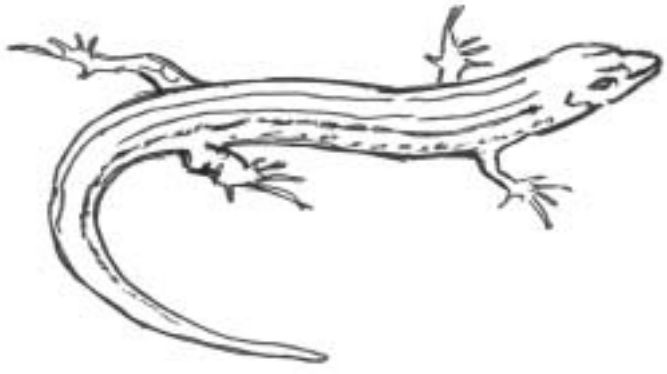
INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.
- recognises a variety of different plant species using senses other than sight
- identifies and classifies features of the school's natural environment
- collects data on a number and variety of species.

UTS2.9 Selects and uses a range of equipment, computer-based technology, materials and other resources with developing skill to enhance investigation and design tasks.
- uses a digital or reflex camera to record evidence of biodiversity in the school grounds.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:
- the nature and function of ecosystems and how they are interrelated (K1).

Students will develop skills in:
- identifying and assessing environmental problems (S2)
- communicating environmental problems to others (S3).



Lesson 5

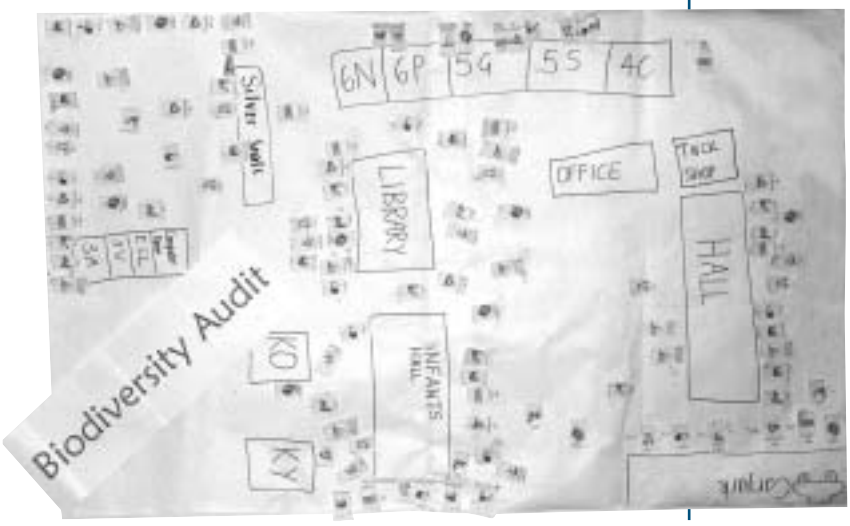
Teaching and learning activities

Blindfold game.

This game helps students explore the features of plants as well as the variety of plants found in your playground. The game is played in pairs. One student is blindfolded. Use blindfolds, sleeping masks or jumpers etc. The student who can see, spins their blindfolded partner to help disorient them, and then leads them to a plant. The blindfolded student examines the plant checking for size, texture, smell, height, leaf shape etc. The student is led away and given a few more spins. Once the blindfold is removed the student tries to find their plant again.

Working in small groups students complete the *Healthy habitat* worksheet. The emphasis of this worksheet is to look at layers and components of a healthy habitat rather than looking at individual species. To minimise duplication assign different parts of the school to each group. Additional adults, ie parents could be used to supervise and guide students as they complete their survey. Students record the presence of different layers and other healthy habitat components on the worksheet. Use a digital camera to record photographic evidence of the places the students are looking at.

Back in the classroom students examine the large map of the school. Students indicate the presence of individual plants, layers and other habitat components on the map by cutting the relevant symbols from their 'healthy habitat' worksheet and pasting them on the map. Use photos taken during the survey to further illustrate the biodiversity status of these areas. Using this map evaluate the school in terms of how it supports biodiversity. At a later stage this map can be used to guide your biodiversity action plan as it should show areas that are good for biodiversity and also those areas which are currently lacking.



Outcomes and indicators

Lesson 6

Vertebrate Survey

Overview

Create a record of vertebrate animals found in the school grounds.

Resources

- *Biodiversity school* poster
- post it notes
- survey poster
- digital camera
- books on vertebrate identification

Preparation

Create a vertebrate survey poster with five sections labelled with mammals, birds, reptiles, amphibians and fish. Alternatively create a separate poster for each of these categories.

Background Information

All animals have certain characteristics that make it easy for them to be placed into groups. All animals that have a backbone are called vertebrates. The vertebrate group can be split into a variety of categories. The characteristics of the five classes are:

Mammals:	warm blooded, usually furry, young feed on milk from the mother
Birds:	warm blooded, usually covered in feathers, have wings, young develop in eggs
Reptiles:	cold blooded usually covered in scales, young usually develop in eggs
Amphibians:	usually lay eggs in water, young usually go through a larval or tadpole stage, later metamorphosing into lung-breathing adults
Fish:	cold blooded, completely aquatic, breathe oxygen from water with gills, usually covered in scales

Note:
Animals found during any of the surveys will greatly depend on the time of day the survey was conducted, the duration of the survey, the season and weather.

Lesson 6

Teaching and learning activities

Begin this lesson by conducting a quick animal survey of the animals found in the *Biodiversity School* poster. Explain to the students that they will be looking for 'vertebrate' animals, that is animals with a backbone. What animals can the students find, and in what classes do they belong? This helps set the scene for the animal survey that will be conducted outside the classroom.

Because most large animals disappear the second students get near them this lesson is best conducted over a number of days or weeks with students recording their results as they actually observe the animals.

Students record their sighting on a post-it note and place this onto the vertebrate survey poster in the appropriate category. It might be useful to provide five minutes at the beginning and end of each day to update the survey. Use a digital camera to record photos of the animals or evidence of their presence like scats, tracks, nests, skin, fur and feathers.

Pose the questions

- How can we find out about animals that we can't see?
- What signs should we look for to find out if animals are around?
- Would we see the same animals at night?
- Why are some animals missing from the playground? For example wallabies and snakes.

Additional surveys could be conducted at the students' homes or in a local park providing a broader picture of biodiversity in the local area.

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.

- observes and reports on the variety of animals seen in the school grounds.

INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.

- identifies and describes a variety of ways in which animals can be observed in the school grounds.

UTS2.9 Selects and uses a range of equipment, computer-based technology, materials and other resources with developing skill to enhance investigation and design tasks.

- uses a digital or reflex camera to record evidence of biodiversity in the school grounds.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:

- the nature and function of ecosystems and how they are interrelated (K1).

Lesson 7

Invertebrate Survey

Overview

Conduct a survey of invertebrate animals found in the school grounds.

Resources

- *Invertebrate survey* worksheet 5
- Books on invertebrate identification (The equipment required for the survey varies according to the survey technique chosen.)
- tote tray, colanders, trowels
- sheets or tarp or large piece of plastic
- hoops
- containers to hold animals – at least two per student (ice cream/margarine containers, not glass)
- magnification equipment
- paint brushes to safely move animals into containers – one per student
- student designed trapping devices
- sweep nets
- dip Nets
- ice cream containers

Preparation

Decide on the survey technique to be used and collect or purchase the equipment required. Most of this equipment is available from normal school supplies. Label a large piece of cardboard with 'Invertebrate diversity in our school', students will paste pictures of some of the invertebrates they collect onto this poster. Photocopy and enlarge a picture of an invertebrate from a library book, or use the *Invertebrate survey* worksheet.

Background information

Invertebrates are animals that do not have a backbone. Most invertebrates have an external skeleton (exoskeleton) or none at all. Animals that can be called invertebrates include insects, arachnids (eg. spiders, ticks and mites), crustaceans (eg. slaters and yabbies), molluscs (eg. Snails and slugs), worms etc. In terms of biodiversity these animals make up the vast majority of species on Earth. Many invertebrates play vital roles in keeping ecosystems healthy. Some invertebrates are now classed as threatened species so plans have been created to help protect them.

Invertebrates:

- help to recycle dead plant and animal material
- turn the soil and distribute seeds
- help to pollinate flowers so that they produce seeds and fruit
- eat other invertebrates to ensure certain species don't become a pest
- end up being food for vertebrates higher up in the food chain.

In fact without invertebrates there would be less of the food that we depend upon.

Invertebrate surveys can quickly give us an indication of how healthy an ecosystem is. An area with lots of plant layers and other habitat components will support far more species of invertebrates than an area that is missing these features. The greater the variety of species found the better the health of an area. They can also help us find out if a plant is native or not. Most native animals prefer native plants therefore the presence or lack of invertebrates may indicate whether the plants are native or not.

Lesson 7

Teaching and learning activities

Hold up the picture of an invertebrate. Ask the students to identify the animal. Discuss what invertebrates are and why they are important.

For homework or as a classroom activity students design a trap or device that can be used to catch invertebrates. Students design a trap that collects nocturnal invertebrates. Any vertebrate animals caught in the trap must be released as soon as they are found.

Student Design Brief

Your task is to:

- design a trap that collects nocturnal invertebrates.

The design must:

- use a variety of natural and non-natural materials
- ensure animals remain unharmed
- be no larger than a shoe box
- be waterproof so if it rains the animals won't drown.

When complete students set their traps and record collected invertebrates on the invertebrate survey worksheet.

Surveys

Apart from using their own traps, there are a number of easy techniques that will help ensure a successful invertebrate survey. When conducting a survey for terrestrial animals try to examine all the plant layers, as different species will be found in each. It is essential that students do not touch invertebrates with their hands, while the vast majority are safe, some have the potential to cause harm. Soft bristled paintbrushes make an excellent capturing tool, they also help to keep the students and invertebrates safe from harm.

Choose your favoured survey method

The examples of invertebrate survey methods listed below are explained in the Teacher's Notes. Pick and choose the ones you are comfortable with or have equipment for. You may even consider devoting entire lessons to different survey techniques.

- Looking for leaf litter animals
- Hoop search
- Sweep nets

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.

- observes and reports on the variety of invertebrate animals in the school grounds.

INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.

- collects, records and describes a variety of invertebrate animals in the school grounds
- draws conclusions about the impact of vegetation layers on species diversity.

DMS2.8 Develops implements and evaluates ideas using drawings, models and prototypes at appropriate stages of the design process.

- Designs, makes, tests and evaluates a device for collecting invertebrate animals.

UTS2.9 Selects and uses a range of equipment, computer-based technology, materials and other resources with developing skill to enhance investigation and design tasks.

- uses a digital or reflex camera to record evidence of invertebrate animals in the school grounds
- uses a variety of appropriate materials in constructing a trap for invertebrate animals
- selects and uses appropriate equipment for collecting invertebrate animals.

Objectives of Environmental Education Policy for Schools

Students will develop knowledge and understanding about:

- the nature and function of ecosystems and how they are interrelated (K1).

Students will develop skills in:

- applying technical expertise within an environmental context (S1).

Students will develop values and attitudes relating to:

- a respect for life on Earth (V1).

Lesson 7

Teaching and learning activities

Outcomes and indicators

- Finding hidden animals in trees

- Dip nets for aquatic animals

Collect the invertebrates and bring them back to class for recording. Note that all collected invertebrates must be returned to the area they were found upon completion of the activity. Take photos of the survey work.

Back in the classroom

Students record the species they have found on the *Invertebrate survey* worksheet. Books from the library can also help in invertebrate identification. To increase the difficulty of the task ask the students to record the number of species in each category rather than just individuals eg. Spiders: 5 yellow striped, 1 brown, 1 green. If available use items like magnifying glasses or any other magnification equipment to have a close up look at the animals.

Conduct a show and tell session where students stand and tell the class about the animals they have found. Which animals were the most abundant? Did any particular layer yield the most invertebrates? Why? Before releasing the animals students draw a few of the invertebrates they have found. These can be pasted onto the 'Invertebrate diversity in our School' poster. On completion all animals should be released back into the area where they were found.

Students' traps

Compare results of the various traps. Which designs were successful and which were unsuccessful? Evaluate why the successful traps caught more invertebrates. Students suggest changes to their own designs to improve their performance.

Lesson 8

Food Chains and Webs

Overview

Make models of animals observed in the playground and use them to make a visual food chain or food web.

Resources

- *Food chains and webs* worksheet 6
- research materials
- access to websites

Preparation

Clear a display board/wall for the food chain/web. Either paint a picture of a tree, shrub or groundcover or use an existing poster.

Background information

Food chains and webs form the basis of all ecosystems. They demonstrate the interconnectedness of all living things. The relationships between species are crucial to sustaining an ecosystem. Often the role of a particular species does not become apparent until that species is lost. For example some insects are responsible for pollinating particular plants, if the insects become extinct then the plants will be lost as well, any other animals that depend on those plants will then disappear, and so on.

A food chain shows the flow of food at a very simple level eg grass – wallaby – dingo. A food web is far more detailed as it shows the flow of food between many species. Because one animal often eats multiple species a food web can become very complex. Drawn food webs often resemble a spiders web, hence the name.

See the *Food chains and webs* factsheet.

Lesson 8

Teaching and learning activities

Students complete the food chains and webs worksheet based on one animal found or observed in their school grounds. Students record a picture of the selected animal and information about where it lives, what it eats, what its predators are and how it protects itself.

Optional: Once complete students create a model of their animal using a range of craft and natural materials. Students should examine the supplied materials and consider which materials will be most appropriate for their model.

Completed models or worksheets are used to create a class display on food chains/webs. Use a picture/painting of a tree, shrub or groundcover as the basis for a food chain, place around the tree any animals that feed on the plant, next place any predators next to their prey. Label each animal as it is placed in the food web. Link each animal to its prey/food using string. This completed food web helps to demonstrate the interconnectedness of living things in the playground, that is, your school ecosystem. Discuss:

- what would happen if the tree were removed?
- are any animals eaten more than others?
- why do plants and animals need each other?

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things as ways in which living things interact with other living things and their environment.

- observes and reports on specific issues related to biodiversity
- recounts specific information about biodiversity from a video.

Objectives of Environmental Education Policy for Schools

Students will develop *knowledge and understanding* about:

- the nature and function of ecosystems and how they are interrelated (K1)
- the impact of people on environments (K2).

Students will develop *values and attitudes* relating to:

- a respect for life on Earth (V1).

Lesson 9

Biodiversity Comparison

Overview

Students compare the biodiversity found at a natural site to the biodiversity found in their school grounds.

Resources

- *Healthy habitat* worksheet 4 (if required)
- *Invertebrate survey* worksheet 5 (if required)
- *Looking after biodiversity* worksheet 7
- survey equipment as used previously – see if this can be provided by the staff at the site you are visiting.

Preparation

Visit the excursion site before the actual excursion.

Invite an expert on the area you are visiting to speak to the students. Let this person know that the students will be interviewing them about what they do to manage biodiversity and provide them with a copy of the *Looking after biodiversity* worksheet, in advance of the visit.

Background information

Sites in your local area that still include remnants of original vegetation are likely to contain a greater range of biodiversity than your school. These sites provide an opportunity to compare your school's biodiversity to that found in a 'natural' site. The comparison can also be used as a basis for what could be done in your school grounds to help improve biodiversity.

Suitable sites for your excursion include places such as national parks, Environmental Education Centres, state forests, state parks, local parks, bush next to a creek, native gardens or remnant vegetation on farms. Some contact details can be found in the teacher's notes.

Lesson 9

Teaching and learning activities

Name the ecosystem you are going to visit. Based on acquired knowledge ask the students to describe what they think this ecosystem will look like and what its main features are. Re-examine this description after the excursion and compare the differences between student descriptions and reality. Before visiting a natural site discuss rules and appropriate ways to behave.

Visit a national park, bushland reserve, State forest, environmental education centre, local park, a native garden, or remnant vegetation of a farm and conduct a comparison biodiversity survey. Some places you visit will have a guide who can assist your students with biodiversity surveys. Surveys could be similar to those conducted in your school or may differ depending on the site you have chosen. An Aboriginal person might be able to provide an insight into how the area had been and still is used and the changes that have occurred over the past 200 years.

At some stage during the visit ask your students to interview the guide and complete the *Looking after biodiversity* worksheet.

After you have completed the surveys discuss:

- Is the biodiversity found here similar or different to what we found at school?

- Did you find the same number of animals in both sites?

- Which site had the greatest amount of biodiversity?

- What would help explain these differences? - link initial plant diversity survey to animal diversity. That is, the greater the variety of plant layers and habitat components, the greater the variety of animals.

- What impact would building a house or creating a farm have on the biodiversity in the area we are visiting?

Consider different people in the community and the way they manage biodiversity. As a research activity have the students complete the *Looking after biodiversity* worksheet for various people in the community. Write a letter, email, or phone various land mangers to find out how they manage biodiversity. Some of the people they could research include a farmer, a forester, a council worker, a fisheries officer, a gardener, an Aboriginal person, and a park ranger. Compare similarities and differences between the completed worksheets.

Outcomes and indicators

LTS2.3 Identifies and describes the structure and function of living things and ways in which living things interact with other living things and their environment.

- observes and reports on the variety of animals in a natural environment.

INVS2.7 Conducts investigations by observing, questioning, predicting, testing, collecting, recording, and analysing data, and drawing conclusions.

- collects, records and describes a variety of animals in a natural environment
- identifies different plant layers
- identifies different types of habitats
- compares data from the natural environment with school ground data and draws conclusions about the reason for the differences between them.
- Interviews land managers about the way they manage biodiversity.

UTS2.9 Selects and uses a range of equipment, computer-based technology, materials and other resources with developing skill to enhance investigation and design tasks.

- uses a digital or reflex camera to record evidence of animals
- selects and uses appropriate equipment for collecting invertebrate animals.

Objectives of Environmental Education Policy for Schools

Students will develop *knowledge and understanding* about:

- the nature and function of ecosystems and how the are interrelated (K1).

Students will develop *skills* in:

- applying technical expertise within an environmental context (S1).

Students will develop *values and attitudes* relating to:

- a respect for life on Earth (V1).

Lesson 10

Improving biodiversity in school grounds

Overview

Create an action plan to improve biodiversity in the school grounds.

Resources

- *Biodiversity School* poster
- School grounds biodiversity map created in lesson 5
- *Biodiversity action plan* worksheet 8
- equipment to help prepare the selected area for the action plan

Preparation

Invite a member of the school executive to part of this lesson.

Background information

Local Councils, landholders and government departments manage, protect and enhance biodiversity. Currently a small portion of land in NSW is set aside to protect native biodiversity.

To ensure the adequate protection of a range of different environments it is important that individuals and landholders try to protect biodiversity wherever it occurs. Schools can play a vital role in the conservation and restoration of biodiversity because they often have land they can set aside for this purpose or they already have remnant vegetation they can protect and enhance.

Biodiversity action plans are one of the most important aspects of this program. They allow students to make real and meaningful changes to school playgrounds to help improve biodiversity.

Biodiversity action plans are also one of the requirements of the DET Environmental Education Policy for Schools. The policy requires schools to develop a School Environmental Management Plan (SEMP) which states how schools are managing the environmental aspects of their curriculum, resources and school grounds. Biodiversity action plans that are developed by the students can be used within a SEMP to demonstrate effective and integrated grounds management. The Environment Education Policy can be downloaded at www. curriculumsupport.nsw.edu.au/enviroed/index.cfm

Lesson 10

Teaching and learning activities

Re-examine the *Biodiversity School* poster and discuss:

- what has this school done to support biodiversity?
- how could we make our school more like this?

What are some actions that students and staff could take to help improve biodiversity in your school grounds or beyond? Refer back to the school map created in lesson 5 and the animal surveys from lesson 6 and 7 for further ideas. List these on the board. Apart from the action it is also important for the students to identify why the action is important. For example native grasses could be planted because they provide habitats for invertebrates and lizards and are missing from the school grounds. Ask the students to think about which of these actions are achievable and practical. As a class prioritise the list.

Actions might include:

- make a frog pond
- propagate local native plants, trees, shrubs and grasses
- grow a bush food garden
- establish a permaculture garden
- remove weeds
- build nest boxes for birds, possums, native bees
- engage in a reduce-reuse-recycle program
- keep worm farms
- start up a rubbish-free lunch policy.

Invite a member of the school executive to participate in the remaining part of this lesson. Select students to present the top ten biodiversity actions (and the reasons why they are important) to the school executive. The executive should review the list and choose four of the options that they think are achievable. If possible it would be great if the school could commit funding towards the action project (eg. $400). Ask students to prioritise the new list while considering which action will have the most benefit to schoolyard biodiversity.

Using the Biodiversity action plan worksheet as a guide students develop an action plan for biodiversity improvement. Start small and with a project that is likely to show clear and rapid results. For example native grasses are usually under-represented in school grounds and make an excellent selection for revegetation projects. By using native grasses students can create a

Outcomes and indicators

BES2.1 Creates, models and evaluates built environments reflecting consideration of functional and aesthetic factors.
- generates ideas for improving the school grounds to support biodiversity
- design and make an action plan that will lead to improvement in biodiversity in the school grounds.

ENS2.6 Describes people's interactions with environments and identifies responsible ways of interacting with environments.
- evaluates the necessity for conserving biodiversity in the school grounds
- identifies responsible way of managing the school grounds for biodiversity outcomes.

Objectives of Environmental Education Policy for Schools
Students will develop knowledge and understanding about:
- the impact of people on environments (K2)
- the role of the community, politics and market forces in environmental decision-making (K3).

Students will develop skills in:
- identifying and assessing environmental problems (S2)
- resolving environmental problems (S4)
- adopting behaviours and practices that protect the environment (S5)
- evaluating the success of their actions (S6).

Students will develop values and attitudes relating to:
- a commitment to act for the environment by supporting long-term solutions to environmenta problems (V3).

Management of the School Grounds objectives:
Schools will
- manage school grounds in accordance with the principles of ecologically sustainable development
- develop school grounds as part of the overall schol plan
- identify learning opportunities for students resulting from the management of school grounds.

Lesson 10

Teaching and learning activities

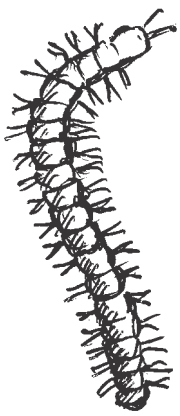
viable habitat within a few months as opposed to years by using trees and shrubs alone. These can be planted under existing trees and shrubs recreating the layers needed to fully support native biodiversity. It's better to concentrate your planting in one area rather than spreading your plants thinly. Dense pockets of ground covers and shrubs provide more protection to animals than individual plants can.

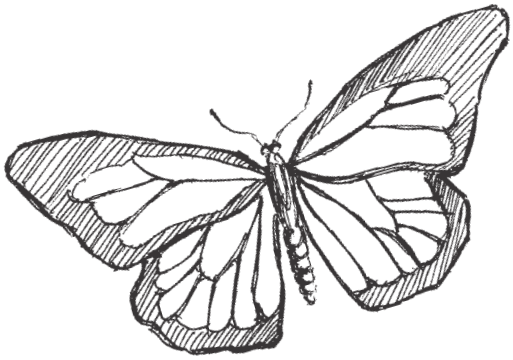
Upon completion of the action plan ask the students to write a report based on something they have learned during the program. These reports should be written to educate a wider audience and be included in school newsletters, or presented at assemblies or special events.

Please note: don't create an area that excludes people. Use it as a teaching/learning tool that can be used by all classes. One requirement of the Environmental Education Policy for Schools is to integrate the use of the playground in the curriculum, and this has been one focus of this unit. Can the new area be incorporated into other teaching/learning programs?

See Implementing the Environmental Education Policy document for further contacts that may be able to help you with your plan, or contact your local Environmental Education Centre or Council.

Outcomes and indicators





Student Worksheets

1. Web of Life
2. Ecosystem research & design brief
3. Aussie Animals
4. Healthy habitat
5. Invertebrate survey
6. Food chains and webs
7. Looking after biodiversity
8. Biodiversity action plan proforma

Web of life

Work Sheet 1

1. Apart from animals, what else does Montague Island National Park protect?
2. What is the most important thing about Montague Island?
3. What birds are you likely to find on Montague island?
4. What is so special about the penguins on Montague Islands?
5. What country do some of the birds on Montague Island come from?
6. What does 'web of life' mean?
7. Where are the humpback whales heading?
8. Biodiversity is short for?
9. What does biodiversity mean?
10. How many species of plants and animals can you find in Australia?
11. Why is Australia called 'mega-diverse'?
12. What is special about our mammals and frogs?
13. Why is Australian biodiversity unique?
14. Why is biodiversity important?
15. What types of clothing does biodiversity provide?
16. What kinds of food does biodiversity provide?
17. What are some of the building materials we get from biodiversity?
18. Why is biodiversity important to Aboriginal people?
19. How can we keep our environment healthy?
20. What kinds of environments do national parks protect?
21. What is not allowed in protected natural environments?
22. What are some of the things that people do in natural environments?
23. Why do students visit natural environments?
24. What lives in natural environments?
25. Where can you find biodiversity?
26. How has our biodiversity been threatened?
27. How many animals have we lost in the past 200 years?
28. How many plants have we lost in the past 200 years?
29. How can people help biodiversity?

Ecosystem Research: Design Brief

Work Sheet 2

Your task: Design and make a 3D model or a diorama of an ecosystem to be used in an advertisement to tell people about different kinds of biodiversity.

Features: What ecosystem features will you include?

Creatures: What plants and animals will you include?

Materials: List the materials and equipment that you will use in your model.

Natural materials	Non-natural materials	Equipment

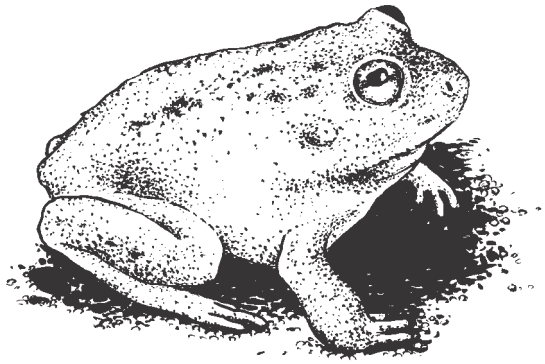
Using your model: Describe how your model will be used in an advertisement to promote biodiversity.

Drawing: Turn this page over and sketch your deisgn on the back.

The maximum size of the base of your model is the size of this piece of paper (A4 size).

Aussie Animals

Work Sheet 3

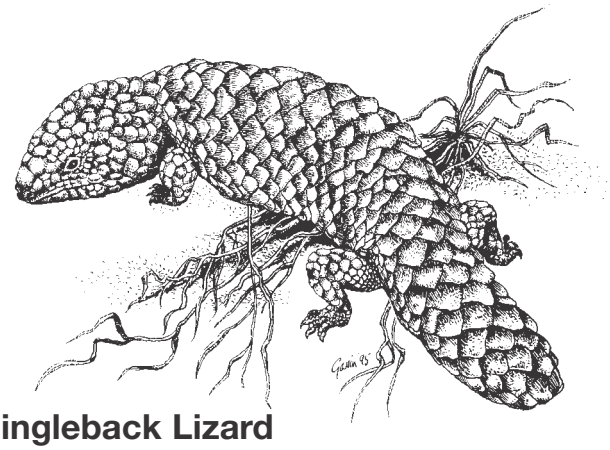


Water Holding Frog

For most of the year I live in a hole underneath
the hot dry plain,
I only come out once in a while after there's been
lots of rain.

Rock-Wallaby

It is to dry places that I tend to flock
In caves and ledges and outcrops of rock.



Shingleback Lizard

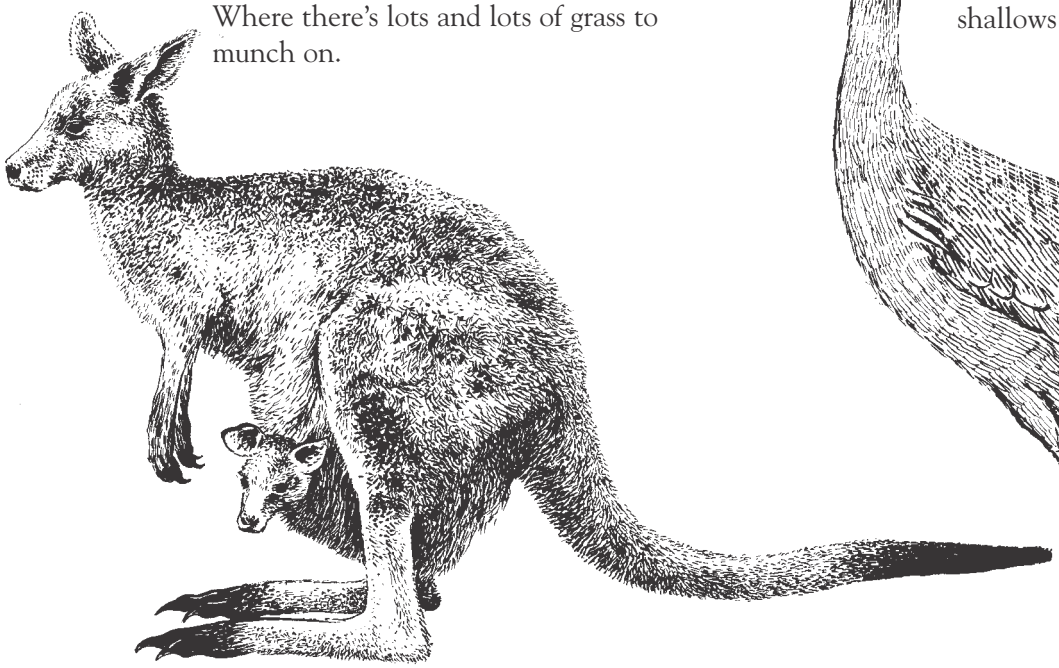
I'm common on plains that are dry and wide,
On the western side of the Great Divide.

Emu

I eat grass, flowers, insects and seeds.
Most natural environments suit my needs.

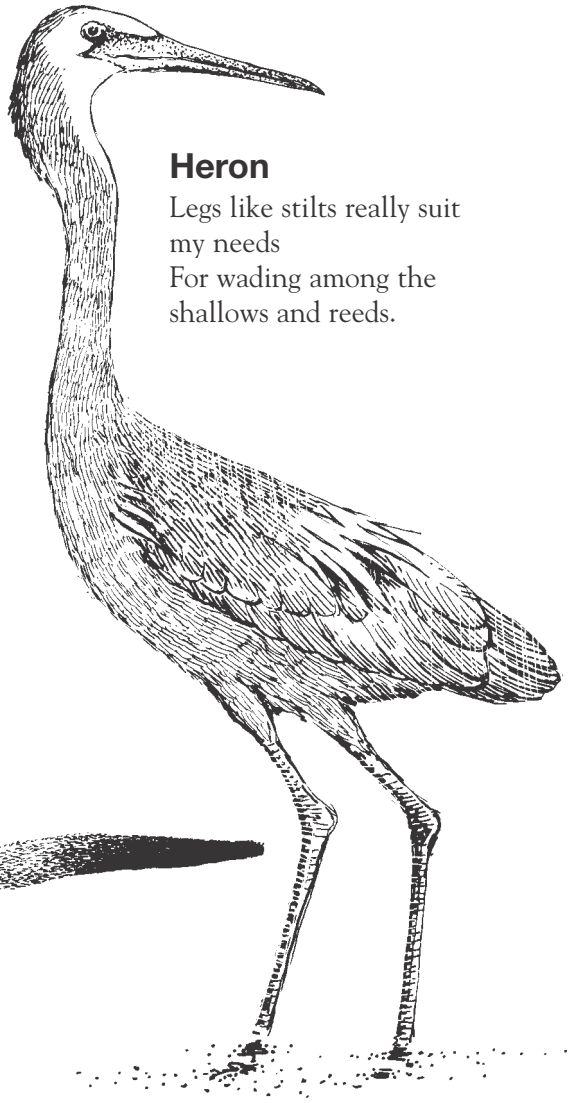
Eastern Grey Kangaroo

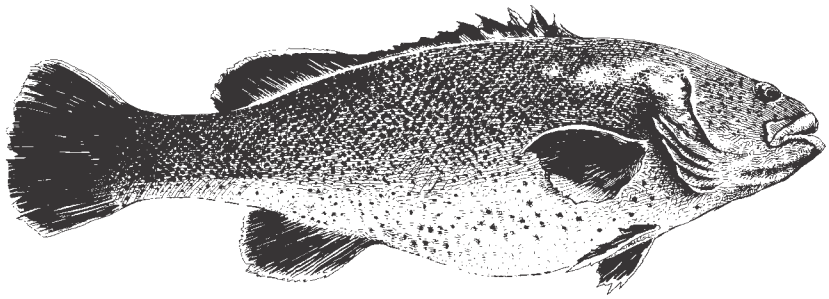
A large grassy clearing is my favourite
place to lunch on
Where there's lots and lots of grass to
munch on.



Heron

Legs like stilts really suit
my needs
For wading among the
shallows and reeds.





Trout Cod

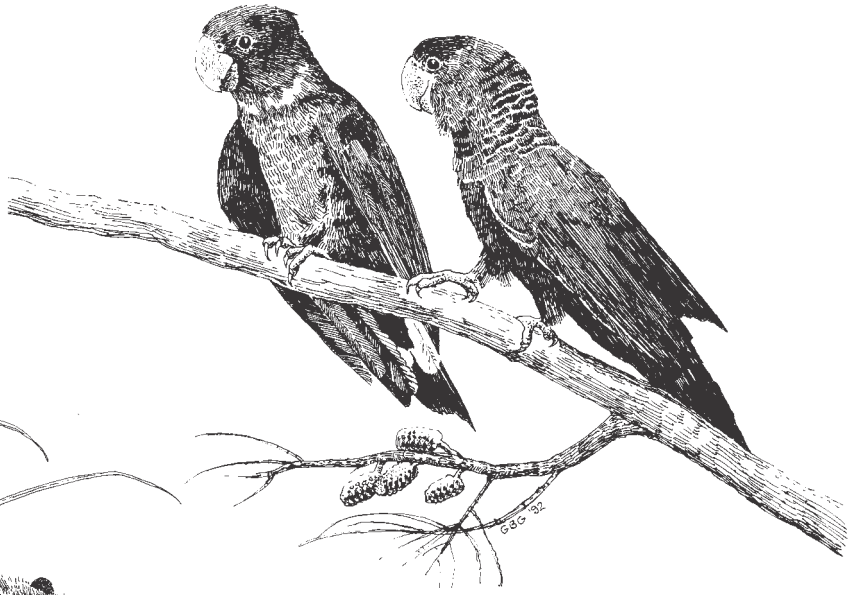
I'm long, smooth and thin – a perfect physique,
For a creature that lives in a river or creek.

Green and Golden Bell Frog

I swim in swamps, I bloat my cheeks,
I dive in dams and croak in creeks.

Glossy Black Cockatoo

She oaks are my main food trees.
I live where there are lots of these.



Swamp Rat

From my name you can probably tell,
That near rivers and creeks is where I dwell.

Red-crowned Toadlet

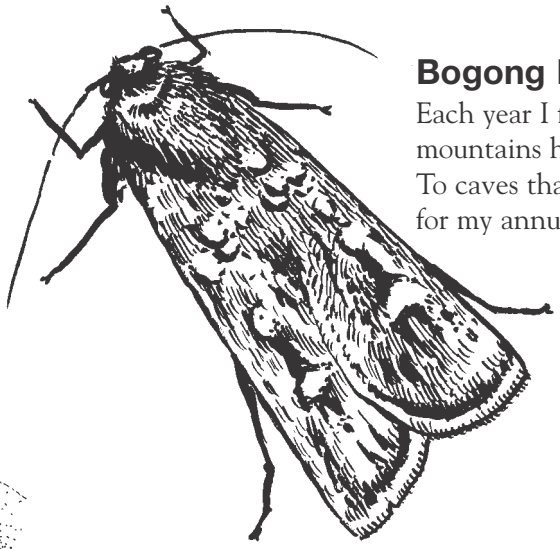
My friends and I have bright red hoods.
We live under hill ridges in the woods.

Sugar Glider

Insects, nectar and fruit are the things I eat,
And the gum tree's sap is my favourite treat.

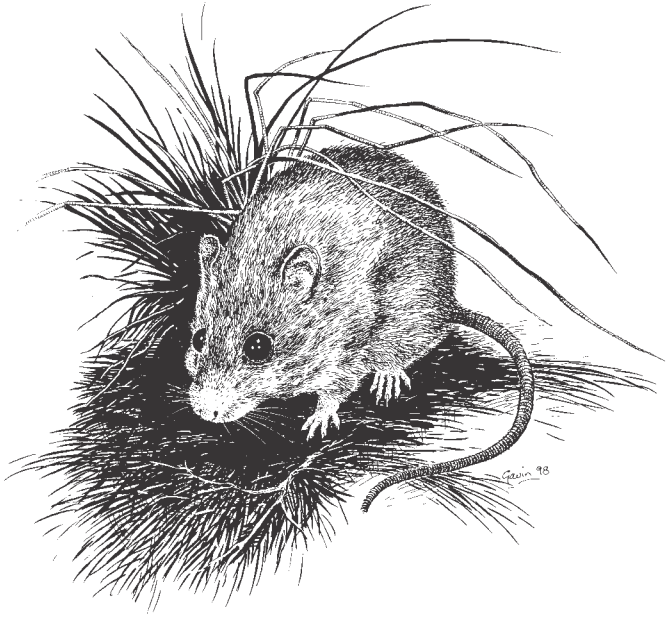
Yellow-tailed Cockatoo

In tall eucalypt trees I make my stops,
On the coast or up on the mountain tops.



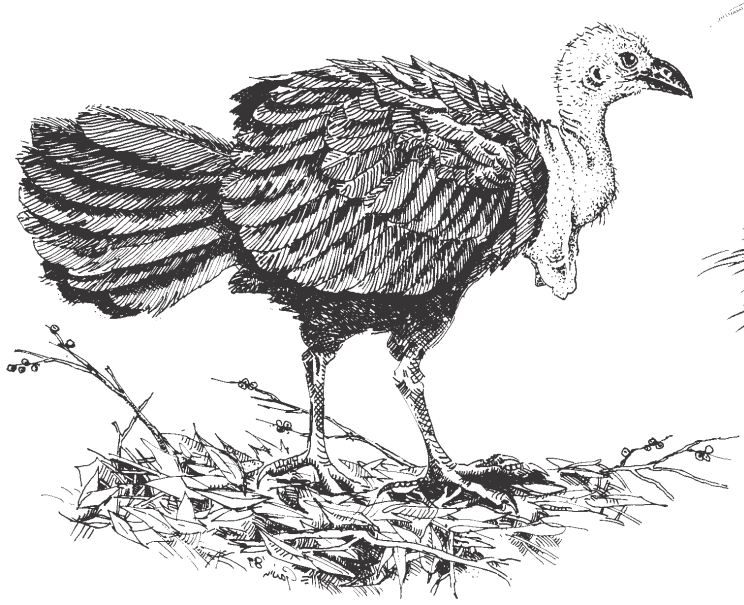
Bogong Moth

Each year I fly to the
mountains high,
To caves that are best
for my annual rest.



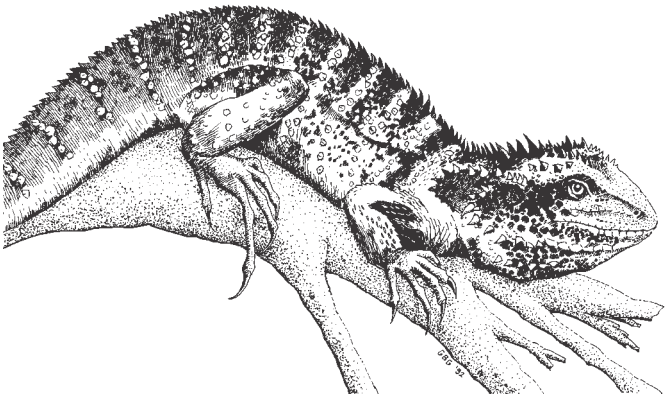
Broad-toothed Rat

The only places I like to go,
are those that often are
covered in snow.



Brush Turkey

From a mound of dead leaves I make my nest.
For this, the dark rainforest floor is best.



Water Dragon

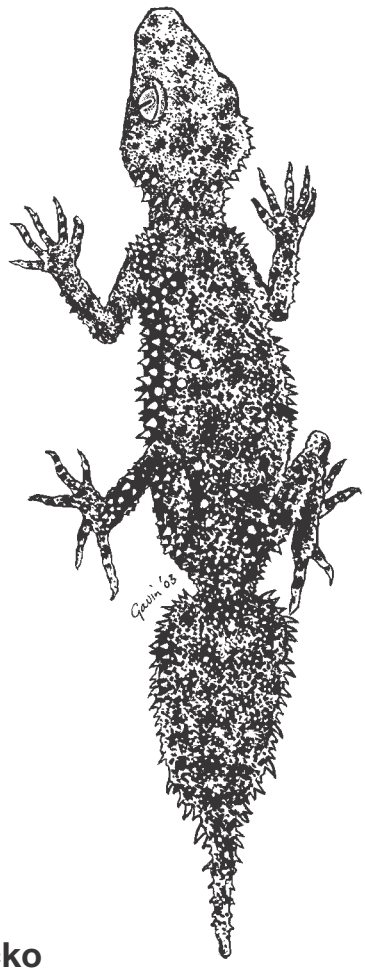
In forests where creeks and rivers abound,
Are the places that I am most often found.

Lyrebird

In most types of forests I'll make my camp,
Particularly those that are rugged and damp.

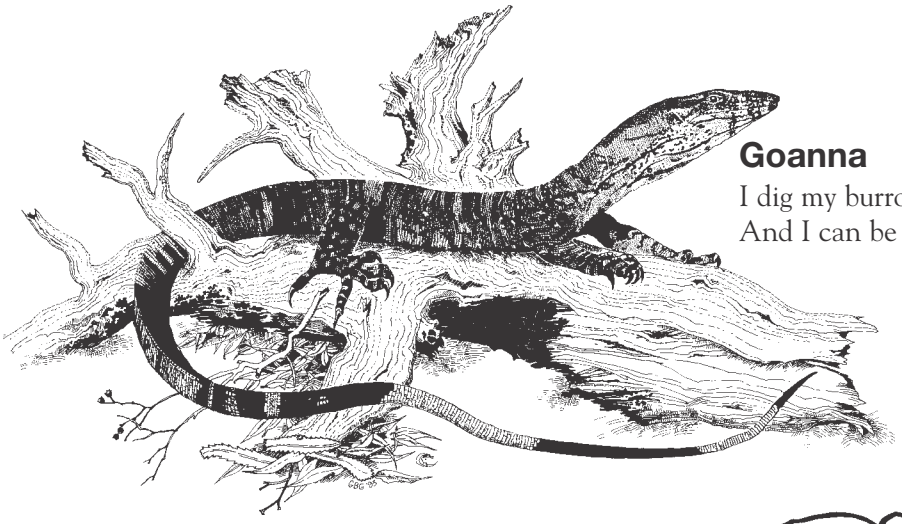
Penguins

Flying like other birds isn't for me.
I prefer to go swimming in the sea.



Gecko

My colour and shape makes me hard to see
On the mossy bark of a rainforest tree.

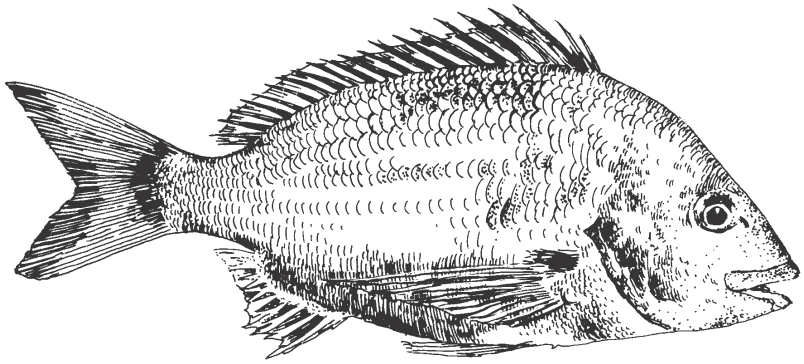


Goanna

I dig my burrow in earth and sand,
And I can be found in most parts of the land.

Seastar

I cling to rocks in my salt water pool,
Where the splashing waves are refreshingly cool.

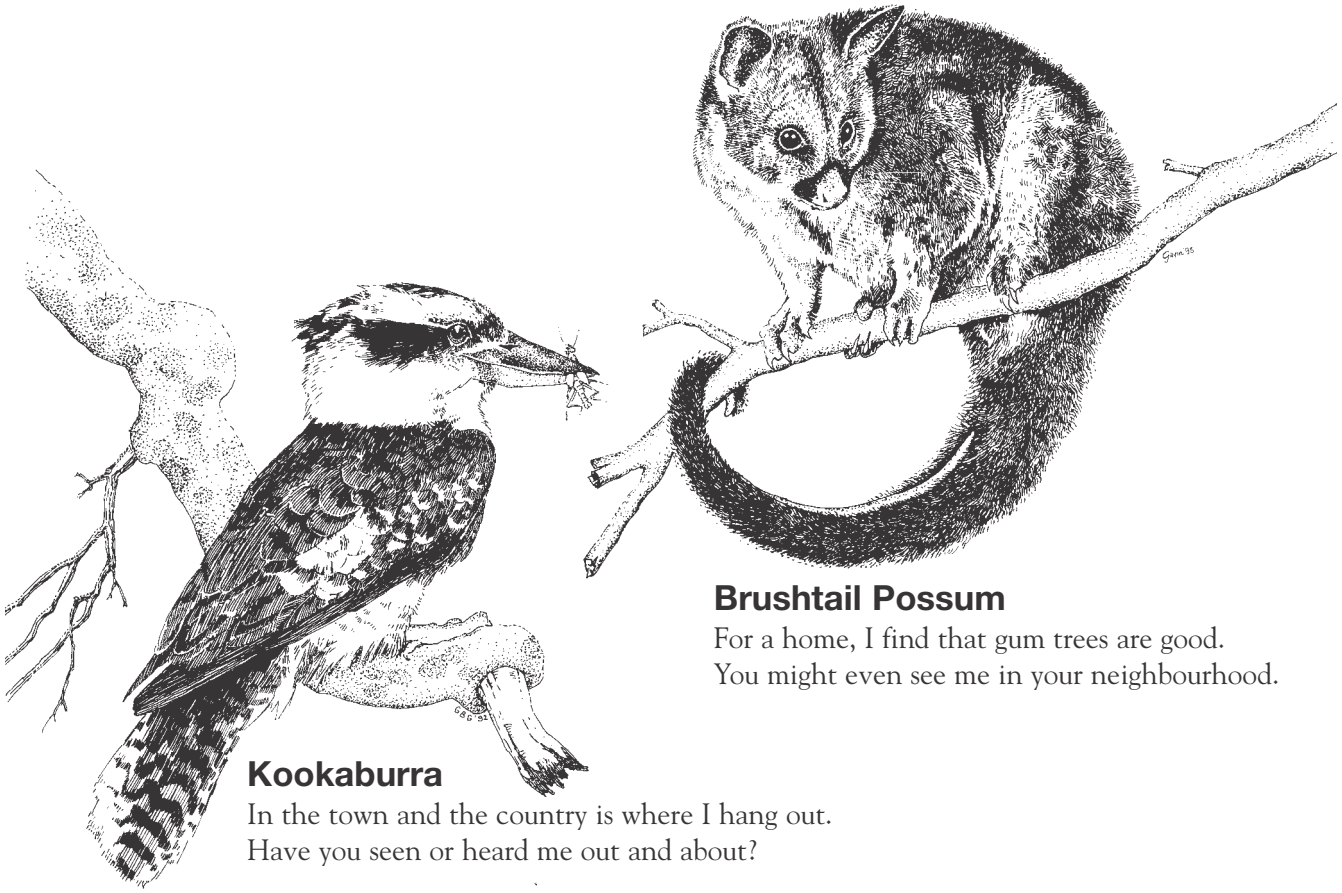


Yellow-finned Bream

The places that I like to swim in the most,
are salt-water river mouths on the coast.

Currawong

From my home in the bush I often fly down,
to visit the nearby farms and towns.



Brushtail Possum

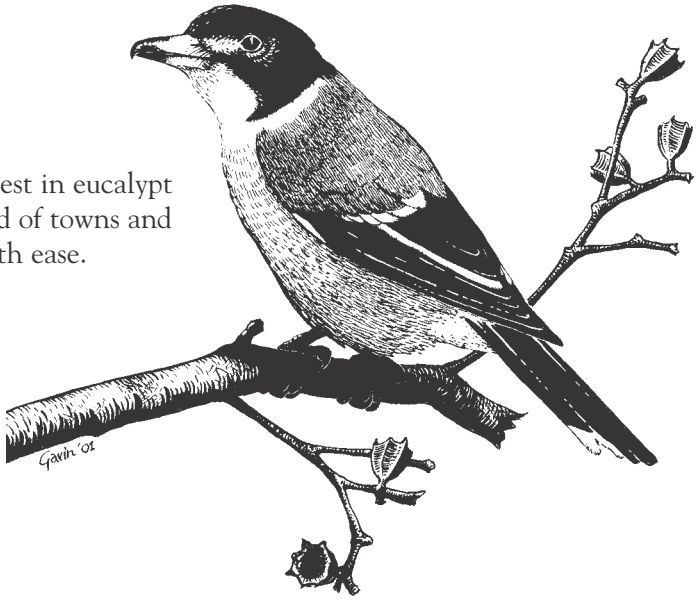
For a home, I find that gum trees are good.
You might even see me in your neighbourhood.

Kookaburra

In the town and the country is where I hang out.
Have you seen or heard me out and about?

Butcherbird

At the edge of the bush I nest in eucalypt trees, when the cleared land of towns and farms allows me to hunt with ease.



Echidna

Eating ants and termites is great!
And I can be found in most parts of the State.

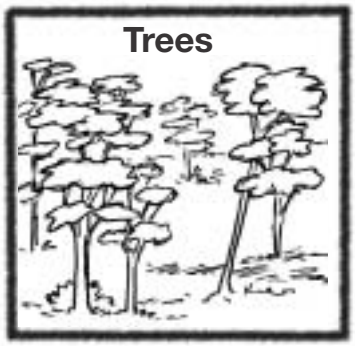
Healthy Habitats

Work Sheet 4

A healthy habitat provides all the things that plants and animals need. Tick the boxes that describe the area you are looking at.

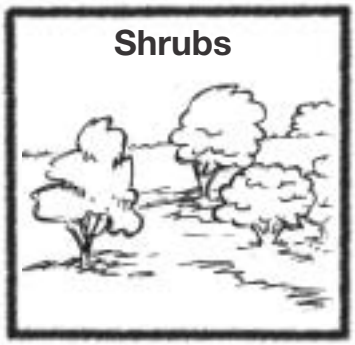
My area is: _____

Trees



☐ none ☐ some ☐ lots

Shrubs



☐ none ☐ some ☐ lots

Ground Cover

☐ none ☐ some ☐ lots

Leaf Litter or Mulch

☐ none ☐ some ☐ lots

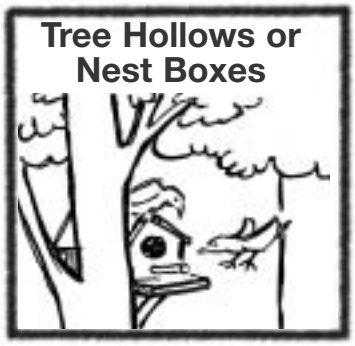
Rocks

☐ none ☐ some ☐ lots

Logs or Fallen Branches

☐ none ☐ some ☐ lots

Tree Hollows or Nest Boxes



☐ none ☐ some ☐ lots

Flowering Plants

☐ none ☐ some ☐ lots

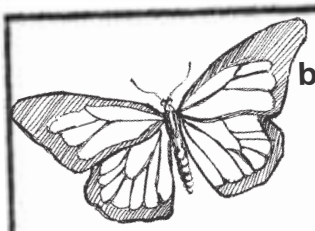
Water

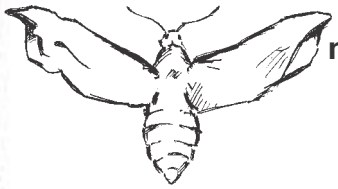
☐ none ☐ some ☐ lots

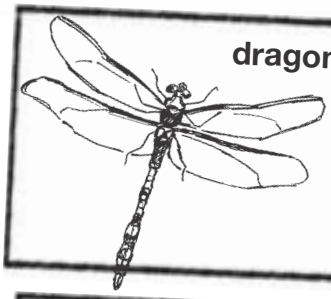
Invertebrate Survey

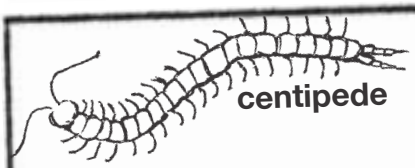
Work Sheet 5

Record the number of each invertebrate you find. There are extra spaces for you to add creatures that are not shown here.


butterfly

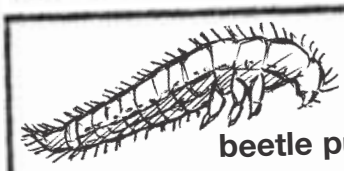

moth

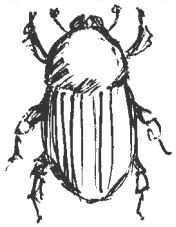

dragonfly

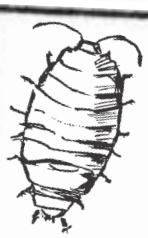

centipede


millipede

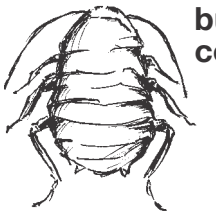

pill millipede


beetle pupa


beetle

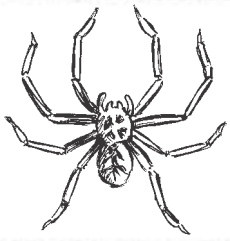

slater

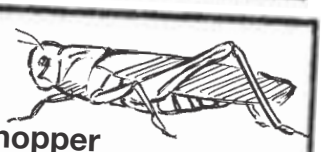

bug


bush cockroach


slug


ant


spider


grasshopper

Food chains and webs

Work Sheet 6

It lives in

It eats

The animal is

It is eaten by

It is protected by

It lives in

It eats

The animal is

It is eaten by

It is protected by

Looking after Biodiversity

Work Sheet 7

Who am I ?

Where do I work ?

What kinds of biodiversity do I look after?

The biodiversity I look after is important because .....

Colour the guide's clothing. Use the correct colours if they wear a uniform.

How do I improve biodiversity where I work?

Action Plan

Work Sheet 8

What?
What are you going to do?

When?
Time frame.

Where?
Area in school.

How?
Steps involved.

Who?
Class, parent helpers, council?

Why?
What is the purpose?

Evaluation
How did it go? What can be improved?

Student Factsheets

1. Plant layers and trees
2. Shrubs and ground covers
3. Leaf litter and rocks
4. Logs and tree hollows
5. Flowering plants and water

Habitat Facts:
Plant layers and trees

Fact Sheet 1

Plant Layers

Layers of trees, shrubs and groundcovers are important because:

- Some animals only like to live in one layer.
- Some animals live in one layer while they feed in another.
- They allow animals to move from one layer to another layer safely.
- They can provide different kinds of food all year round such as flowers, seeds and leaves.
- They provide safer nesting environments.
- They help to keep each other healthy.

Did you know that Australian animals prefer to eat and live in Australian plants?

Tree Layer

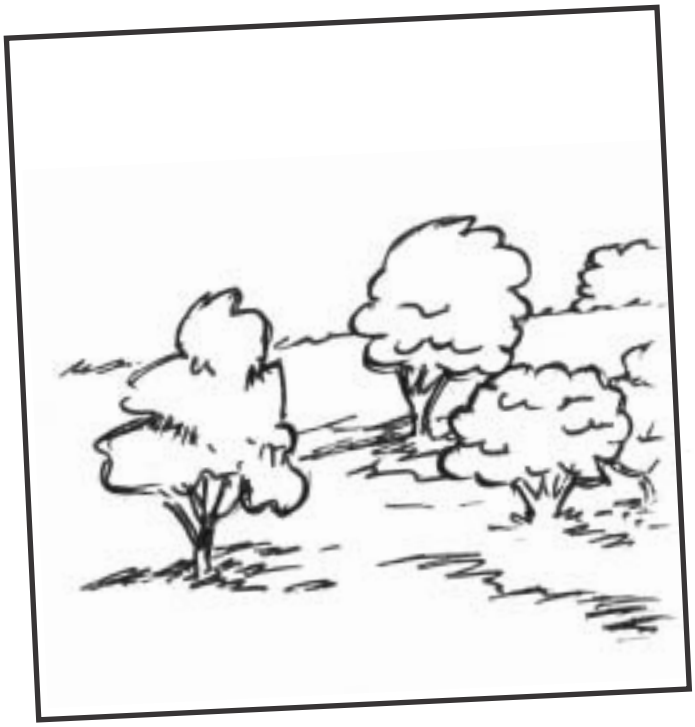
Trees are important because they:

- Provide nest sites for mammals, birds, reptiles and frogs.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Grow flowers containing nectar. Some birds, invertebrates and mammals need nectar for food.
- Produce seeds, which provide food for birds.
- Provide safe places to hide from predators.
- Allow birds to check the ground for food.
- Provide hollows, which are used by many animals.

Did you know that most of the species of flowering plants in Australia are found nowhere else in the world?

Habitat Facts:
Shrubs and ground covers

Fact Sheet 2



Shrub Layer

Shrubs are important because they:

- Provide nest sites for small mammals, birds, reptiles and frogs.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Grow flowers containing nectar. Some birds, invertebrates and mammals need nectar for food.
- Produce seeds, which are food for many animals.
- Provide safe places to hide from predators.
- Increase the health of trees.

Did you know that groups of shrubs growing closely together provide safer nesting sites than shrubs that are growing alone? Can you guess why?

Groundcover Layer

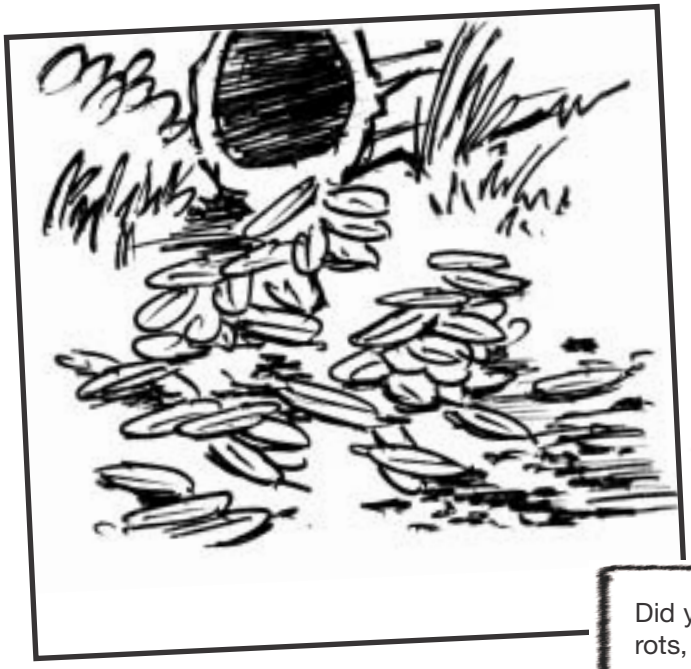
Groundcovers are important because they:

- Provide nest sites for invertebrates, small mammals, ground feeding birds, reptiles and frogs.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Produce seeds that provide food for many small birds.
- Provide safe places to hide from predators.
- Help to keep the ground moist.
- Increase the health of trees and shrubs.

Did you know that some types of ground cover plants such as native grasses are endangered in NSW?

Habitat Facts:
Leaf litter and rocks

Fact Sheet 3



Leaf litter or mulch

Leaf litter or mulch is important because it:

- Provides nest sites for invertebrates, reptiles and frogs
- Provides homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Stops the soil from drying out.
- Stops the soil from washing away or being blown away in storms.

Did you know that as the leaf litter and mulch rots, it helps to feed the surrounding plants?

Rocks

Rocks are important because they:

- Provide nest sites for small mammals, reptiles and frogs.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Provide safe places to hide from predators.
- Protect animals from bad weather and fire.
- Reduce moisture loss from the soil.
- Stop soil from washing away or being blown away in storms.
- Create moist places for young plants to grow.

Did you know that some animals are endangered by the removal of rocks from the bush?

Habitat Facts:
Logs and tree hollows

Fact Sheet 4

Logs

Logs are important because they:

- Provide nest sites for small mammals, ground feeding birds, reptiles and frogs.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Provide a perch from which birds and reptiles can hunt.
- Provide safe places to hide from predators.
- Protect animals from bad weather.
- Provide moist places for young plants to grow.

Did you know 20% of our native mammals need logs to nest in?

Tree hollows or nest boxes

Tree hollows or nest boxes are important because they:

- Provide nest sites for mammals, birds and reptiles.
- Provide homes for invertebrates. Some birds, reptiles and mammals eat invertebrates for food.
- Provide nest sites for different animals at different times of the year.
- Provide safe places to hide from predators.
- Protect animals from bad weather.

Did you know that it takes from 70 to 300 years for a tree to grow a tree hollow?

Habitat Facts:
Flowering plants and water

Fact Sheet 5

Flowering plants

Flowering plants are important because they:

- Provide nectar and pollen for invertebrates, small mammals and birds to eat.
- Develop seeds that are food for many invertebrates, mammals and birds.

Did you know it's best to have a garden with plants that flower at different times throughout the year? This helps to ensure there is always nectar and pollen available for the animals that need it?

Ponds, Creeks and Water

Ponds, creeks and water are important because they:

- Provide nest sites for invertebrates, frogs, and fish.
- Provide water for animals to drink.
- Provide moisture to keep plants alive.
- Provide moist places for young plants to grow.

Teacher's Notes

Answers to *Web of Life* worksheet

Types of ecosystems

Invertebrate survey methods

Food chains and food webs

Contacts and Websites

Teacher's Notes 1

Answers to Web of Life worksheet

[This sheet should be a copy of the cutting out one with the answers written in..]

Q1. Apart from animals Montague Island National Park also protects...?
A. A *beautiful lighthouse made of granite*.

2. What is the most important thing about Montague Island?
The abundance and diversity of wildlife.

3. What birds are you likely to find on Montague island?
Sea birds, especially shearwaters and crested-terns

4. What is so special about the penguins on Montague Island?
It is the second largest colony of little penguins in the world

5. What country do some of the birds on Montague Island come from?
Siberia. A round trip of 20,000 kms

6. What does 'web of life' mean?
The way in which all living things depend on one another for survival.

7. Where are the humpback whales heading?
Antarctica

8. Biodiversity is short for?
Biological diversity

9. What does biodiversity mean?
The variety of plant and animal species.

10. How many species of plants and animals can you find in Australia?
More than one million

11. Why is Australia called 'mega-diverse'?
Because there are so many different species

12. What is special about our mammals and frogs?
They are found nowhere else on the planet.

13. Why is Australian biodiversity unique?
Because most of our frogs and mammals are found nowhere else on Earth.

14. Why is biodiversity important?
It provides us with all the things we need to survive clean water, healthy soils, food, medicine, clothing and building materials.

15. What types of clothing does biodiversity provide?
Wool, from sheep, cotton and linen from plants
(NB not specifically stated on video)

16. What kinds of food does biodiversity provide?
All food comes from biodiversity
(NB not specifically stated on video)

17. What are some of the building materials we get from biodiversity?
Timber and wood products, rubber, some types of paint
(NB not specifically stated on video)

18. Why is biodiversity important to Aboriginal people?
Plays a role in their spiritual beliefs and it has influenced the way they manage the land.

19. How can we keep our environment healthy?
One way is through a network of national parks

20. What kinds of environments do national parks protect?
Deserts mountains, rainforests, the coast and everything in between

21. What is not allowed in protected natural environments?
Activities that harm native plants, animals and their homes such as building towns, hunting, collecting plants, cutting down trees and dumping pollution.

22. What are some of the things that people do in natural environments?
Picnics, walking, relaxing, appreciating and studying nature

23. Why do students visit natural environments?
To study landforms and biodiversity

24. What lives in natural environments?
Plants and animals such as the corroboree frog, pygmy-possum, glossy black cockatoo

25. Where can you find biodiversity?
National parks, backyard, school yard, on a farm, in a creek, just about anywhere

26. How has our biodiversity been threatened?
Clearing of land; feral pests and weeds, overgrazing by farm animals

27. How many animals have we lost in the past 200 years?
40 mammal species

28. How many plants have we lost in the past 200 years?
100 species

29. How can people help biodiversity?
Careful use of land, rivers and the sea; planting trees

Teacher's Notes 2

Types of ecosystems

This unit deals with seven general types of natural ecosystems.

Semi-arid

These ecosystems are found in western NSW and are characterised by low rainfall and high daytime temperatures that can drop substantially overnight. The plant species in these areas, including saltbush, mulga and river redgums, are drought tolerant and have adapted to poor soil and drainage.

Grassland

Grassy ecosystems are dominated by native grasses, often interspersed with native wildflowers. They may contain widely spaced tree cover or shrubs, creating a grassy woodland.

Wetland

Wetlands are found on land that is temporarily or permanently covered by fresh, brackish or saline water. Wetlands include rivers, streams, creeks, lakes, dams and ponds, billabong, swamps, marshes, bogs, fens, lagoons, floodplains, estuaries and mangrove swaps.

Woodland & Forest

Woodlands and forests are areas with trees, shrubs and grassy areas. Trees in woodlands and forests grow far enough apart to allow light to enter through the canopy to support a diverse shrub and groundcover layer. Woodlands and forests can be divided into dry sclerophyll and wet sclerophyll. The latter grows on moister soil and has taller and more closely spaced trees, and a less obvious shrub layer.

Alpine

Alpine ecosystems occur in NSW at altitudes over 1800 metres where snow covers the ground for a substantial part of the year and it is too cold for trees to grow. The sub-alpine area immediately below this is distinguished by the predominance of snow gums.

Rainforest

Rainforest ecosystems grow where there is high rainfall and high soil moisture content. They have a closed canopy in which the interlocking branches and leaves at the top of tall trees completely shade the forest floor.

Coastal

Coastal ecosystems are found where the sea meets the land. They may involve rugged eroded headlands, sand dunes, sandy beaches, saltmarsh, mangrove mud flats, coastal heath, seagrass beds, rocky shores, beaches and estuaries. They are influenced by the tides, waves, and wind.

Teacher's Notes 3

Invertebrate survey methods

Listed below are examples of invertebrate survey methods. Pick and choose the ones you are comfortable with or have equipment for. You may even consider devoting entire lessons to one or two survey techniques. All collected invertebrates must be returned to area they were found upon completion of the activity.

Terrestrial Animals

Looking for Leaf Litter Animals
This method is great for collecting invertebrates that can be found among sticks and leaves on the ground (leaf litter). You will need a tote tray, a colander, a trowel and a paintbrush and some sort of collection container.

1. Students scrape leaf litter into the colander.
2. Hold the colander over the tote tray and shake. Dirt and small invertebrates will fall out of the holes in the colander and will be deposited into the tote tray for collection. Collect the invertebrates by brushing into collection containers.
3. Empty the tote tray.
4. Gently tip some of the remaining leaf litter into the tote tray, move leaves around with the paint brush looking for invertebrates, collect and then repeat until all the leaves have been used.

Hoop Search
Hoops help focus attention on one particular spot, which is particularly useful when examining the ground cover layer. Using a paint brush students can carefully examine plants and leaf litter in the hoop for the presence of invertebrates. Collect any animals found using a paint brush and collection container.

Sweep Nets
Sweep nets are used to capture invertebrates that are airborne or live in or near the ground cover layer of plants. They can also be used in shrubs and trees if the foliage and branches are soft. Captured animals are transferred from the net into a collection container.

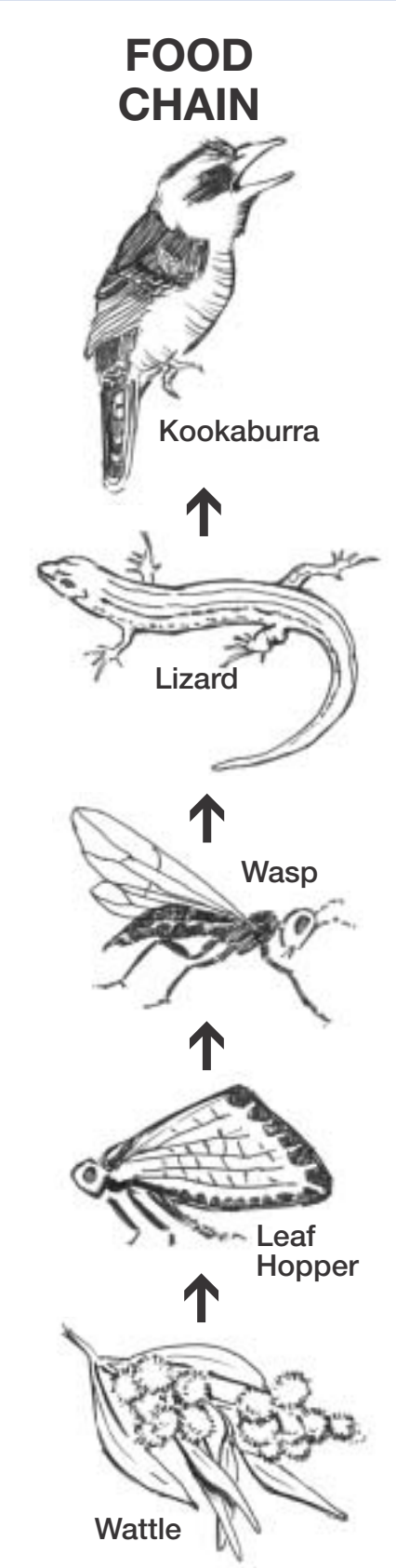
Finding Animals Hidden in Trees
To dislodge hidden invertebrates from a branch conduct a tree shake. This requires students to hold a sheet/tarp/plastic under a branch while another person shakes the branch. Any invertebrates on the branch should be dislodged and fall onto the sheet. These can be collected by brushing the animals into a collection container.

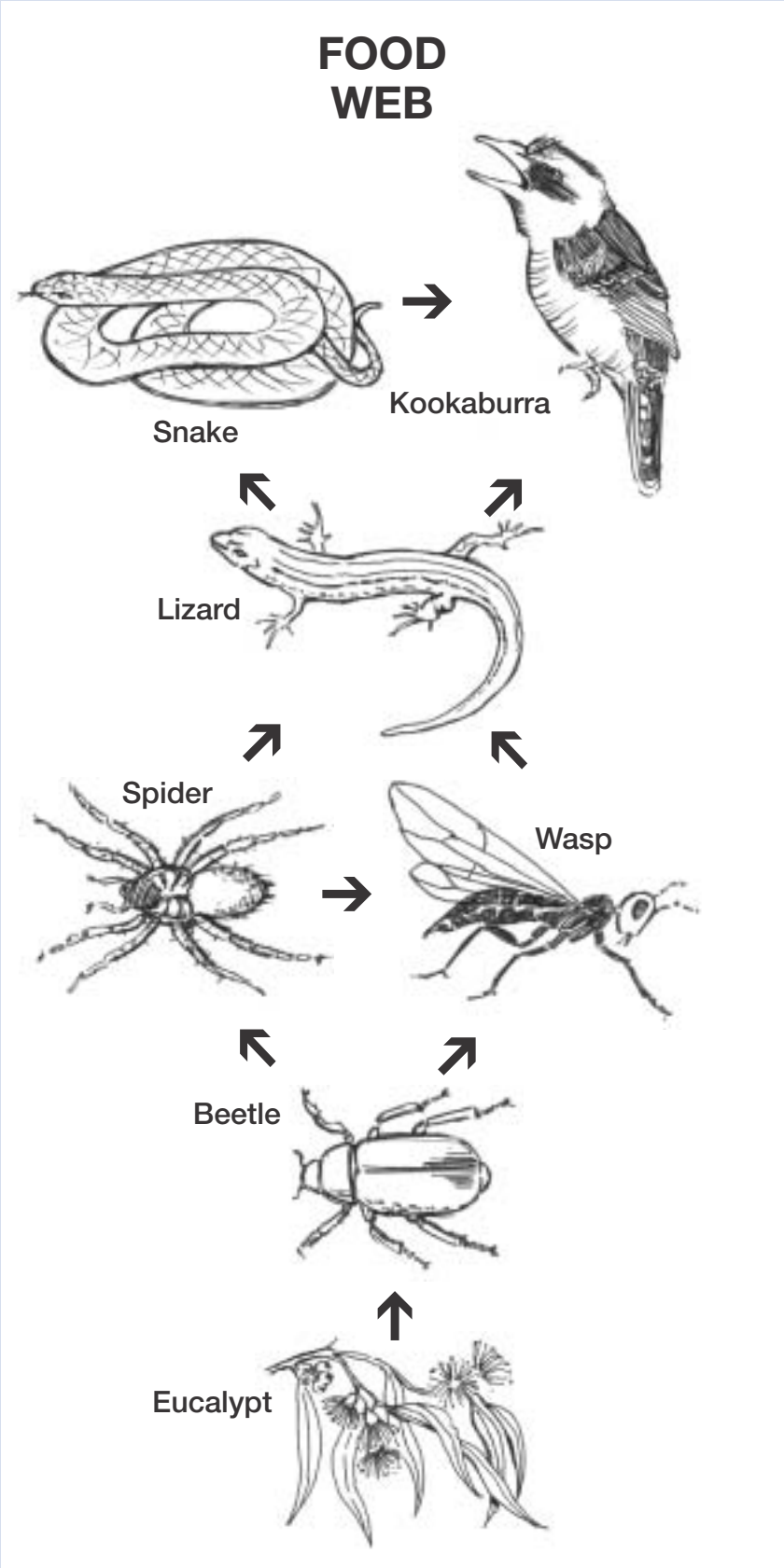
Aquatic Animals

Dip nets
Aquatic animals live in many different parts of a creek or pond. Some live on the surface, some live on the bottom while others live in vegetation at the side of a waterway. When looking for aquatic animals it's important to check in as many of these different areas as possible. Use a dip net to sample in these different environments. Transfer any animals found from the net to an icecream container using a paintbrush.
The 'bugasaurus explorus' website can assist with aquatic animal identification www.bugsurvey.nsw.gov.au. The presence or absence of certain types of aquatic animals will provide information on the health of the creek as well. The Department of Land and water conservation conducts the NSW waterbug survey twice a year in October and March. You can participate in this survey at any of these times. Sydney Water Streamwatch can also assist you with water bug surveys.

Teacher's Notes 4

Food Chains and Webs





Teacher's Notes 5

CONTACT DETAILS FOR VARIOUS ORGANISATIONS

NSW National Parks and Wildlife Service
A variety of guide books, posters and maps are available through the National Parks and Wildlife Service Information Centre, Hurstville, or your local National Parks and Wildlife office.
For information on national parks contact the National Parks Centre
102 George Street, The Rocks, Ph 1300 361 967
email: info@npws.nsw.gov.au
website: www.nationalparks.nsw.gov.au

NSW Department of Land and Water Conservation
Ph: 02 9228 6111
email: infocentre@dlwc.nsw.gov.au
website: www.dlwc.nsw.gov.au

Sydney Water Streamwatch
Ph: 02 9952 0358
website: www.streamwatch.org.au

State Parks
website: www.stateparks.nsw.gov.au

State Forests of NSW
Cumberland State Forest Studies Centre
Ph: 02 9871 0050
email: cumberland@sf.nsw.gov.au
website: www.forest.nsw.gov.au

NSW Aboriginal Land Council
contact details for regional land councils can be found at: www.alc.org.au/about/organisation/RALCS/RALCS.html

Environmental Education Centres, NSW
Department of Education and Training
Information on each environmental education and zoo education centre can be found at: www.curriculumsupport.nsw.edu.au/enviroed/index.cfm or in DET directories.

Environment Australia
(manages commonwealth national parks)
www.ea.gov.au/parks/commonwealth/index.html

Royal Botanic Gardens
Ph: 02 9231 8134
website: www.rbgsyd.nsw.gov.au

WEBSITES
General resources:
NSW Board of Studies
resources list for 'State and national parks' unit
www.bosnswk6.nsw.edu.au/hsie/resourcelist/k6hsie_s2_nparks.html

Gould League
www.gould.edu.au

Animal factsheets:
Australian Museum – Wildlife of Sydney
wildlife.faunanet.gov.au/index.html

Australian Museum general factsheets
www.amonline.net.au/factsheets/index.htm

Bugasaurus explorus
www.bugsurvey.nsw.gov.au

NPWS – wildlife fact sheets
www.npws.nsw.gov.au/wildlife/factsheets/index.html

Department of Land and Water Conservation - wetlands
www.dlwc.nsw.gov.au/care/wetlands/facts/paa.html

Backyard Buddies
www.npws.nsw.gov.au/backyardbuddies/meet_your_buddies.html

Threatened species information
Community Biodiversity Network
www.nccnsw.org.au/member/cbn/projects/education-centre/index.html

Environment Australia –
threatened species fact sheets
www.ea.gov.au/biodiversity/threatened/information/factsheets/index.html

NPWS – threatened species profiles
www.npws.nsw.gov.au/wildlife/threatened.htm#profiles

Threatened Species Network – factsheets
www.wwf.org.au/default.asp?p=../tsn/index.htm

Biodiversity
NSW Environment Protection Authority –
biodiversity page
www.epa.nsw.gov.au/envirom/biodiversity.htm

Australian Museum – biodiversity page
www.austmus.gov.au/biodiversity/

GLOSSARY

amphibian – an animal that belongs to the class of vertebrates that includes frogs and salamanders. They lay eggs in water have a larval tadpole stage then metamorphose into a four-legged adult.

aquatic – living or growing in water.

arboreal – living in or among trees.

biodiversity – the variety of all living things on earth.

Biodiversity Strategy – the NSW Biodiversity Strategy is a framework for coordinating and integrating the efforts of the Government and the community to protect and conserve the biodiversity of NSW.

bird – a warm-blooded animal with feathers and forelimbs modified to form wings.

conservation – the preservation of culturally and scientifically significant natural areas.

diurnal – active during the day.

ecosystem – a community of plants and animals interacting with one another and the surrounding environment.

ecosystem diversity – the many different kinds of environment, including the many different species adapted to live in them.

endangered – at risk of becoming extinct.

environment – the combination of all the conditions that influence the life of an individual or population: the natural environment; the built environment; and, the social cultural environment.

erosion – the cracking and wearing away of rock and soil by the weather.
evolution – continuous genetic change of species adapting to their environment.

exoskeleton – an external protective covering of an animal, as in a shell.

extinct – a species with no living representative.

fauna – animals

feral – a plant or animal that is a pest.

fish – a cold blooded aquatic vertebrate animal that breathes through its gills.

flora – plants

food chain – a 'chain' of organisms which depend on each other in their feeding habits (plants are eaten by animals and then other animals eat them).

food web – a series of interrelated food chains.

genetic diversity – the diversity of genes within and across all species.

habitat – the place where a plant or animal naturally lives or grows.

invertebrate – an animal that doesn't have a backbone.

landforms – the features that make up the surface of the earth, such as mountains, valleys, plains, rivers, canyons.

mammal – a warm blooded animal with fur or hair, that suckles its young on milk produced in it mammary glands.

megadiverse – having relatively high biodiversity.

native – environments, plants and animals that are original inhabitants in an area.

nocturnal – active during the night.

pest – a plant or animal that is troublesome, destructive and a nuisance.

population – the total number of people, or animals, or plants living in a particular area.

predation – the hunting, or preying, of one animal upon another.

remnant vegetation – clumps of native vegetation that remain standing after land clearing for agriculture and urbanisation.

reptiles – cold blooded vertebrate animals including lizards, snakes, turtles and crocodiles.

species – a distinct sort or kind of plant or animal, having a unique set of common characteristics.

species diversity – the variety of species.

terrestrial – of or belonging to the land.

threatened species – a plant or animal that is at risk of becoming extinct.

Threatened Species Conservation Act – a law that protects biodiversity and aims to prevent extinction of threatened species by protecting them and controlling processes that threaten them.

urban – of or related to living environments of a town or city.

vulnerable species– a threatened species that is at lower risk of extinction than an endangered species.

weeds – a plant that grows in the wrong place and is a nuisance.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