## Wildlife Corridors for Kids

Stage 3 - Teaching Package







## About this resource

#### Audience

This resource is intended for teachers of Stage 3 students. The activities and lessons included in this unit assist students to achieve cross-curriculum outcomes linked to the Science K-10, English K-10, Maths K-10, Geography K-10 and Creative Arts K-6 NSW syllabuses.

#### The resource

Wildlife Corridors for Kids provides a range of suggestions for achieving Stage 3 learning outcomes across a spectrum of K-10 and K-6 syllabuses. Teaching and learning activities can be modified to suit the local needs of students and can be replaced as desired with other activities. Several extension activities have also been included in the package to further enhance learning.

What the package includes:

- Lesson guides
- A series of colourful factsheets to assist learning
- A range of interactive activities to inspire students and encourage discussion



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The Great Eastern Ranges Initiative (GER) is one of the world's largest connectivity conservation projects. GER brings people and organisations together to protect, link and restore healthy habitats over 3,600km, from western Victoria through NSW and the ACT to Far North Queensland.



The Great Eastern Ranges:

- Are 3,600 kilometres in length.
- Are 33,000,000 hectares in area.
- Go across 14 bio-regions.
- Contain three World Heritage Areas
- Have the world's greatest concentration of primitive rainforest flowering plants
- Have Australia's largest and tallest old growth forests
- Contain more than 8,000 species of plants of which 25% are endemic
- Contain the headwaters of 63 large rivers
- Provide clean water for three quarters of Australia's population.



## Why are the Great Eastern Ranges important?

The Great Eastern Ranges contain the continent's richest diversity of plants and animals along with a wide variety of habitats from towering rainforests and woodlands through colourful heaths and thriving wetlands to herb fields and grasslands. They also contain catchments for the most reliable rainfall in eastern Australia which provide clean water to over 90% of the population of the local population. In the future, the Great Eastern Ranges will provide vital refuge for plants and animals seeking new homes due to the warmer temperatures and change in rainfall patterns brought on by climate change.

### Why do we need GER?

In the past, natural landscapes were well connected and continuous. Today, roads, fences, cleared land and buildings serve to carve up the land into small islands, blocking the movement of plants and animals and leading to habitat loss and degradation. By helping to re-establish natural connections we assist not only our wildlife but our land and natural resources.

# Why should we help the environment?

By making sure our environment is thriving and healthy, our families and future children will enjoy:

- Fresh air to breath and clean water to drink;
- Trees and shrubs that provide shade and shelter for people, farm animals and native wildlife;
- Deeper, richer, more productive agricultural soils to grow our food in;
- Healthy soils that do not erode away;
- A diversity of birds and insects that assist plants with pollination;

 Healthy native animals (such as birds and spiders) that help to control germs and pests (such as grass hoppers and earth mites).

A healthy landscape also protects us against extreme weather events and a changing climate.

## What does GER do?

GER works closely with landholders, community groups, indigenous groups, organisations and government agencies to relink the land enabling animals and plants to move more easily between areas like they did in the past. This is achieved by encouraging landholders to protect existing habitat on their farms, planting of trees and shrubs, strategic control of feral animals and weeds, sharing of Aboriginal traditional land management practices, and raising awareness about the importance and need for conservation.



# Some of the species that live in the Great Eastern Ranges



**Tiger Quolls** 

The cat size Tiger Quoll is mainland Australia's largest carnivorous marsupial. Since European settlement populations of this native predator have been decimated and now remain in only isolated patches of rugged terrain.



#### **Gliding Possums**

Australia is home to nine species of gliding possum, ranging in size from the world's smallest gliding mammal, like this Feather-tailed Glider, to one of the most vulnerable, Queensland's critically endangered Mahogany Glider.



#### **Richmond Birdwing Butterflies**

The iridescent Richmond Birdwing Butterfly is Australia's largest subtropical butterfly. Once abundant across its range, this colourful insect is now restricted to only two populations in the Sunshine Coast and Gold Coast, and in far North-east New South Wales.



#### Cassowaries

Shy and solitary, the unmistakable Cassowary of far north Queensland, sports a vivid blue neck, long drooping red wattles and high helmet. Cassowaries play an important role in maintaining the diversity of rainforest trees by helping to disperse seeds over long distances. The Great Eastern Ranges are home to more than 60% of Australia's threatened animals and 70% of its plants. Unique species like the Cassowary, Richmond Birdwing Butterfly, Koala, Wollemi Pine and Mountain Pygmy Possum all live within its valleys and peaks. In the future, the more reliable rainfall and higher altitudes of the ranges will serve as vital refuges for species moving in response to the impacts of climate change, such as shifting rainfall patterns leading to a dryer coastline and inland Australia.



Wollemi Pines

Thought to be long extinct, the Wollemi Pine was rediscovered in a gorge in the Blue Mountains in 1994. One of the world's rarest tree species dating back 200 million years, this living fossil is one of several ancient flowering rainforest plants found in the ranges.



#### Tree Kangaroos

Superbly adapted to moving across the tree canopy, the extraordinary Tree-kangaroos of Queensland's Wet Tropics have become restricted to high altitude areas and ever decreasing patches of remnant vegetation.



**Coroboree Frogs** 

Unique among the frog world, coroboree frogs produce their own poison rather than obtain it from their food. These tiny, striking frogs are restricted to a small 400km<sup>2</sup> patch in the sub alpine regions of southern NSW and Victoria.



#### Echidnas and Platypus

Inhabiting the riverbanks and forests of eastern Australia, the Platypus and Echidna are two of only five species in the world that lay eggs and suckle their young (monotremes).

## Aims

This two semester unit has been developed to assist Stage 3 NSW students to learn about and understand the importance and need for connectivity conservation and the value of large landscape projects such as the Great Eastern Ranges Initiative. The package is designed to make it easy for teachers to deliver across a range of Key Learning Areas linked to the NSW curriculum.

## Unit Overview

In this unit a mix of classroom-based learning, internet research and outdoor activities are used to teach students about biodiversity and the role of wildlife corridors in helping to conserve native plants and animals. Together, the lessons step students through the basics of connectivity conservation in plain English including why connectivity is important, threats to biodiversity and how wildlife corridors are created.

By the end of the unit students will be able to:

- Understand biodiversity and the role it plays in ensuring healthy ecosystems.
- Describe the food web of a gum tree.
- Discuss and understand the cultural history of the Aboriginal totem system.
- Write about a local native plant or animal.
- Create a map of their property and school grounds.
- Discuss the threats to biodiversity in New South Wales.
- Measure the movement and habitat requirements of gliding possums.
- Analyse and state the human impact on their local environment, develop and plan a project to support local biodiversity.

The unit culminates in the students developing a project to help native wildlife on their school grounds. This involves making a case for improved biodiversity, developing an action plan, implementing the project proposal and reflecting and evaluating the success of their project.

## Acknowledgements

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## Stage 3 NSW Syllabus Outcomes

English K-10	Mathematics K-10	Science K-10	Geography K-10	Creative Arts K-6
<b>EN3-1A</b> communicates effectively for a variety of audiences and purposes using increasingly challenging topics, ideas, issues and language forms and features	MA3-2WM selects and applies appropriate problem solving strategies including the use of digital technologies, in undertaking investigations	ST3-1VA shows interest and enthusiasm for science and technology, responding to their curiosity, questions and perceived needs, wants and opportunities	<b>GE3-1</b> describes the diverse features and characteristics of places and the environment	VAS3.1 investigates subject matter in an attempt to represent likenesses of things in the world.
EN3-2A composes, edits and presents well- structured and coherent texts	<b>MA3-3WM</b> gives a valid reason for supporting one possible solution over another	<b>ST3-2VA</b> demonstrates a willingness to engage responsibly with local, national and global issues relevant to their lives and to shaping sustainable futures	<b>GE3-2</b> explains interactions and connections between people, places and environment	VAS3.2 makes artworks for different audiences assembling materials in a variety of ways
EN3-3A uses an integrated range of skills, strategies and knowledge to read, view and comprehend a wide range of texts in different media and technologies	MA3-5NA selects and applies appropriate strategies for addition and subtraction with counting numbers in any size	<b>ST3-3VA</b> develops informed attitudes about the current and future use and influence of science and technology based on reason	<b>GE3-3</b> compares and contrasts influences on the management of places and environments	VAS3.3 Acknowledges that audiences respond in different ways to artworks and that there are different opinions about the value of artworks.
<b>EN3-4A</b> draws on appropriate strategies to accurately spell familiar and unfamiliar words when composing texts	MA3-6NA selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation	<b>ST3-4WS</b> investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations	<b>GE3-4</b> acquires, processes and communicates geographical information using geographical tools for enquiry	VAS3.4 Communicates about the ways in which subject matter is represented in artworks.
<b>EN3-6B</b> uses knowledge of sentence structure, grammar, punctuation and vocabulary to respond to and compose clear and cohesive texts in different media and technologies	<b>MA3-9MG</b> selects and uses the appropriate unit and device to measure lengths and distances, calculate perimeters, and converts between units of length	<b>ST3-5WT</b> plans and implements a design process, selecting a range of tools, equipment, materials and techniques to produce solutions that address design criteria and identified constraints		
EN3-7C thinks imaginatively, creatively, interpretively and critically about information and ideas and identifies connections between texts when responding to and composing texts		<b>ST3-10LW</b> describes how structural features and other adaptations of living things help them to survive in their environment		
<b>EN3-8D</b> identifies and considers how different viewpoints of their world, including aspects of culture, are represented in texts		<b>ST3-11LW</b> describes some physical conditions of the environment and how these affect the growth and survival of living things		
<b>EN3-9E</b> recognises, reflects on and assesses their strengths as a learner				

## Did you know?

Plants help to provide us with fresh water to drink by absorbing dirty run-off from our streets and filtering it through their roots removing harmful bacteria, parasites and pollutants.

#### **Overview:**

The focus of this lesson is for students to learn about biodiversity through investigating the variety of life on the school grounds - the plants and animals that live or feed there. The class discussion around biodiversity helps students to understand the importance of biodiversity in maintaining the healthy ecosystems that benefit both the environment and themselves.

#### **Resources**:

- Clipboard or notepad
- Pencil or pen
- Whiteboard
- Fact Sheet 1: Biodiversity and Healthy Ecosystems
- Activity 1: What Lives on our School Grounds?
- Australian field guide of plants, mammals and/or birds

#### **Background information**

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.

In simple terms, *biodiversity* is the variety of all life on earth. In relation to the school grounds, it is all the different kinds of plants and animals found there. In Australia, we are privileged to have around one million distinctive kinds of native plants and animals, many of them found nowhere else on earth.

#### What does native mean?

Native species (plants and animals) are ones that live in the same place that they are originally from. Most native plants and animals in Australia have evolved over many thousands or million of years, such as the Platypus and Echidna. Dingos are an unusual case as though they are not technically native because they were brought to Australia by the Aboriginal people, they have been in our country for so long (4,000 years) that we now consider them to be one of our native animals.

#### Why is biodiversity important?

Biodiversity is vital for all life on earth and is the foundation of healthy, functioning ecosystems. It provides all of our food and many of our industrial products and medicines. Biodiversity ensures that we have clean air to breath, fresh water to drink, fertile soils to grow our crops in and protects us from extreme weather events, such as floods and droughts. It also provides opportunities for recreation, tourism, scientific research and education, and is a source of cultural identity for many Australians.

## LESSON 1 (WEEK 1) Biodiversity and Healthy Ecosystems

## Teaching and learning activities

#### What uses our school grounds?

Take the students on a discovery walk around the school grounds to observe the plants and animals that live there or use them. Get them to pretend they are detectives who are looking for animals or evidence of animals such as bug trails, spider webs or scratch marks. Take a field guide with you so that students can identify the species they don't know. Ask them to take detailed notes and draw or photograph what they see using Activity sheet 1. Ask them to include as much detail in their drawings or photos as possible so they will be able to describe their features when they are back in the classroom. Compete to see who can find the most number of plant and animal species!

#### Reflect

Back in the classroom, ask the students to list all of the different types of plants and animals that they recorded outside on the board. Explain that this is just a tiny percentage of the actual species that live on the school grounds. Ask them to include some other animals or plants on the board that they know occur in their neighbourhoods. Explain that these are still just a small percentage of the species that actually live in their local area. Ask them to research on the internet how many species of plants and animals there are on the entire planet. Explain that this variety of life is referred to as biodiversity.

#### Observe

Ask the students to take a close look at the photos and drawings they made of the plants and animals they found outside and then to describe some their features. Have a group discussion around how these characteristics help them to survive in your local environment.

#### Discuss

Read and review the definition of biodiversity, why it is important and debate whether you have biodiversity in your school grounds based on your investigation. Have a class discussion about biodiversity. *What resources (services) does the environment provide for the animals we have seen? What resources (services) does it provide us with?* 

### Outcomes and indicators

English EN3-1A, EN3-7C

Science ST3-1VA, ST3-2VA, ST-4WS, ST3-11LW

Geography GE3-1, GE3-2

Creative Arts VAS3.1

## Idea

If there is a suitable location on your school grounds such as an unused corner of the playground, use it to develop a bush garden! A bush garden is a great way to encourage native species onto your school grounds and increase its biodiversity, whilst familiarising students with some of the local native plants. Include a water feature or bird bath to provide water for the neighbourhood animals. Students can be engaged at all stages including planning, establishment, maintenance and monitoring. A peaceful bush garden also provides a great place for people to relax and unwind during breaks. Work with the children to decide what should go in the garden and why.

You can even introduce some creative arts elements into the lesson by asking the students to draw what they would like the garden to look like from different angles (birds eye view, eye level)

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## Did you know?

Golden-green Carpenter Bees build nests by hollowing tunnels into the stalks of grass trees. The hollows can reach up to 30cm long!

In this lesson, students learn about food webs and chains and why they are important for people and nature by closely observing the animals living in and around a single gum tree.

#### **Resources**:

- Whiteboard
- Fact Sheet 2: Food Chains and Food Webs
- Activity Sheet 2: Eucalypt Ecosystem Study

#### **Background information**

All plants and animals need food to survive. A food chain is a drawing that shows who-eats-what in the environment. Most plants make their own food from the sun - a process called *photosynthesis*. Animals however cannot produce their own food so have to eat other animals or plants to produce the energy they need to live.

Plants are called **producers** as they use the energy from the sun to *produce* food. Animals are called **consumers** because they have to *consume* food to survive. There are three groups of consumers:

- Herbivores animals that eat only plants (primary consumers)
- **Carnivores** animals that eat only other animals (carnivores that eat herbivores are called **secondary consumers** whilst carnivores that eat other carnivores are called **tertiary consumers**)
- Omnivores Animals that eat both plants and animals.

Finally there are the decomposers (bacteria and fungi) which feed on decaying matter.

Most animals are part of more than one food chain. When connected together these food chains form a **food web.** 

This interconnectedness between species (i.e. they way in which they depend on one another for survival) is an important aspect of biodiversity. Food chains and webs are one way that we can present these connections.

## Teaching and learning activities

Provide the students with an overview of food chains and food webs explaining the difference between producers, consumers and decomposers.

#### Eucalypt ecosystem study

Take the class outdoors and ask them to find a eucalypt tree. Have a group discussion around it: *What animals can you find living in and around this tree?* 

Who is eating what or who?

What food does the tree itself provide? (sap, pollen, nectar, leaves, flowers)

What other animals do we know feed on or around eucalypt trees? (Birds: powerful owls, goshawks, crimson rosellas, rainbow lorikeets, honeyeaters; Possums: ringtail possums, squirrel gliders; Insects: hoverflys, christmas beetles, cicadas, ants, psyllids; Reptiles: lace monitors, skinks).

Ask the students to put all the animals into a food web around the tree using Activity Sheet 2.

The lesson is completed with a group discussion around the following question:

#### Why do we need gum trees?

Ask the students to research eucalypts on the internet and then have a group discussion around the following questions:

Why are eucalypts important? What do eucalypts need to survive? What can we do to help eucalypts?

#### Nature journal (Enrichment project)

Ask the students to create a journal recording the life of the plants and animals that share their school grounds and what changes the seasons bring. It can include things they see, hear, feel or smell. Encourage the students to think creatively and include a range of different things in their diarys including drawings, photos, dried leaves and flowers and poems. Remind the students to date each entry they make.

### Outcomes and indicators

English EN3-1A, EN3-3A, EN3-7C

#### Science

ST3-1VA, ST3-2VA, ST3-4WS, ST3-2VA, ST3-11LW

Geography GE3-1, GE3-2

#### Creative Arts VAS3.1, VAS3.3

## Idea

Why not organise for your local Aboriginal Discovery Ranger (NSW National Parks and Wildlife Service) to take your students out for a walk in a nearby national park or woodland? This is a great way for children to learn about the bush, explore nature and meet some of their local wildlife.



## Did you know?

There are more than 700 species of eucalyptus. Most of them are found in Australia but you also get a few in New Guinea and Indonesia.

#### **Overview:**

In this lesson students learn about the different types of habitat and why they are important.

#### **Resources**:

- Internet
- Fact sheet 3: Habitat
- Flat pack nestbox or nestbox building material

#### Links:

- Australian habitats: www.australianmuseum.net.au/wild-kids-habitats
- How to build a nestbox: http://www.wildlife.org.au/wildlife/livingwithwildlife/image/nestbox\_instructions.pdf
- Build a bee hotel: www.bit.ly/1PUVLx2
- Tree hollow presentation: http://hunter.lls.nsw.gov.au/\_\_data/assets/pdf\_file/0008/594098/hollows-for-habitatan-overview.pdf
- Environment Centres: http://www.environment.nsw.gov.au/sustainableschools/manage/EnviroCentres.htm

#### **Background information**

*Habitat* is the natural home or environment of an animal, plant or other organism. Animals need five things to survive in a habitat: food, water, shelter, air and a place to raise their young. Different types of plants and animals have different *habitat needs*. Some need only tiny habitats like worms, whilst others need large territories to roam across like quolls. Some need rocky tidal pools like starfish, others may need tropical rainforests like tree kangaroos whilst some can live in dry deserts like thorny devils.

If an animal's habitat becomes unsuitable it will try and move to a different area in search of a new home. Historically this was due to extreme weather events such as fires or floods but today we are the major reason why animals are forced to leave their homes - we clear habitat to build houses and buildings destroying shelter and food, we construct fences and roads which prevent animals from easily moving from one part of their habitat to another and we litter and pollute habitat impacting the health of the water and air.

## Teaching and learning activities

Provide students with an overview of Australian habitats and habitat needs. Decide together with the students what types of habitat occur in your area.

#### Habitat needs

Ask the children to investigate the habitat needs of a native animal of their choice.

What does your animal need in its habitat?

What size is its habitat? Where does it sleep? Where does it raise its young?

#### The disappearing tree hollow

Give the students a presentation on tree hollows (see links section for a ready made one) talking about how they form and why they are important. Ask them to investigate what animals use tree hollows.

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#### Hollow tree survey

Together with your students, conduct a survey of trees (15-20) of different sizes and ages on your school grounds. Create a table of your observations that includes the height, size (small. medium or big trunk) and number of hollows in each tree.

Is there a relationship between the size/age of the tree and the presence of hollows? What does this tell us?

#### Make your own habitat

Tell the students that they can have a positive impact on the environment by helping to replace lost habitat. Explain that it is better however to try and keep native habitat in the first place.

#### **Option 1: Build a nestbox**

Speak to the students about nestboxes and how they are used as supplementary habitat. Work with small groups of students to construct one or more nestboxes and then work with them to identify suitable locations on your school grounds to install them.

#### Option 2: Build a bee hotel

Talk to the students about native bees and the important role that pollinators play in the environment. Mention how bees are declining due to the use of pesticides and lack of natural habitat. Then work with the students to build a bee hotel to hang outside the school. Each week, check back with the students to see whether the hotel has been occupied!

### Outcomes and indicators

English EN3-1A

Mathematics MA3-2WM

#### Science

ST3-1VA, ST3-2VA, ST3-4WS, ST3-5WT, ST3-10LW, ST3-11LW



### Idea

Nestboxes are a great way to create new homes for wildlife on your school grounds. Your school can purchase affordable flatpack nestboxes for a range of different species (run a google search to find your nearest supplier) or you could get your students to design and construct their own. Contact your local Men's Shed, Environmental Education Centre (see links section), Landcare Group or local GER Facilitator to assist with construction and installation of the nestbox.

## Did you know?

Despite being a tiny 80mm in length, Feathertail Gliders are capable of gliding up to a massive 25 metres!

#### **Overview:**

In this lesson, students learn to connect with nature through the lens of the Aboriginal totem system. There is an emphasis on how Aboriginal people used totems as a way to protect local ecosystems and live in harmony with the environment. Through the activities students learn about some of the plants and animals that share their land and then have an opportunity to engage more deeply with their chosen totem through research, creative writing and art. The aim of this lesson is to provide students with a new perspective on their environment and to encourage them to think about what happens when people lose their connection to nature.

#### **Resources**:

- Internet
- Whiteboard

#### Links:

- Atlas of Living Australia: www.ala.org.au
- Aboriginal Totems booklet: http://library.envirostories.com.au/product-tag/tools-totems-tucker/

#### **Background information**

For centuries Aboriginal people in Australia used the totem system as a means of protecting local ecosystems and living in harmony (sustainably) with their environment.

When an Aboriginal child is born, he or she is given a totem (a local animal or plant) by their family which they are responsible for protecting for the rest of their lives. Aboriginal children grow up to know everything there is to know about that plant or animal, learning through ceremonies, song, Dreaming stories and by watching them.

Aboriginal nations have many different totems. In the past, mobs would make it a rule to have as many totems represented as possible in their group. It was their way of having as much knowledge as possible within a mob. Men were often asked to choose wives from other mobs to bring in different and new totems.

Aboriginal people never eat or kill their own totems. This is to ensure that no species is ever over eaten or becomes extinct.

A series of excellent booklets on Aboriginal culture including one on totems can be downloaded free from http://library.envirostories.com.au/product-tag/tools-totems-tucker/

## LESSON 4 (WEEK 5) Protecting Local Ecosystems - The Totem System

## Teaching and learning activities

Invite a local Aboriginal elder or land owner to speak to the class about the totem system. Explain how it has been used traditionally as a means to protect local ecosystems and live in harmony with the environment. Download the Aboriginal Totems booklet (see links section) and read it with the students.

#### Reflect

Help the students to reflect on their learning by participating in a class discussion around the question:

What happens when we lose our connection to our environment?

#### **Explore**

Divide the class into groups and ask them to research what animals and plants live in their area by using the Atlas of Living Australia (www.ala.org.au). (tip: In small schools there could just be two groups - one to research plants and the other to research animals)

Ask the students to compile lists of common plants and animals and write them up on the whiteboard.

#### Adopt

Invite each student to select or 'adopt' a totem from the list on the board. Remind the students that by selecting a totem they are pledging to learn as much as they can about that plant or animal and are responsible for caring for it (e.g. This could be by designing a project to help their totem; by teaching other children or their parents about their totem; or taking steps to minimise their impact on the environment and therefore their totem).

Write about your totem (Enrichment project)

For homework, ask students to research their chosen totem and write a short illustrated story about a day in the life of that plant or animal based on their findings. The story should include what role their totem plays in the environment (why the species is important) and what they are pledging to do to help their totem.

### Outcomes and indicators

#### **English:**

EN3-1A, EN3-2A, EN3-3A, EN3-4A, EN3-6B, EN3-7C. EN3-8D

**Mathematics** MA3-2WM

Science and Technology: ST3-2VA, ST3-1VA

**Geography:** GE3-2, GE3-4

**Creative Arts:** VAS3.1, VAS3.2, VAS3.4



## Idea

To increase cultural learning outcomes, ask the students to draw their totem in the regional style of the local Aboriginal people. Aboriginal people have different styles of painting (e.g. x-ray art, desert sand dot painting, cross-hatching) depending on the area they are from. Explore and learn about the regional style of painting in your local

area. Visually representing their totem will students and will increase their powers of

## Did you know?

Koalas have two thumbs on their front paws – to help them climb, to hold onto the tree and to grip their food.

#### **Overview:**

In this lesson students are introduced to the concept of connectivity and why a connected landscape is vital for species' movement.

#### **Resources**:

- Activity 3: How Does the Quoll Cross the Road?
- Activity 4: Close the Gaps
- Factsheet 4: Movement and Connectivity

#### Background

Before European settlement, animals could *migrate* (move) quite easily from one place to another in search of homes, partners and food because their habitat was well *connected*. Those same animals now have to scale fences, cross busy roads, traverse backyards with dogs and cats, and walk across open areas like lawns or paddocks with no tree cover exposing them to predators.

#### Why do species need to move?

Most animals need to eat a variety of foods to survive. These food sources are often found in different places and change from season to season. Animals therefore need to be able to *forage* (look for food) in different areas to get all the nutrients they need. Sometimes animals migrate for other reasons such as Bogong Moths which migrate over a massive 1,000km from as far away as Queensland to the Australian Alps every year to escape the summer heat. Animals also need to find other animals that are not related to them to breed with. This means that they need to travel to new areas to find a partner. In the case of large animals, such as Red Kangaroos, this can mean ranging over vast distances. Like us, some young animals in turn have to move away from their families and find their own space or new territories to live in - a territory is an area that an animal lives in and defends to secure enough food, water, shelter and breeding partners for itself or its family.

Even though we don't think of plants as species that move, they face the same problems. Different types of plants need different types of nutrients and soil to grow in, and different amounts of water to sustain them. Young plants need to be able to *disperse* (move) to new areas to grow and reproduce. Connectivity also enables species to cope better with climate change and other stresses such as habitat loss and inadequate food sources.

#### **Reconnecting habitat**

We can reconnect habitat to enable wildlife to move more easily through the landscape like they did in the past by protecting existing habitat, improving land management practices, controlling feral animals and weeds and planting native trees and shrubs. These conservation actions will be the focus of another lesson.

## LESSON 5 (WEEK 6) Movement and Connectivity

## Teaching and learning activities

Provide students with an overview of why animals need to move and what things restrict their movements (e.g. roads, fences, buildings, open fields, domestic animals).

**Role Play Game** 

Role play the difficulties animals face moving across a landscape.

Appoint Group A students as different animals: e.g. Koala, Fairy Wren, Echidna, Blue Tongue Lizard, Booroolong Frog. Appoint Group B students as barriers to movement: e.g. A barbed wire fence, cars on a busy road, buildings, a back yard with an aggressive dog, a feral cat.

The objective of the game is for Group A students to move from one side of the classroom or playground to the other by staying in character e.g. Wrens can only fly small distances, frogs can only hop, echidnas can walk but not climb, etc.

Explore some of the concepts:

What if this was a four lane freeway instead of a small road?

What if this fence was joined up with the neighbours fences so it became really long? How would you get across the area now?

What if this backyard had a fierce dog in it?

#### Connectivity at the species level

Take connectivity down to the species level by asking students to complete Activity 3: How does the Quoll Cross the Road? at the back of this booklet.

#### Closing the gap

How do we improve connectivity for gliders?

Provide students with a better understanding of the complexity of restoring connectivity by asking them to work through Activity 4: Close the Gaps. The exercise involves students calculating the distance and spacing needed between plantings to ensure that gliders can move between two patches of bushland.

Have a class discussion about what could be done in the short term whilst the new trees are growing to help the gliders move between the patches.

## Outcomes and indicators

English EN3-1A

**Mathematics** MA3-5NA, MA3-6NA, MA3-9MG

Science ST3-1VA, ST3-2NA, ST3-3VA, ST3-4WS, ST3-11LW

Geography GE3-2, GE3-3



#### Idea

concepts of movement and connectivity, why not divide the students into groups and ask them to invent a board game (or computer game) that incorporates them. For example they could design a board game based on Snakes & Ladders with animals as players,

## Did you know?

Red foxes were shipped over from England in 1871 for recreational hunting. Since then they have spread across most of Australia.

#### **Overview:**

In this lesson students learn about the threats to native species from feral animals and weeds through a series of research and practical activities supplemented with group discussions.

#### **Resources**:

- Internet
- A3 sheet of paper
- Activity 5: Feral Animal Match
- Factsheet 5: Feral Animals and Weeds

#### Links:

• www.feralscan.org.au/mynascan/default.aspx

#### **Background information**

Invasive species are one of the biggest threats to biodiversity in Australia (the other being habitat loss and fragmentation). Introduced predators including foxes, wild dogs and cats impact heavily on native animals by preying on small native mammals, birds, frogs, reptiles and insects. Feral herbivores such as rabbits, goats, wild pigs and deer compete with native animals for food and shelter and in some places overgraze an area which degrades native vegetation and soils. Pest species also compete with native species for resources like nesting sites, food and shelter, and can spread disease.

Introduced plants cause their own set of problems. In Australia, 15% of our plants have been introduced from other countries. Weeds sometimes grow much more rapidly than our native plants and displace, out-compete and smother them. In turn, this affects the food, shelter and other resources available for native animals. Weeds can also have an impact on the health of our ecosystems by causing changes in water flow, run-off, nutrient cycles and fire regimes. Major weeds in NSW include Lantana and Bitou Bush. We help to spread weeds by transporting them accidentally to new areas in the tyres of our cars or tread of our boots and by planting them in our gardens, by increasing the nutrient levels of our soils with fertilisers creating good habitat for weeds and through inappropriate grazing and fire management.

#### Combating feral animals and weeds

A range of methods are used to control feral animals in Australia including baiting, aerial culling, trapping and biological control. A wide variety of weed control methods are used to manage and remove invasive plant species depending on the type of vegetation and how advanced the infestation is including ecological burning, digging, cutting and spraying.

## LESSON 6 (WEEK 7) Threats: Feral Animals and Weeds

## Teaching and learning activities

Provide students with an overview of feral animals and weeds and their impact on native species and ecosystems. Hand out the factsheet.

#### Research

Ask students to find out what pest animals have been recorded in their area using FeralScan (www.feralscan.org.au/mynascan/default.aspx).

#### Have a group discussion:

Have you seen a pest animal in your neighbourhood? What problems do they cause?



#### Match the feral animal to the problem

Ask students to complete Activity 5: Feral Animal Match.

#### Stopping the Spread

Ask students to choose a feral animal or weed and put together a powerpoint presentation on that species which includes:

- A brief description of the plant or animal
- Where it originally came from
- Why it introduced to Australia
- Where it lives or grows
- Why it is a threat
- What it is about the animal or plant that makes it successful
- How the species is controlled or managed

As part of the activity ask students to design an A3 poster for their neighbours or an audience of their choice with tips on how they can help prevent the spread of weeds or feral animals.

Discuss the posters as a class:

Who is the audience? What are you going to do with the poster? Where will it go? What is it saying? Will it get through to them? What will you do/use to promote it?

### Outcomes and indicators

English EN3-1A, EN3-2A, EN3-3A, EN3-4A, EN3-6B

Science ST3-1VA, ST3-2VA, ST3-10LW

Geography GE3-3

Creative Arts VAS3.2, VAS3.3



## Idea

For a lesson with a difference speak to your Local Land Services team about visiting your school to teach students about some of the common feral animals, how they are impacting on native wildlife in your area and what they are doing to control them.

## Did you know?

Rainbow Bee-eaters are immune to the stings of bees but just to be sure they knock the insects stinger against their perch to remove it, closing their eyes to avoid being squirted with poison.

#### **Overview:**

Students learn about the causes and effects of habitat fragmentation and habitat loss on native species.

#### **Resources**:

- Internet
- Hula hoops in different colours or butchers paper and colour markers
- Fact Sheet 6: Habitat Loss and Fragmentation

#### Links:

• https://www.google.com/earth/explore/showcase/historical.html (You will need to download Google Earth)

#### **Background information**

Habitat loss is the primary cause of biodiversity loss and extinction of native species in Australia and most parts of the world. Humans are the major cause of this habitat loss - either directly through clearing of land for development, mining and industry, or through indirect activities such as pollution and climate change. Habitat can also be lost through environmental factors like fire or drought but often not at the same scale or rate, allowing the land to recover over time through natural processes.

Habitat fragmentation is a related process that is often associated with habitat loss. It occurs when remaining vegetation is broken up into small, isolated patches by clearing or construction of barriers such as roads or buildings. This can result in populations of a species becoming isolated in small fragments of habitat, where they are more susceptible to inbreeding and the impacts of natural disasters. Fragmented habitat is also more susceptible to degradation by influences from the surrounding areas, including invasion by weeds and feral animals and the impacts of uncontrolled grazing. This can lead to the loss of species from an area and interruption of important ecosystem functions, such as pollination and food webs.

Within NSW alone, there are approximately 360 threatened species and 25 threatened ecological communities for which habitat loss, or fragmentation, is a known threat. In NSW it is estimated that 2,000 individual birds alone are lost for every 100 ha of woodland cleared.

#### **Reversing habitat loss and fragmentation**

By reconnecting the landscape by protecting remnant vegetation, revegetating areas and encouraging natural regeneration of habitat we can help to reverse some of the damage caused by habitat loss and fragmentation.

## LESSON 7 (WEEK 8) Threats: Habitat Loss and Fragmentation

## Teaching and learning activities

Provide students with an overview of habitat loss and fragmentation and how it impacts plants and animals.

#### **Musical remnants**

Lay some colourful hoops out in different spots around the classroom e.g. one in an open space, one near the window etc. Tell the students that each colour represents a different habitat type and explain what these are. Alternatively you could use butchers paper and ask the students to draw a different habitat type on each sheet.

Assign each student a role as a different type of animal ensuring that there is at least one student representing each major category (mammals, birds, fish, reptiles, amphibians and invertebrates).

Discuss the different habitat needs of the animals and ask the students to head to the hoop that will make the most suitable home for them. Let them know that it is okay for them to live in the same hoop.

Explain that the game you are about to play is similar to musical chairs. Each time the music stops you will remove one hoop and the animals that live there will have to find a new hoop home to move to. Encourage them to discuss what is happening as you go.

Is there enough habitat for all of you?

*Is there another type of habitat that you can move to? Why not?* 

What do you think will happen to the animals with no habitat left?

When you are finished, play a second round. This time assign a small number of students as predators.

What happens as the habitat shrinks and predators and prey are confined to the same small area?

#### Investigating change

As a group, investigate the changes that have taken place in your local landscape over the past twenty years by comparing Google Earth (Historical Imagery) satellite images from different time periods. Have a group discussion about the changes.

What has changed? What have we lost? How do you think the plants and animals living in our landscape have been affected?

### Outcomes and indicators

Science ST3-1VA, ST3-2VA, ST3-4WS

Geography GE3-1, GE3-2



### Idea

To make the lesson come to life, invite a longterm resident to visit the school and talk about the changes they have seen taking place to their local environment over the decades.

## Did you know?

All species of gliding possum need tree hollows to survive. Without a hollow to nest in they have no-where to raise their young or to shelter from predators.

#### **Overview:**

In this lesson students learn about wildlife corridors, why they are important and how they are created.

Sugar Glider

#### **Resources**:

- Images from Activity 5: Create a Wildlife Corridor
- Factsheet 7: Wildlife Corridors
- Satellite map of school grounds and surrounding neighbourhoods from https://maps.six.nsw.gov.au
- Blue-tack, Labels, Whiteboard

#### Links:

- Great Eastern Ranges Initiative video www.youtube.com/watch?v=eVEOnN-5asg
- Great Eastern Ranges website www.greateasternranges.org.au

#### **Background information**

Wildlife corridors are areas of habitat that connect different patches of vegetation. These nature highways are one way in which we can reconnect areas that have become fragmented or where habitat has been lost to enable species to move more easily between areas in search of food, partners and habitat. By linking areas we also increase the amount of habitat available allowing populations to increase. Wildlife corridors range in size from very small corridors that link two patches of forest, like we created in Activity 4, to large corridors that span thousands of kilometres like the Great Eastern Ranges Initiative (see case study at front of book).

#### Wildlife corridors are created by:

- Planting trees or shrubs to link different habitat patches.
- Retaining or planting strips of vegetation along roadsides and fences to connect habitat patches.
- Planting native grass in paddocks to create new habitat
- Planting paddock trees to create 'Stepping stones' to link different habitat patches.
- Sensitively designing urban parks and gardens to conserve and maintain habitat for native species.
- Protecting large patches of native vegetation to provide core habitat on private properties.
- Creating biodiverse, wildlife friendly gardens.
- Controlling feral animals and weeds.
- Linking national parks and protected areas with surrounding habitat patches.
- Managing fire and grazing regimes.
- Installing nestboxes to provide supplementary habitat for tree hollow dwelling animals.
- Establishing wildlife crossing structures across major roads, such as glider poles.

## LESSON 8 (WEEK 9) Creating Wildlife Corridors

## Teaching and learning activities

Ask the students to recall the lesson on Movement and Connectivity. Provide students with an overview of wildlife corridors, why they are important and how they are created. Hand out the factsheet.

#### Provide an example

As a class, watch the five minute video on the Great Eastern Ranges Initiative (GER).

Discuss the video: Why is GER important? What species is it helping? What is GER doing to reconnect the land? Who are they working with? How might we be benefiting?

#### Connect your neighbourhood

Print out a large satellite map from the Six Maps website (https://maps.six.nsw.gov.au) showing the school grounds and surrounding neighbourhoods. Ask the students to cut out the different wildlife corridor elements from Activity 5.

As a class, label the core habitat areas (i.e. areas with good vegetation cover, national parks, forests etc.), and potential barriers to movement. (E.g. roads, lawns, buildings, swimming pools and fences).

Tell the students that you have been tasked to help GER build a wildlife corridor to help reconnect your landscape. Together with the students, select a part or parts of the map where you think habitat should be reconnected, then get the students to stick the images onto the map to build a wildlife corridor.

## Outcomes and indicators

English EN3-1A

#### Science

ST3-1VA, ST3-2VA, ST3-3VA, ST3-4WS, ST3-5WT, ST3-10LW, ST3-11LW,

Geography GE3-2, GE3-3

### Idea

Organise with your local Landcare Group or Friends Group to run a tree-planting and wattle information day with your students to engage them directly in helping their local environment and to explain the importance of wattles in the environment. Landcare will assist with sourcing of the seeds and planting.

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## Did you know?

Barbed wire poses a nasty threat to gliders who get caught on the barbs as they glide between trees. This can lead to injury and often death.

#### **Overview:**

In this lesson, students learn about Squirrel Gliders and other gliding possums, the threats they face and how they can help to protect them through a series of practical and research tasks.

Squirrel Glider

#### **Resources**:

- Internet
- Whiteboard
- Fact sheet 8: The Squirrel Glider
- Activity sheet 7: Are there Gliders in our Area?
- Activity sheet 8: Make Your Own Glider

#### Links

- Glideways website: www.glideways.org.au/about-gliders/
- Squirrel Glider Education Kit: www.bit.ly/1Ubi3jq
- Atlas of Living Australia website: www.ala.org.au

#### **Background information**

Gliders are a type of possum called a *gliding possum*. What makes them different from other members of their family is that they have a gliding membrane on each side of their body that extends from wrist to angle. These 'wings' enable the possum to glide between trees in search of food, shelter and breeding partners. There are six species of gliding possum found in Australia: the Squirrel Glider, Greater Glider, Feathertail Glider, Sugar Glider, Yellow-bellied Glider and Mahogany Glider.

All of these species are dependant on old hollow-bearing trees which they nest in, many using several different dens within their home range. Sadly, habitat loss and fragmentation, and feral predators such as cats, foxes and dogs have led to the decline of glider populations in many parts of Australia.

#### **Squirrel Gliders**

Squirrel Gliders get their name from their dense, fluffy tails which resemble that of a squirrel. This threatened species, which is listed as vulnerable in NSW, occurs primarily in woodland and open eucalypt forest along Australia's east coast. Like other gliders, Squirrel Gliders live in the hollows of old trees where they create small, round nests out of leaves. Often living in small groups, their diet consists of nectar, pollen, tree sap, honeydew (a sugary coating on leaves made by scale insects) and invertebrates. Squirrel gliders have a home range of 3-5 hectares and move between 1-9 different den sites.

## LESSON 9 (WEEK 10) The Squirrel Glider

## Teaching and learning activities

Ask the students to recall the lesson on totems. Tell them that you have selected a squirrel glider as your class totem because what you do to protect them also helps to protect a range of other species including some of their totems.

#### Learn

Provide students with an overview of gliding possums focusing on the squirrel glider and provide them with the fact sheet. Have a group discussion around it.

What is the conservation status of the squirrel glider and where are they found?

What do squirrel gliders need in their habitat? What other animals do you think share the same habitat as gliders?

#### Make your own glider

This activity involves each student creating their own glider models out of paper mache which must match the actual weights and dimensions of the glider. *See Activity sheet 8: Make Your Own Glider* 

#### Research

Ask the students to investigate whether any gliding possums have been seen in their area using the Atlas of living Australia's website and to record their findings using Activity Sheet 7.



#### Brainstorm

Have a brainstorm around ways in which your class can help gliders in your neighbourhood:

Are there suitable trees for gliders? What's missing?

Could we install a nestbox or plant trees to replace lost habitat?

What else do we need to provide, or do, to allow gliders to survive in our neighbourhood?

Work together to think of ideas on how to make your school grounds more inviting for gliders. These will be used in the next lesson.

### Bolk the stur

Ask the students to create a A3 map (diagram) of their property showing where a glider might live and things they could add to their garden or house to make it more appealing to gliders (e.g. install a nestbox, walk the dog on a lead, put a bell on the cat, plant some feed trees, replace barbed wire).

## Curriculum links

English EN3-6B, EN3-7C

#### Science

ST3-1VA ST3-2VA ST3-3VA, ST3-10LW, ST3-11LW

Geography GE3-2, GE3-3

Creative Arts VAS 3.1, VAS3.2



#### **Overview:**

This lesson aims to cement the concepts learned during the last nine lessons by getting students to develop a project to help their local wildlife, either in the school or in their own backyards.

Students will:

- Make the case for helping local wildlife and for developing a project (why it's necessary/important),
- Define the scope of action possible for their project or school (what's feasible and practical).
- Develop an action plan for their project,
- Implement their project (putting the plan into action), and
- Reflect and evaluate the success of their project and learning.

#### Resources

• See the teachers notes at the back of this booklet to guide your project based learning process.

#### Links

- NSW Environmental Trust grants: http://www.environment.nsw.gov.au/sustainableschools/manage/ fundingopps.htm
- Australian Government Environment Grants: http://www.australia.gov.au/information-and-services/ environment/environment-grants
- Gould League: http://www.gould.org.au (search for Environment Grants)
- Teachers Mutual Bank: https://www.tmbank.com.au/ (search for Teachers Environment Fund)

## Teaching and learning activities

Tell your students that your school is a partner of the Great Eastern Ranges Initiative and that you have been asked to develop a project (select an option from the list below) that will contribute to GER and help make a difference for your local wildlife.

Explain the steps that are involved in developing a project: 1. Making the case; 2. Defining the scope of action; 3. Developing an action plan; 4. Implementing the project and 5. Reflecting.

#### Option 1: Make your school glider friendly

Ask the students to recall the ideas they had about how to make their school grounds more inviting for gliders. Work together to create a map of the school showing all of the buildings, including the fences, swimming pool and sports fields, and any big trees and/or other natural features that gliders might use.

Divide the class into small groups and ask the students to develop a project to help gliders or attract gliders to the school grounds. The students can use the map to work out which part of the school grounds to focus on. Tell them that the class will then vote on the project idea that they like best (that is also achievable), and that the class will then work together to implement that project.

## Option 2: Make a wildlife corridor for woodland birds

Ask the students to recall the lesson on wildlife corridors. Tell them that you are going to work as a class to make a real wildlife corridor on your school grounds to help woodland birds.

Work with the students to plan out where the corridor should be (create a map of the school) and to decide what you will use to make the corridor e.g. plant some trees or shrubs, provide new water sources. Then work with the students to implement the project.

## Option 3: Increase the biodiversity of your school grounds

Ask the students to recall the lesson on biodiversity. Tell them that you have been asked to develop a class project that helps increase the biodiversity of your school grounds e.g. making a bush garden (See Lesson 1 Tip). Divide the class into small groups to research various options and plan, and then agree on one of these projects to work on as a class.

### Outcomes and indicators

#### English

EN3-1A, EN3-2A, EN3-3A, EN3-4A, EN3-6B, EN3-7C, EN3-9E

#### Science

ST3-1VA, ST3-2VA, ST3-3VA, ST3-3VA, ST3-4WS, ST3-5WT, ST3-10LW, ST3-11LW

#### Geography

GE3.2, GE3.3

### Idea

For help with implementing your project, get in touch with your Local Landcare group (www.landcareonline.com.au) or local GER Facilitator (www.ger.org.au) to see if they are able to assist with advice, support or even some funding. Also keep an eye out for potential grants from other sources such as the NSW Environmental Trust (Eco Schools), Australian Government (Environment Grants) Gould League and Teachers Mutual Bank (Environment Fund). See Links section.

## FACTSHEET Biodiversity and Healthy Ecosystems

*Biodiversity* is the variety of all life on earth including plants, animals and fungi. An ecosystem is a large community of all living things in a particular area. Healthy biodiversity is essential for a healthy ecosystem. Ecosystems can be any size from a small puddle to an Amazonian rainforest. Your school yard is in fact an ecosystem and all the different plants and animals that live in it form part of your school's biodiversity!

## Why is biodiversity important?

Biodiversity is vital for supporting all life on Earth. It provides all of our food and many of our medicines and industrial products. Biodiversity is the foundation of healthy ecosystems upon which all life depends, including us. Biodiversity helps:

- To create fertile soil
- To protect us against floods and erosion
- To provide clean air and water
- To break down pollutants
- To control pests and disease
- Is a vital part of the nutrient, nitrogen, oxygen and carbon cycle
- To produce energy

Biodiversity also provides opportunities for recreation, tourism, scientific research and education, and is a source of cultural identity for many Australians.



## Did you know?

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 are found nowhere else on Earth.

## What does native mean?

A *native* plant or animal is generally defined as one that is found naturally in an area or country. Most native plants and animals in Australia have evolved over many thousands or million of years such as the Platypus and Echidna. Dingos are unusual as though they are not technically native because they were bought to Australia by the Aboriginal people, they have been in our country for so long (4,000 years) that we now consider them one of our native animals.

![](_page_29_Picture_17.jpeg)

## PACTSHEET Food Webs and Food Chains

All living things, including you, need energy to survive which we get from food. Most plants make their own food from the sun - a process called *photosynthesis*. Animals however cannot produce their own food so have to eat other animals or plants to produce the energy they need to live. A *food chain* is a drawing that shows who-eats-what in the environment.

## What is a food web?

Most animals are part of more than one food chain. When connected together these food chains form a food web.

## Parts of a food chain

A food chain always starts with a *producer* which is an organism that produces its own food. This is usually a green plant which uses the energy from the sun to make food. Animals are called *consumers* because they have to consume food to survive. There are three groups of consumers:

- *Herbivores* animals that eat only plants (primary producers)
- *Carnivores* animals that eat only other animals (carnivores that eat herbivores are called *secondary consumers*; carnivores that eat other carnivores are called *tertiary consumers*)
- Omnivores animals that eat plants and animals

The final part of the food chain is the *decomposers* (bacteria and fungi) which feed on decaying matter.

![](_page_30_Figure_10.jpeg)

Example of a simple food web

## How does a food chain break?

When one of the links (species) in a food chain is no longer present (for example a species goes extinct or a feral animal takes over), the food chain breaks. Sometimes, this can cause other animals in the food chain to disappear as well and the whole ecosystem can become imbalanced or even collapse. For example, the number of dingos in Australia has been dramatically reduced due to hunting. As dingos are an apex predator (they sit right at the top of a food chain) their disappearance from certain areas has contributed to an unsustainable increase in kangaroo numbers which in some areas has resulted in grasslands being overgrazed.

![](_page_31_Picture_0.jpeg)

Habitat is the natural home or environment of an animal, plant or other organism. Animals need five things to survive in a habitat: food, water, shelter, air and a place to raise their young.

Different types of plants and animals have different habitat needs, just as we do.

Different species have

different habitat needs

Some require only tiny habitats like starfish, whilst others need huge territories to roam across like tigers. Some need rocky tidal pools to live in like blue-ring octopus, others can only live in tropical rainforests such as spider monkeys, whilst some like dry desserts like camels.

Every species is specially adapted to live in certain habitat types.

## Habitat loss

If an animal's habitat becomes unsuitable it will try and move to a different area in search of a new home. Historically, this was due to extreme weather events such as fires or floods, but today we are the major reason why animals are forced to leave their homes. We clear habitat to build houses and buildings; we construct fences and roads which prevent animals from moving easily from one habitat patch to another, and we litter and pollute the air and water making it unsuitable as habitat.

![](_page_31_Picture_8.jpeg)

## Tree hollows

Tree hollows serve as vital habitat for many native animals. They provide nesting sites for native bees, gliders and birds, homes for invertebrates, places in which animals can shelter from bad weather and damp areas for young plants to grow in. Hollows take hundreds of years to form so only very old trees contain them. Sadly, these ancient trees are disappearing in many parts of Australia due to land clearing for development and farms, and logging. Nest boxes are used to try and replace lost tree hollows but it is far more beneficial to never remove the trees in the first place!

![](_page_32_Picture_0.jpeg)

In the past, animals could migrate (move) quite easily from one place to another in search of homes, partners and food because their habitat was well connected. Those same animals now have to scale fences, cross busy roads, traverse backyards with dogs and cats, and walk across open areas like lawns which exposes them to predators.

## Why do species need to move?

Most animals need to eat a variety of foods to survive. These food sources are often found in different places and change from season to season. Animals therefore need to be able to forage (look for food) in different areas to get all the nutrients they need. Animals also need to find other animals that are not related to them to breed with. This means that they need to travel to new areas to find a partner. In the case of large animals, such as Red Kangaroos, this can mean ranging over vast distances. Like us, some young animals in turn have to move away from their families and find new territories to live in.

Even though we don't think of plants as species that move, they face the same problems. Different types of plants need different types of nutrients and soil to grow in, and different amounts of water to sustain them. Young plants need to be able to disperse (move) to new areas to grow and reproduce. Connectivity also enables species to cope better with climate change and other stresses such as habitat loss and inadequate food sources.

![](_page_32_Picture_5.jpeg)

## How can we reconnect habitat?

We can reconnect habitat to enable wildlife to move more easily through the landscape like they did in the past by:

- Protecting habitat in national parks
- Encouraging landholders to conserve native vegetation on their properties.
- Controlling feral animals and weeds.
- Planting native trees and shrubs.
- Removing barbed wire fencing.

## Did you know?

Sometimes animals migrate for reasons other than food and to breed such as Bogong Moths which migrate over a massive 1,000km from as far away as Queensland to the Australian Alps every year to escape the summer heat.

![](_page_32_Picture_15.jpeg)

## 5 FACTSHEET Feral Animals and Weeds

Invasive species, such as feral animals and weeds, are one of the most major threats to biodiversity in Australia along with habitat loss and fragmentation. There are many different types of *invasive* species in Australia. In fact 15% of all of our plants come from other countries! Luckily not all of these plants are invasive i.e. become weeds.

![](_page_33_Picture_2.jpeg)

## What is an invasive species?

An invasive species is a plant or animal that has been introduced from another country and has negative effects on the environment, economy or our health. In Australia we call invasive animals, feral animals and invasive plants, weeds. Not all introduced species are invasive.

## Why are invasive species a problem?

Introduced predators prey on native species such as small mammals, birds, frogs, reptiles and insects. Feral herbivores compete with native animals for food and shelter and sometimes overgraze an area which leads to soil erosion and degrades native vegetation. Invasive species also compete with native species for nesting sites, food and shelter, and can spread disease.

Introduced plants cause their own set of problems. Weeds grow much more rapidly than our native plants and displace, out-compete and smother them. In turn, this affects the food, shelter and other resources available for native animals. Weeds can also have an impact on the health of our ecosystems by causing changes in water flow, run-off, nutrient cycles and fire regimes. We help to spread weeds by transporting them accidentally in the tyres of our cars or tread of our boots, by increasing the nutrient levels of our soils with fertiliser providing good habitat for weeds and through inappropriate grazing and fire management.

## Controlling feral animals and weeds

A range of methods are used to control feral animals in Australia including baiting, aerial culls and trapping. Weeds are controlled and managed by digging, cutting and spraying.

## 6 FACTSHEET Habitat Loss and Fragmentation

Habitat loss is the primary cause of biodiversity loss and extinction of native species in Australia and most parts of the world. Habitat fragmentation is a related process that is often associated with habitat loss. It occurs when remaining vegetation is broken up into small, isolated patches through clearing of land or the construction of barriers such as roads, fences or buildings.

## What causes habitat loss?

Sadly, we are the major cause of habitat loss. Since the 19th century we have been clearing land at a rapid rate to develop new houses and infrastructure, build mines, create new farmland and obtain wood. Habitat can also be lost through environmental factors like fire or drought, but human driven habitat loss has had a far more devastating impact on our wildlife and plants.

![](_page_34_Picture_4.jpeg)

## What's so bad about habitat fragmentation?

Habitat fragmentation results in populations of a species becoming isolated in small pockets of land, where they are more susceptible to inbreeding and the impacts of natural disasters like droughts and floods. Habitat that has been fragmented is also more susceptible to invasion by weeds and feral animals and the impacts of uncontrolled grazing. This can lead to the loss of species from some areas and the interruption of important ecosystem functions, such as pollination and food webs.

# How can we reverse these threats?

We can reverse some of the damage caused by habitat loss and fragmentation by planting new trees and shrubs. This also serves to reconnect patches of habitat, providing more homes for wildlife and allowing populations to move and expand into new areas.

## Did you know?

Within NSW alone, there are approximately 360 threatened species and 25 threatened ecological communities under threat from habitat loss and fragmentation. One of these is the koala.

![](_page_34_Picture_11.jpeg)

![](_page_35_Picture_0.jpeg)

Wildlife corridors are areas of habitat that we can create to connect up different patches of vegetation.

## Why do we need them?

Wildlife corridors are one way in which we can reconnect areas that have become fragmented, or where habitat has been lost, to enable species to move more easily between areas in search of food, partners and habitat.

## How big are they?

Wildlife corridors range in size from very small corridors that just link two patches of forest like we created in Activity 4, to large corridors that span thousands of kilometres like the Great Eastern Ranges Initiative (GER). GER is working to connect over 3,600km from the Grampians in Victoria, all the way to Far North Queensland!

## Elements of a wildife corridor

![](_page_35_Figure_7.jpeg)

Illustration from the National Wildlife Corridors Plan (Australian Government, 2012). Modified with permission.

![](_page_36_Picture_0.jpeg)

![](_page_36_Picture_1.jpeg)

Squirrel Gliders (*Petaurus norfolcensis*) are one of six species of gliding possum found in Australia. What makes them different from other types of possum is that they have a gliding membrane on each side of their body that extends from wrist to angle. These 'wings' enable them to glide between trees in search of food, shelter and breeding partners. In NSW, Squirrel Gliders are listed as a *Vulnerable* species which means that we need to reduce the threats to their survival to stop them from becoming extinct.

## Habitat and diet

Squirrel Gliders occur mainly in woodland and open eucalypt forest, where they create small, bowl-shaped nests out of leaves in the hollows of old trees. Here, they often live in small groups and move between 1-9 different den sites.

Squirrel Gliders are nocturnal so they feed at night. Their diet varies seasonally and consists of nectar, pollen, eucalypt and wattle sap, seeds, honeydew (a sugary coating on leaves made by scale insects) and insects.

## What do they look like?

Squirrel Gliders get their name from their dense, fluffy tails which resembles that of a squirrel and is longer than their body! They have soft grey fur on top with a dark stripe that runs half-way down their body and a white belly. They weigh only a tiny 190-300grams but have been known to glide for up to 90 meters!

## Did you know?

Squirrel Gliders communicate with others using a raspy call interspersed with gurgling chatter. If alarmed, they let out a loud yip! Have a listen to what they sound like at www.bit.ly/1PUSAFO

## Threats

- Loss and fragmentation of habitat
- Loss of hollow-bearing trees due to logging and development
- Predation by cats and foxes
- Barb wire fencing
- Loss of flowering shrubs and trees in forests and woodlands

# ACTIVITY 1: What Lives on our School Grounds?

You are a detective tasked with looking for animals or finding evidence of animals (bug trails, spider webs or scratch marks on a tree) on your school grounds. Head outside with your class. Keep your eyes peeled - what can you see? Listen carefully - what can you hear? Draw or write about the plants and animals you see or hear.

![](_page_38_Picture_0.jpeg)

![](_page_38_Picture_1.jpeg)

## Complete the Gum Tree Food Web

Label each species with its name and whether it is a decomposer, producer or consumer and what type. A single eucalypt food chain is shown below to get you started. Remember that the directions of the arrows indicates who-eats-what so be careful not to point them in the wrong direction!

![](_page_38_Picture_4.jpeg)

ACTIVITY How does the Quoll cross the Road?

## Spotted-Tailed Quoll (Dasyurus maculatus)

## Instructions

#### Step 1

Read the information about where and how the quoll lives.

#### Step 2

Read the challenge section and use the map on the opposite page to answer the questions. Use a ruler to measure the distances between points on the map.

## Information

You like big patches of bushland with plenty of small birds and mammals as prey. You are quite wary of new things and like to stick to areas with plenty of cover. Dogs hate you and will bark loudly any time they see you. You prefer to run through the canopy, but can cross a road if you have to, only you aren't too good at checking for traffic.

For the purpose of this exercise assume you:

- have a one in ten chance (10%) of being run over by a car when you cross a road (you would be dead after crossing 10 roads);
- have a one in five chance (20%) of being caught by a dog if you cross an open area (you would be dead after crossing five open areas). Built-up and open areas are white on the map; and
- can only travel 2 km per night (you are very busy looking for food).

## Your challenge

1. You live in the eastern section of Abercrombie River National Park (Point A). Your brother and sister also live in the reserve and you need to find a partners from another reserve. The closest quoll who is not a member of your family lives in the western section of Abercrombie River National Park (Point B). How long would it take you to get there?

2. Would you be able to get to Nuggetty State Conservation Area (Point C)? How long would it take?

3. Would you be able to get to Razorback Nature Reserve (Point D)? How long would it take?

![](_page_40_Picture_0.jpeg)

![](_page_40_Picture_1.jpeg)

## Spotted-Tailed Quoll (Dasyurus maculatus)

#### Legend

![](_page_40_Figure_4.jpeg)

- Spotted-tailed Quoll Main Road Minor Road
- Creeks

![](_page_40_Figure_7.jpeg)

Conservation Reserve State Forest Native forest & Woodland

Disclaimer: This map has been compiled from various sources and the publisher and/or contributors accept no responsibility for any injury, loss or damage arising from the use, errors and/or omissions therein.

![](_page_41_Picture_0.jpeg)

![](_page_41_Picture_1.jpeg)

## The Facts

- Gliding possums do not like travelling on the ground and move through the landscape by gliding from tree to tree.
- Gliders lose 1m of height for every 1.8m travelled during a glide.
- Box/gum woodland trees reach a height of between 20m and 30m.
- Planted box and gum trees grow at a rate of about 1m per year.
- Gliders roost and nest in tree hollows that take between 100 and 250 years to form in a tree.

Type of glider	Food	Glide Distance (m)
Feather-tailed Glider	Insects, sap, nectar	30m
Sugar Glider	Insects, sap, nectar, manna	50m
Squirrel Glider	Insects, sap, nectar	50m
Greater Glider	Leaves	100m
Yellow-bellied Glider	Sap	100m (max 140m)

## Exercise

There are two patches of bushland 200 metres apart in a paddock. This distance is too far for gliders to cross. To enable them to move from one patch of bushland to another we need to plant some additional trees to fill in the gaps. Using the information from the fact facts and the glide distances in the table above, calculate how far apart we will need to place the plantings to ensure that all five species of glider can move across the paddock.

![](_page_41_Figure_11.jpeg)

200m

## Answer:

ACTIVITY 5 Feral Animal Match

![](_page_42_Picture_1.jpeg)

## **Exercise**

Research the preferred diets for all of the species featured in the images below as well as the Bilby. Then read the questions and match each to the correct animal on the right. Write your answer in the space below each question.

The young chicks of a Rainbow Lorikeet have suddenly disappeared. What ate them?

![](_page_42_Picture_6.jpeg)

Feral Pig

![](_page_42_Picture_8.jpeg)

European Rabbit

![](_page_42_Picture_10.jpeg)

Feral Goat

![](_page_42_Picture_12.jpeg)

Feral Cat

![](_page_42_Picture_14.jpeg)

Red Fox

Something has damaged the crops in your parents vegetable patch. Who was it?

A local farmer has lost some of

their lambs. Who did it?

Something has eaten all of the Bilby's food. Which animal was responsible?

![](_page_42_Picture_21.jpeg)

Something has destroyed the farmers pasture with its hard hooves. Who?

![](_page_43_Picture_0.jpeg)

![](_page_43_Picture_1.jpeg)

## Instructions

Using a pair of scissors, cut around each of the images below then stick them on the satellite image on the whiteboard using Blu Tack to build a wildlife corridor. Make multiple copies of the images if you need to.

![](_page_43_Figure_4.jpeg)

Revegetated area

![](_page_44_Picture_0.jpeg)

Paddock tree

Nestbox

![](_page_44_Figure_4.jpeg)

ACTIVITY Are there Gliders in our Area?

![](_page_45_Picture_1.jpeg)

## Instructions

We want to know if any Squirrel Gliders have been seen in our area. To do this we are going to use a website called the Atlas of Living Australia which is a database (collection of information) of occurrence records (where animals and plants have been seen) of a large number of Australian species. If you don't find any records it doesn't necessarily mean that you don't have gliding possums in your area especially if the habitat is suitable. It could just mean that noone has recorded a sighting on the Atlas.

- 1. Open the Atlas of Living Australia website www.ala.org.au.
- 2. Click on the button which says 'Browse locations' under 'Species by location'.
- 3. On the next page, click on the button which reads 'Browse by location' under Explore by address or location.
- 4. Enter your location e.g. Crookwell or Wollongong.
- 5. Under All Species, click 'Mammals' in the list under 'Group'.
- 6. Scroll down and look for *Petaurus norfolcensis* (Squirrel Glider).
- 7. If you find some records, click on the record and then on 'list of records'.
- 8. Have a look at where the gliders were seen are they in a national park? Are they in an urban area?.
- 9. Have a look through the list to see if there are any other types of glider or possum found in your area using the same process. Highlight the names of the ones you find below.

## Which of these species do you get in your area?

#### Gliding possums

![](_page_45_Picture_15.jpeg)

Squirrel Glider

![](_page_45_Picture_18.jpeg)

Sugar Glider

![](_page_45_Picture_20.jpeg)

Feathertail Glider

![](_page_45_Picture_22.jpeg)

Yellow-bellied Glider

![](_page_45_Picture_24.jpeg)

Greater Glider

#### Some common relatives

![](_page_45_Picture_27.jpeg)

**Ringtail Possum** 

![](_page_45_Picture_29.jpeg)

**Brushtail Possum** 

![](_page_45_Picture_31.jpeg)

ACTIVITY <u>Make yo</u>ur own Glider

![](_page_46_Picture_1.jpeg)

## What you need

Paper

8

- Scissors
- Glue
- Scale
- Paints

## Exercise

Choose one of the five species of glider from the table below. Using paper mache, create a replica (model) of that glider - the glider you make should have exactly the same dimensions (head/body length and tail length) and weight as that of the real glider. You will need to work out the glider's width from the figures on the diagram below. Once the model has dried, try and paint it in the same colours as the glider you chose so that your model glider resembles the real one as closely as possible. Use the scale to weigh your glider as you go. Tip: To decrease the weight, remove some layers of paper mache or use a balloon as a base. To increase the weight add more layers of paper mache.

Type of glider	Weight (g)	Head/Body Length (mm)	Tail Length (mm)
Feather-tailed Glider	13	75	78
Sugar Glider	130	170	190
Squirrel Glider	230	210	270
Yellow-bellied Glider	555	275	350
Greater Glider	1120	420	530

![](_page_46_Figure_11.jpeg)

![](_page_46_Figure_12.jpeg)

## Teachers notes for Lesson 10 Project based learning process

![](_page_47_Picture_1.jpeg)

This five-step Sustainability action process will guide you and your students through the process of developing, planning and implementing a creative and practical conservation proposal for your school.

#### **STAGE 1: MAKING THE CASE FOR CHANGE**

We have altered our environment in ways that have changed the availability of habitat, the diversity of plants and animals, and the ability of species to move easily through the landscape like they did in the past. We can assist our land, wildlife and natural resources by taking a range of actions to improve the connectivity of our area.

#### **Exploring Connectivity**

- What do I know about living things and biodiversity?
- How and where will I find out more about the native species in and around our school?
- What does connectivity have to do with conservation?

#### Assessing your current situation

Before deciding what changes need to be made, an audit of the species in and around your school grounds is a great place to start.

- What species are in our school environment?
- Are they endemic or introduced species and what role do these species play?
- Are they of benefit or are they causing harm?
- Which parts of our school has the greatest biodiversity?
- Who are the people (stakeholders) at our school who manage areas that impact biodiversity and what are their needs and concerns?
- Do we need to do something to increase the number and type of species in our school? Why?

#### Investigating concepts related to connectivity

To make a case for change at your school, it is important to investigate what connectivity means for your school, the local environment and Australian and global environments.

- What further investigations do we need to undertake to learn more about connectivity conservation?
- What did we find out?
- What else do we need to know?

#### Stating the case for what needs to change and why

At this stage you should be able to state the reasons for improving the connectivity of your school grounds or local environment. You should investigate the issues and avoid thinking about solutions e.g. actions or specific changes.

- What is the preferred future for wildlife living in and around our school grounds?
- What do we need to change in our school and the local area to bring about that change?
- Do we need to learn more about species in our local area and in our school?
- Can we state simply what needs to change and why?

#### **STAGE 2: DEFINING THE SCOPE FOR ACTION**

Your local community may already have taken actions to improve connectivity in your neighbourhood.

#### **Resources and constraints**

Before developing your ideas further, it is important to know what resources are available to your school and also to identify 'constraints' that might limit your ability to implement an idea or reduce its potential success.

- Who might be available to help us?
- What resources are required to increase connectivity?
- What time and finances are available for the project?
- What might limit our actions?

#### Selecting ideas for action

Now you have identified a range of actions to improve connectivity, you will need to select the best option. Consider your school's context, the local environment and provide evidence that a particular idea is the best one. Some decision making tools may assist you.

- Considering our resources and constraints, what type of actions best meet the criteria for increasing connectivity in and around our school grounds?
- How can we come up with a great idea?
- What will we do?

## STAGE 3: DEVELOPING THE PROPOSAL FOR ACTION

A proposal for increasing connectivity requires a clear statement of action, criteria for success and agreement by stakeholders.

#### Developing the statement (brief) for action.

Refine the direction you have chosen through a project brief. You will need to develop some specific actions, responsibilities and expectations for your project.

A 'brief' is a document that describes a plan, process or approach and should include a way to measure or rate how well it succeeded. As an introduction your brief should include both broad aims as well as some detailed reasoning.

You may need to provide some evidence for your answers.

- What is the type of connectivity improvement action we have planned?
- How will we judge the success of our improvement?
- What are the individual steps required?
- What budget or resources are required for each individual step or action?
- Who will be responsible for these actions?
- What could we do if things don't go to plan?

#### Preparing to communicate the proposal

You have generated an idea for an action that will improve connectivity in and around your school grounds. To gain support for your idea it is important to communicate this to stakeholders.

- Who do we need to share our plan with?
- How will we use feedback to improve our proposal?
- What will the changes cost or involve?
- Who will take the actions?

#### Gaining agreement for the proposal

Before you finalise your proposal it will be important to consult with the Principal and others and respond to any suggestions that are made.

- Has our class and have others in the school agreed to our ideas?
- Has our Principal agreed?
- What modifications have been made to gain the endorsement of the Principal?

#### **Proposal description**

This is your final plan and should include all of the necessary information to proceed and make it happen.

Does your document include:

- A plan for action?
- The budget, personnel and timing requirements?
- The steps you will follow to implement your plan?
- The criteria and how you will record information to judge how successful you have been?
- What will you do if the implementation does not go according to plan or schedule?

#### **STEP 4: IMPLEMENTING THE PROPOSAL**

To put a proposal into action you need to follow the project plan, monitor your progress and collect data to help measure your success.

#### Putting the proposal into action

Use this stage to identify issues with the project and discuss solutions.

- Are we following the steps set out in the proposal?
- Are we keeping the purpose for the action clearly in mind?
- How will we know we are implementing the plan as it was agreed or intended?

#### Monitoring and recording the implementation

The progress of your project needs to be monitored and documented. The collection and organisation of information at this stage will assist you with evaluating the success of your project.

- Are we collecting the information for the evaluation?
- How can we use this information at this stage to communicate our project and engage others?

#### STEP 5: REFLECTING AND EVALUATING

You need to be able to judge and measure the success of your proposal in addressing the original issue and achieving your goal of improving connectivity.

#### Evaluating the sustainability action

Evaluate your project against the goals of your project plan.

- Did we achieve our goal of improving the connectivity of our school or local environment?
- Have we measured and described this?
- What were the strengths and weaknesses of our plan?
- What could we have done differently to get a better result?
- Does our action provide connectivity improvements for other schools?
- How can we communicate our success and engage others to try our idea?

#### STEP 5: REFLECTING ON THE LEARNING

It is important to reflect on and consider your individual learning and development as a group.

- How have my/our feelings and behaviour changed as a result of my/our learning?
- How well did I/we participate in any group learning activities?
- Thinking back on what was achieved, the most enjoyable part of the project was ...
- How can I apply what I've learnt to another conservation issue?

## Glossary

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

Carnivores: Animals that eat only other animals

**Connectivity conservation:** A relatively new conservation strategy that focuses on creating linkages and corridors between protected areas and other core habitat areas through revegetation and protection of existing habitat.

Landscape Connectivity: The degree to which the landscape facilitates or impedes the movement of an organism among habitat patches

**Consumer:** An organism that has to feed on another organism to survive.

Decomposers: organisms that feed on decaying matter.

Disperse: Move to different locations.

**Feral animals:** An animal living in the wild that has descended from domesticated individuals.

**Food chain:** A diagram that shows who-eats-what in the environment

Food web: A number of interrelated food chains.

Forage: The seeking or obtaining of food

**Habitat:** is the natural home or environment of an animal, plant or other organism.

Habitat needs: What a plant or animal requires in its habitat to survive.

**Habitat loss:** When remaining vegetation is broken up into small, isolated patches by clearing or construction of barriers such as roads or buildings.

**Habitat fragmentation:** the process by which habitat loss results in the division of large, continuous habitats into smaller, more isolated remnants.

**Invasive Species:** a plant, fungus, or animal species that is not native to a specific location (an introduced species), and which has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health.

Migrate: move from one region or habitat to another

**National park:** Large areas of public land set aside for native plants, animals and the places in which they live.

**Native species:** Plants and animals that live in the same place that they are originally from.

**Photosynthesis:** The process by which plants make their own food from the sun.

**Producer:** Organisms that make their own food from the sun.

**Threatened species:** Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future.

**Totem:** A natural object, plant or animal that is inherited by members of a clan or family as their spiritual emblem.

**Weeds:** A non-native plant that requires some form of action to reduce its effects on the economy, the environment, human health and amenity.

**Wildlife crossing structure:** Structures that allow animals to cross human-made barriers safely.

**Wildlife corridor:** An area of habitat, generally native vegetation, which joins two or more larger areas of similar wildlife habitat.

![](_page_49_Picture_27.jpeg)

## Links

#### RESEARCH

**Atlas of Living Australia** 

Australian habitats

Build a bee hotel

Feral Scan

**Google Earth** 

How to build a nestbox

#### LEARNING

Aboriginal Totems booklet

Tree hollow presentation

Glideways website

**Great Eastern Ranges Initiative** 

**Squirrel Glider Education Kit** 

#### SUPPORT

**NSW Environment Centres:** 

Landcare NSW

#### **GRANTS PROGRAMS**

**NSW Environmental Trust Grants** 

Australian Government Environment Grants

**Gould League Environment Grants** 

**Teachers Mutual Bank Environment Fund** 

![](_page_50_Picture_22.jpeg)

![](_page_51_Picture_0.jpeg)

![](_page_51_Picture_1.jpeg)

This resource was developed with support from the NSW Environmental Trust