

Module 2

Threats



Cotoneaster

Threats

Lord Howe Island's isolated geographic location, limited access and small size make it an area for a number of identifiable and common threats, including pest species, marine debris and climate change. The Lord Howe Island Board (LHIB) aims to limit or eliminate these threats and to protect the unique biodiversity of Lord Howe Island.

Pest Species

An ongoing threat to the biodiversity of the Lord Howe Island Group (LHIG) is the introduction of new exotic fauna and flora. The arrival of every ship and aircraft poses a risk, with the introduction of new pathogens, weeds, invertebrates and vertebrates a distinct possibility. The Island's strict quarantine principles must be adhered to in order to prevent the introduction of pest species.

Invasive species have been the greatest drivers of species extinctions worldwide and is an ongoing threat that needs to be managed. The arrival of every ship and aircraft poses a risk, with the introduction of new pathogens, weeds, invertebrates and vertebrates a distinct possibility. The Island's strict quarantine principles must be adhered to in order to prevent the introduction of pest species, including Phytophthora, Myrtle Rust and African Big Headed Ants.

Weeds

Weed invasion is a major threat to the biodiversity of the LHIG, with weeds affecting all vegetation communities to some extent. There are over 670 species of introduced plants on the island, many of which impact biodiversity. Approximately 40% are weeds which have invasive characteristics, these weeds pose a serious threat to LHIG habitats and need to be monitored. Most of the weeds on Lord Howe Island include introduced garden plants and introduced grasses and herbaceous plants or exotic garden and agricultural plants. The settlement area has been, and continues to be, the major source of new weed species and a seed source for existing weed species.



Photo: S. Bower (LHIB)

The majority of the weeds currently found on the Island produce seeds. Dispersal of weed species can occur naturally by wind, birds, water or gravity. Humans also transport weeds along walking tracks on Lord Howe Island.

Threats

Ship rat

The introduction of rats to the Island has greatly affected the biodiversity and continues to have an impact to this day. The ship rat *Rattus rattus* (or black rat) was accidentally introduced in 1918 when the supply ship Makambo ran aground offshore. The rat population increased dramatically once established, spreading through terrestrial habitats on the main island where it is now widely distributed.



Photo: M. Murphy

The ship rat's diet mainly consists of seeds, green plant material, fungi, invertebrates, small vertebrates and eggs. The ship rat is implicated in the decline and extinction of five species of bird and they also have negative impacts on native plants. Invertebrate species have been impacted by the ship rat, particularly the Lord Howe Island placostylus (a land snail - right) and the Lord Howe Island phasmid, which are listed as endangered under the *Threatened Species Conservation Act (TSC Act)*. The ship rat was also involved in the removal of breeding populations of kermadec petrel and white-bellied storm petrel from the main island. Today, these birds only breed on Balls Pyramid.

Rat baiting has been done primarily to protect the kentia palm industry because their seeds are heavily preyed on by rats. Some low-level baiting has also been done for biodiversity reasons, for example, for the Lord Howe Island placostylus.

The LHIB is proposing to implement a comprehensive baiting program with the aim of eradicating rodents from Lord Howe Island.

The positive effects of eradicating rodents include:

- restoration of natural vegetative communities
- increased numbers of large invertebrates and some lizards
- increased numbers of insectivorous birds
- improved seabird breeding
- opportunities to restore the original fauna assemblage on Lord Howe Island
- reduced ongoing effort and costs in rodent management
- reduced long-term use of poisons in the environment
- increased palm seed yields.

The removal of rats will allow for the reintroduction of locally extinct species, for example, the reintroduction of the Lord Howe Island phasmid to the mainland. Removing rats will also enhance populations of those species that have been depleted by rodents.

Threats

Marine Debris

Marine debris has numerous effects on the wildlife of Lord Howe Island. Not only does it affect marine life, it is also responsible for deaths of seabirds, including the endangered flesh-footed shearwater.

Marine debris is known to be a problem throughout the world's oceans. It is estimated that 7 billion tonnes of plastic litter enter our oceans every year. Plastic debris is ingested by seabirds because it resembles prey, or because it is already present in the gut of prey. Adult seabirds pass on the plastic to their chicks by regurgitation. The chick cannot regurgitate this plastic until it is fully fledged, so it sits in the gut. This accumulated plastic can lead to health problems in the chick, such as diminished appetite and the inability to eat a full load of food.

Entanglement by marine debris is another common problem, with many seabirds and turtles dying each year as a result. Marine debris not only kills wildlife it also destroys habitats and threatens our health and the economy. Practices where we reduce, reuse and recycle can limit the amount of marine debris entering our waterways. Most importantly, do the right thing – don't litter.

Climate Change

Climate Change is a change in the average pattern of weather over a long period of time. There is clear evidence that our climate is changing due to human activities such as industrialisation and land clearing which can cause atmospheric changes. Climate change is having an affect on our earth's natural processes with scientists predicting increased land temperatures, warming oceans and melting snow and ice which may in turn lead to sea level rise and ocean acidification, changes to our weather patterns including increased severity of drought and flood events and disruption to plant and animals life cycles. As animals are no longer able to move freely to adapt to climate change, due to increased agriculture and human habitation of their habitats, it is estimated that millions of species worldwide are threatened with extinction.

*'It is predicted that climate change could impact on Lord Howe Island by increasing the altitude of the cloud layer through rising sea surface temperatures. This would constitute a major climate-related threat to the plant communities of Lord Howe Island. This cloud layer provides a source of precipitation and maintains the humidity required by about 86 per cent of the island's endemic plant species, including the dwarf mossy forest that dominates the summit of the peaks on the Island. Seabirds may also be at risk from changes in the abundance and distribution of marine food caused by climate change in combination with other threats, such as intensive fishing activities.'**

* Department of Climate Change and Energy Efficiency
<http://www.climatechange.gov.au/climate-change/impacts/national-impacts/nsw-impacts.aspx>

Threats

Lord Howe Island is highly vulnerable to projected climate change. Appropriate actions need to be taken by government, businesses, communities and individuals to ensure effective adaptation is possible in a changing environment.

Threatened Species Recovery Programs

'Threatened' species are plants and animals that are in danger of becoming extinct. The NSW *Threatened Species Conservation Act* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) provide the legislative framework to protect and encourage the recovery of threatened species, populations and ecological communities.

Lord Howe Island is home to more than 60 threatened species, some of which are found nowhere else in the world. There are also 15 key threatening processes operating on the Island, including predation by ship rats and impact of marine debris.

The most powerful biodiversity conservation techniques are protection and restoration of habitats and ecosystems. The LHIB is actively protecting and restoring the biodiversity of Lord Howe Island. For example, the Board is implementing the Lord Howe Island Biodiversity Management Plan which aims to eliminate or limit threats on Lord Howe Island. This will provide scope for reintroducing threatened species back into their natural habitats and ranges.

There are also threatened species recovery programs being implemented for LHI woodhen and LHI phasmid (right), and a proposed rodent eradication plan.

The protection and enhancement of biodiversity will not only reinforce the World Heritage listing of Lord Howe Island, it will provide for further tourism opportunities. Tourism is the driving force of the Island's economy, so biodiversity protection will ultimately benefit all residents.



Photo: C. Haselden (LHIB)

References and Additional Resources

- Department of Environment and Climate Change (NSW) 2007, *Lord Howe Island Biodiversity Management Plan*.
- Auld, TD, Hutton, I, Ooi, KJ, Denham, AJ 2010, 'Disruption of recruitment in two endemic palms on Lord Howe Island by invasive rats'.
- Heath, L 2008, *Garnet Climate Change Review, Impacts on Australia's World Heritage properties and their values*.
- The Earthwatch Institute Climate Watch program <http://www.climatewatch.org.au/>



Stage 1 Local Places

Teacher Activity Plan

Outcomes and Indicators

ENS1.6 Demonstrates an understanding of the relationship between environments and people

- shows an understanding of environmental issues
- identifies wise and unwise use of resources
- suggest ways of caring for sites, features, places and environments to which they can contribute

DMS1.8 Develops and implements own design ideas in response to an investigation of needs and wants

- develops design concepts through drawing and modelling
- shares design ideas with others and responds to feedback

Equipment Used

- native seeds or seedlings
- gardening equipment, e.g. gloves, trowels, shovels and pruners
- bucket
- watering cans
- soil
- wheelbarrow
- four 4 m x 4 m pieces of garden edging
- A4 paper

Teacher Resources

Grow Native on Lord Howe Island (available from LHIB)

Schools Tree Day
<http://treeday.planetark.org/schools/>

Activity 1 – Weeds Excursion

Introduce students to the concept of threats using the Teacher Fact Sheet. Explain that on Lord Howe Island there are plants called 'native plants' that are meant to be there, and plants called 'weeds' that are in the wrong place. Weeds can reduce local biodiversity and can permanently change local ecosystems. They can destroy the habitat of our native animals and can compete with our native plants for resources.

Reiterate to students that weeds can be spread by a variety of different methods including dispersal of seed by birds, wind and incorrect disposal of weeds by humans. Weeds that have been removed must be disposed of in a responsible manner, for example, by mulching them or disposing of them at the tip. Cuttings, seeds, fruits or roots of weeds should never be thrown into areas of native vegetation.

Take students on a walk through the bush. During the walk students are to collect leaf samples of native plants they see (ferns, shrubs, sedges and trees). Whilst on the walk ask them if they can identify any weeds while there. Explain to them the correct methods for removing and disposing of weeds. Back in the classroom, students are to design a native area, pasting the samples collected onto Activity Sheet 1. Ask students to present their design to the class and use their ideas to develop an overall class design. Plan this activity to coincide with Schools Tree day (refer to Teacher Resources). Liaise with the Lord Howe Island Board to get accurate information of where the activity should take place, ask for their input and the communities' assistance to make the day a success. Students will plant out their design in an area that the whole community can enjoy and be part of a broader revegetation strategy for the Island. Develop a roster system, involving the whole school, to maintain their native area.



Stage 1 Local Places

Teacher Activity Plan

Activity 2 – How I help my environment

Explain to students that how we choose to use our resources each day directly affects the health of our environment. If we use our resources unwisely we will threaten the overall health of our environment, which often leads to a reduction of biodiversity. Correct use of resources is important to ensure that our environment stays healthy.

Students are to run their own recycling station for a week. Organise bins in the classroom for plastic, paper, cans and glass. Ask students to put the waste generated in the classroom into the appropriate bin. Monitor the amount that is going into the bin over the week. At the end of the week sort through the material with the class and lead a discussion on how they can reduce their waste by identifying resources they need and resources they want.

Discuss how they can improve recycling in school and at home, and how it can benefit the environment overall. Ask students to answer the questions on Activity Sheet 2 and illustrate their responses. Create a class display based on 'how I help the environment'.

At the end of the week arrange an excursion to the waste management facility on the island. Ask an employee of the facility to show students how all waste on the island is currently managed. From what they have learnt during their recycle week, ask students if they think that doing the right thing and disposing of waste on the island is done correctly by most residents. How can they make changes at home to make sure that their family disposes of waste correctly? Ask students to talk to their parents and come up with one idea that will reduce waste in their household and implement it.

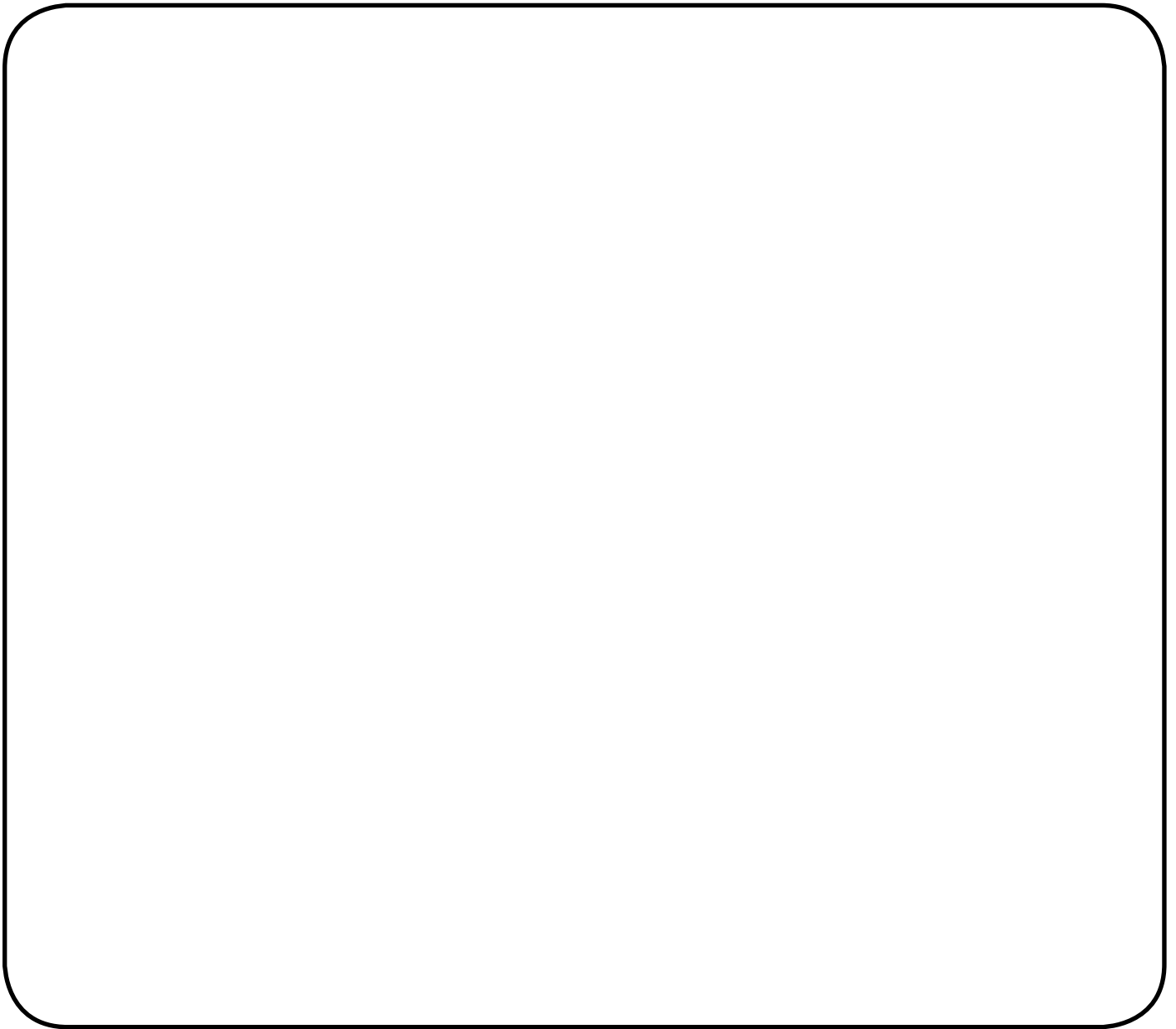
Extension Exercise

Conduct a working bee where parents and the Lord Howe Island Board Weed Team are invited to come along to the school and help students eliminate weeds from the school grounds. Get students to present their native garden and explain why weeds need to be removed from Lord Howe Island.

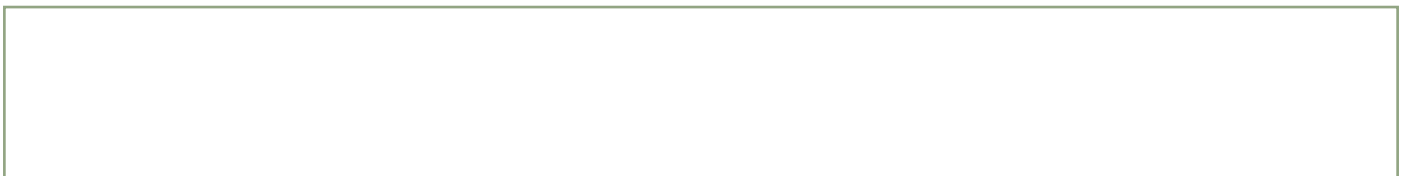
Activity Sheet 1

Natives

Use the space below to draw your native garden.



What plants will you put in your garden?



Activity Sheet 2

How I help my environment

How we use resources is important, we can use them wisely or unwisely.

When sorting through the material from the recycling activity, write down the resources that you need in the classroom and the resources that you want.

Need

Want

Answer the following questions about how you help your environment. Draw a picture of your answer in the question boxes.

I/we will help the environment at home by...

I/we will help the environment in my street by...

I/we will help the environment at school by...

I/we will try to get other people to help the environment by...

Fast Fact

Many of the native plants on Lord Howe Island are found nowhere else in the world.



Stage 2 Local Environments

Teacher Activity Plan

Outcomes and Indicators

ENS2.6 Describes people's interactions with environments and identifies responsible ways of interacting with environments

- describes features of the environment using key concepts in an experiential situation
- demonstrates an aesthetic awareness of environments, both natural and built, relating these environments to their key body senses
- participates effectively in an informal class debate on a particular local environmental issue — ship rat eradication
- expresses an understanding of the different points of view on the issue of ship rat eradication

MUS2.2 Improvises musical phrases, organises sounds and explains reasons for choices

- experiments with a range of sound sources and organises them into a simple composition in an onomatopoeia poem on threats

Equipment Used

- blindfolds
- 30 m measuring tape
- A4 paper

Activity 1 – Explore your Environment Excursion

Explain to students the impact that pest species have on the native flora and fauna of Lord Howe Island. Introduce to the class the current issues surrounding eradication of ship rats on Lord Howe Island.

Inform students that black rats are still causing devastating affects on not only wildlife but also on the Kentia Palm industry which is important to the islands economy. Black rats also eat a wide range of other plant seed which can lead to reduction of native plant species propagation. Currently the Lord Howe Island Board baits for black rats, this poison is impacting on woodens that eat the poisoned rats.

Take students to the Clear Place where there is a variety of vegetation and wildlife. Prior to the start of the activity, scope out the area to ensure there are no pieces of broken glass or other harmful objects that could injure the students when they are exploring.

In groups of three - consisting of an investigator, a reporter and a recorder - ask students to complete Activity Sheet 1. The investigator is blindfolded and is lead along a 30m transect. At each 10 m interval, students are to sit on the ground and listen to the sounds around them. The investigator is to explain to the reporter the sensations and sounds of the environment. The reporter then relays those words to the recorder who notes the points. Repeat this activity focusing on sounds and touch, using hands and bare feet. Once the four stops have been recorded, the reporters from each group meet and collate lists of key words for each sense. Report back and discuss findings with the class.

Ask students whether they would hear, smell and feel the same things in 10 years time? Why? Why not? What would they hear if ship rats are not eradicated on Lord Howe Island?

Stage 2 Local Environments

Teacher Activity Plan

Teacher Resources

Threatened species recovery programs:

<http://www.lordhoweisland.info/library/species.pdf>

<http://www.lordhoweisland.info/conservation/recovery2.htm>

Impacts of rodents on Lord Howe Island – fact sheet 1–6 (available from LHIB)

Activity 2 – Threatened Species

Discuss with students the impact that the introduction of ship rats has had on species such as the LHI placostylus, LHI phasmid and kermadec petrel. Split the class into groups of five. Ask students to discuss how the eradication of ship rats will be beneficial to each of these species and record on Activity Sheet 2.

Ask students to think of some bird species that may return to the Island if ship rats were no longer a threat to them. Relate to student's sensory investigation of their environment, what calls can they expect to hear? Do they think that there would be more wildlife? Do they think the eradication of ship rats from Lord Howe Island is a good idea? Why? Why not? How can they help make sure that ship rats don't make another species extinct on Lord Howe Island? Refer to Table of Extinctions to lead the discussion.

Extension Exercise

Using the information gathered on the excursion, students are to write a poem about species under threat from the black rat using onomatopoeia. Write the poem on Activity Sheet 3.

Students are to include species that are under threat from the black rat. Ask students to count how many onomatopoeic words are included in their poem. You can start students off with this example:

The black rats go squeak then the...

Muttonbirds go pick me

Wood hens go squeaky wheel

Sooty terns go wide awake

Activity Sheet 1

Explore your environment

Record your observations.

SITE 1 (0 m)	<i>Sounds</i>
	<i>Smells</i>
	<i>Touch</i>
	<i>Key words</i>
SITE 2 (10 m)	<i>Sounds</i>
	<i>Smells</i>
	<i>Touch</i>
	<i>Key words</i>
SITE 3 (20 m)	<i>Sounds</i>
	<i>Smells</i>
	<i>Touch</i>
	<i>Key words</i>
SITE 4 (30 m)	<i>Sounds</i>
	<i>Smells</i>
	<i>Touch</i>
	<i>Key words</i>

Activity Sheet 2

Threatened species

Impact of the rat

Ship rats were introduced to Lord Howe Island in 1918 following the grounding offshore of the supply ship *Makambo*. As a result, many of the native plants and animals suffered. In your groups, explain how each species was impacted and how they are now protected against the ship rats.

Species	Impacted	Protected
Lord Howe Island placostylus		
Lord Howe Island phasmid		
Kermadec petrel		

What will happen if ship rats are eradicated on Lord Howe Island?

Will there be an increase in biodiversity? Yes No

Why?

What can you do to control black rats at your home?

What other wildlife will benefit from the eradication of ship rats?

Fast Fact

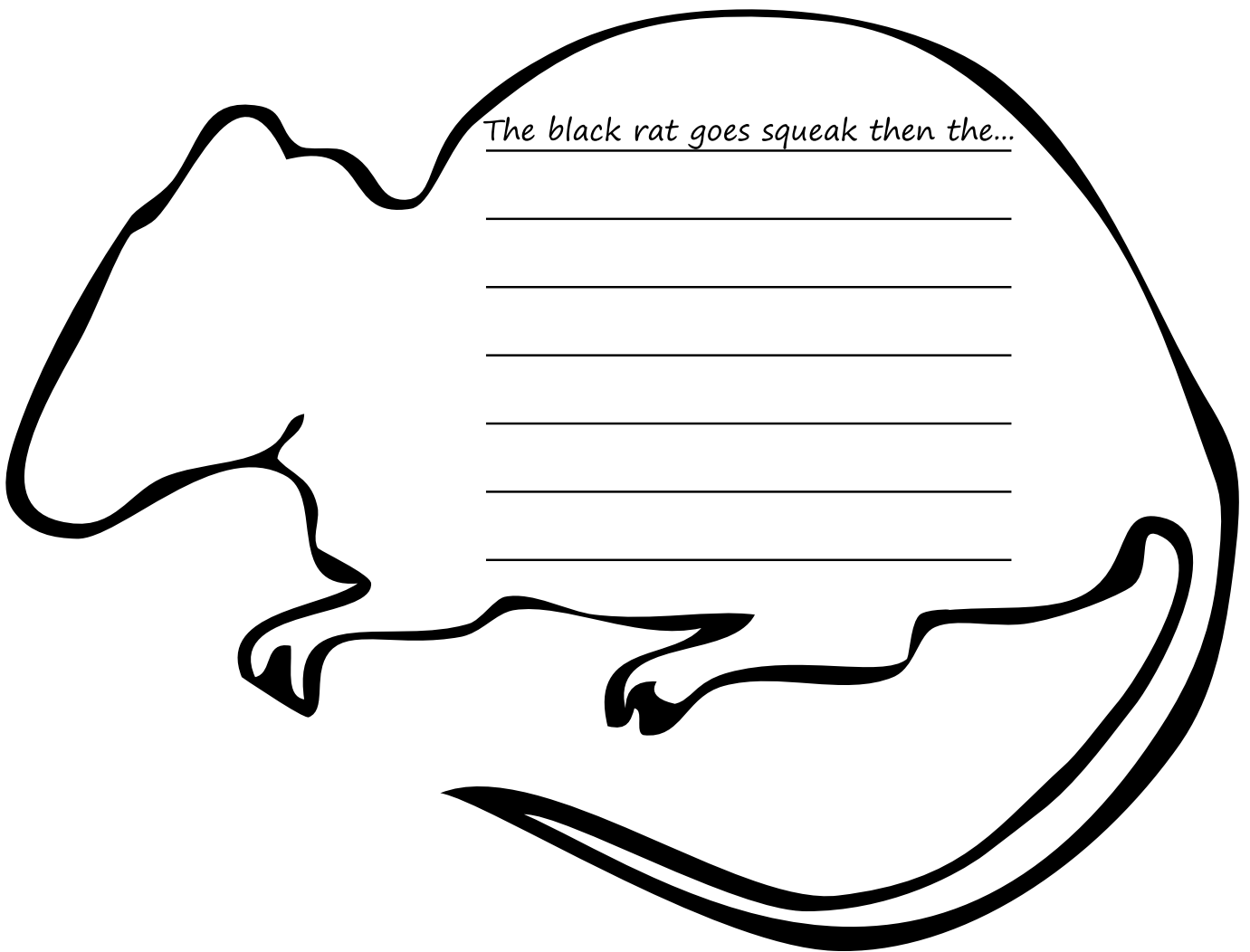
The ship rat has been implicated in the decline and extinction of five species of bird.

Activity Sheet 3

Threats poem

Onomatopoeia (pronounced: on-oh-MAT-oh-pea-uh) is a word that imitates the sound of the thing the word describes. Below is a ship rat's belly - write an onomatopoeia poem about species under threat from the black rat. Colour in and cut out to display in the classroom.

Number of onomatopoeia words in your poem:





Stage 3 Living Land

Teacher Activity Plan

Outcomes and Indicators

ENS3.5 Demonstrates an understanding of the interconnectedness between Australia and global environments and how individuals and groups can act in an ecologically responsible manner.

- analyses an article on marine debris and understands that this is a global issue
- considers the affect of marine debris on seabirds

ENS3.6 Explains how various beliefs and practices influence the ways in which people interact with, change and value the environment.

- reads and discusses environmental issues associated with Lord Howe Island
- develops own response to reduce biodiversity loss as a result of marine debris

PHS3.12 Explains the consequences of personal lifestyle choices.

- researches current issues affecting seabirds

Equipment Used

- computer
- colour printer
- A4 paper

Activity 1 - The role of the media

In class, introduce the role of the media in reporting on significant issues that affect all of us. Hand out Activity Article to students, ask them to read through the article and answer the questions on Activity Sheet 1. After the questions are answered, discuss answers with the class.

Activity 2 - Bird Observation Excursion

Take students on an excursion to Neds Beach. Explain to students the significance of Lord Howe Island as a seabird rookery. Use the Student Identification Sheet to identify some of the seabirds of Lord Howe Island and tick off each one when found. It is important to ensure that students don't get too close to the birds - they are to observe birds at a safe distance so the bird does not feel threatened. Students are to answer the questions on Activity Sheet 2.

While undertaking the excursion, students are to collect any litter they find. Draw two large circles in the sand and ask students to divide litter into biodegradable and non-biodegradable. Once the litter is collected, ask students to record what they found on Activity Sheet 3*. Discuss findings, including where the majority of the litter came from and the possible impacts on species identified in the first half of the activity.

In the classroom, students are to develop an information brochure on one of the threatened seabird species on the Student Identification Sheet, including information on biology, habitat, threats and what can be done to protect and conserve this species.

* Teachers note: a national marine debris database is currently being developed by Earthwatch Institute Australia as part of a schools program aimed at years 6-12. This program will involve a standardised method of collecting and recording marine debris with data to be used in future research projects. A school based program will be available in May 2012.

Teacher Resources

<http://www.lordhoweisland.info/library/seabirds.pdf>

<http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10896>

<http://www.environment.nsw.gov.au/animals/shearwaters.htm>

http://www.reefed.edu.au/home/explorer/hot_topics/marine_debris

Extension Exercise

In groups students are to discuss some of the onshore impacts on seabirds. Lead the discussion with the following questions:

- Which species no longer nest on the main island? Why?
- Which ones will benefit from rodent eradication?
- Which ones have benefited from eradication of cats, pigs and goats? Why?
- What other onshore threats affect seabirds?

Inform students that road kill, trampling of burrows by livestock, mowing, dogs, weeds like ground asparagus and thick grass which prevent access to burrows are also having an impact on seabirds. Ask students what campaigns they are currently aware of e.g. Shift a Shearwater, Move a Mutto etc.

In their groups students are to research a species affected by one of the threats discussed and come up with a campaign designed to educate others about the threat. They are to come up with a slogan and identify four important facts they need to tell their audience for the campaign to be successful.

Each group is to present their campaign to the class. The class will then vote on whose campaign they think will be most successful in protecting the selected species.

Student Identification Guide

Seabirds of Lord Howe Island



Photo: J. Shick



Providence petrel

(*Pterodroma solandri**)

Nest on the top of Mount Gower and Mount Lidgbird. Lord Howe Island is the only breeding location aside from a few pairs on Norfolk Island.



Photo: J. Shick



Sooty tern

(*Sterna fuscata**)

Larger colonies on offshore islets, a substantial number breed at Mount Eliza with a small number at Muttonbird Point and Neds Beach.



Photo: J. Shick



Kermadec petrel

(*Pterodroma neglecta**)

Balls Pyramid is the only known breeding site in Australian waters.



Photo: M. Legge-Wilkinson



White tern

(*Gygis alba**)

Nests on branches in trees along Neds Beach and Lagoon Roads.



Photo: Lord Howe Island Board



Black winged petrel

(*Pterodroma nigripennis**)

They nest in burrows on many headlands around the Island and can often be seen at Neds Beach flying in courtship patterns.



Photo: J. Shick



Common noddy

(*Anous stolidus*)

Breed on main Island and offshore islets, including colonies at Old Gulch and the Southern End of Blinky Beach.



Photo: J. Shick



White-bellied storm petrel

(*Fregetta grallaria**)

In Australia, breeds only on offshore islands in the Lord Howe Island Group.



Photo: I. Hutton



Black noddy

(*Anous minutus*)

Occur in small numbers around Lord Howe Island and can be seen flying around the cliffs at Old Gulch where they also breed.



Photo: Lord-Howe Island Board



Flesh-footed shearwater

(*Puffinus carneipes**)

Nest in forests on sandy soils from Neds Beach to Clear Place, with small colonies below Transit Hill and at Old Settlement Beach.



Photo: J. Shick



Grey ternlet

(*Procelsterna cerulean**)

Can be observed at most times of the year around the cliffs and on offshore islands Admiralty Islets, Muttonbird Island and Balls Pyramid.

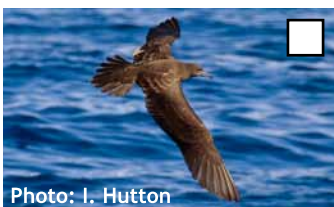


Photo: I. Hutton



Wedge-tailed shearwater

(*Puffinus pacificus*)

Mainly breed on the offshore islands including Blackburn Island in the lagoon. A small number breed at Signal Point and Lovers Bay.



Photo: I. Hutton



Masked booby

(*Sula dactylatra tasmani**)

Lord Howe Island is the most southerly breeding colony in the world. Can be seen at Kings Point, Muttonbird Island and on offshore islets.



Photo: A. Tate



Little shearwater

(*Puffinus assimilis**)

Mainly breed on the offshore islets, can also be found at Muttonbird Point and Transit Hill.

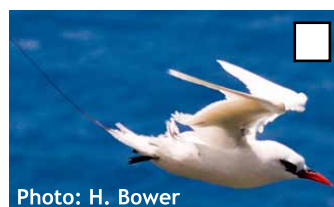


Photo: H. Bower



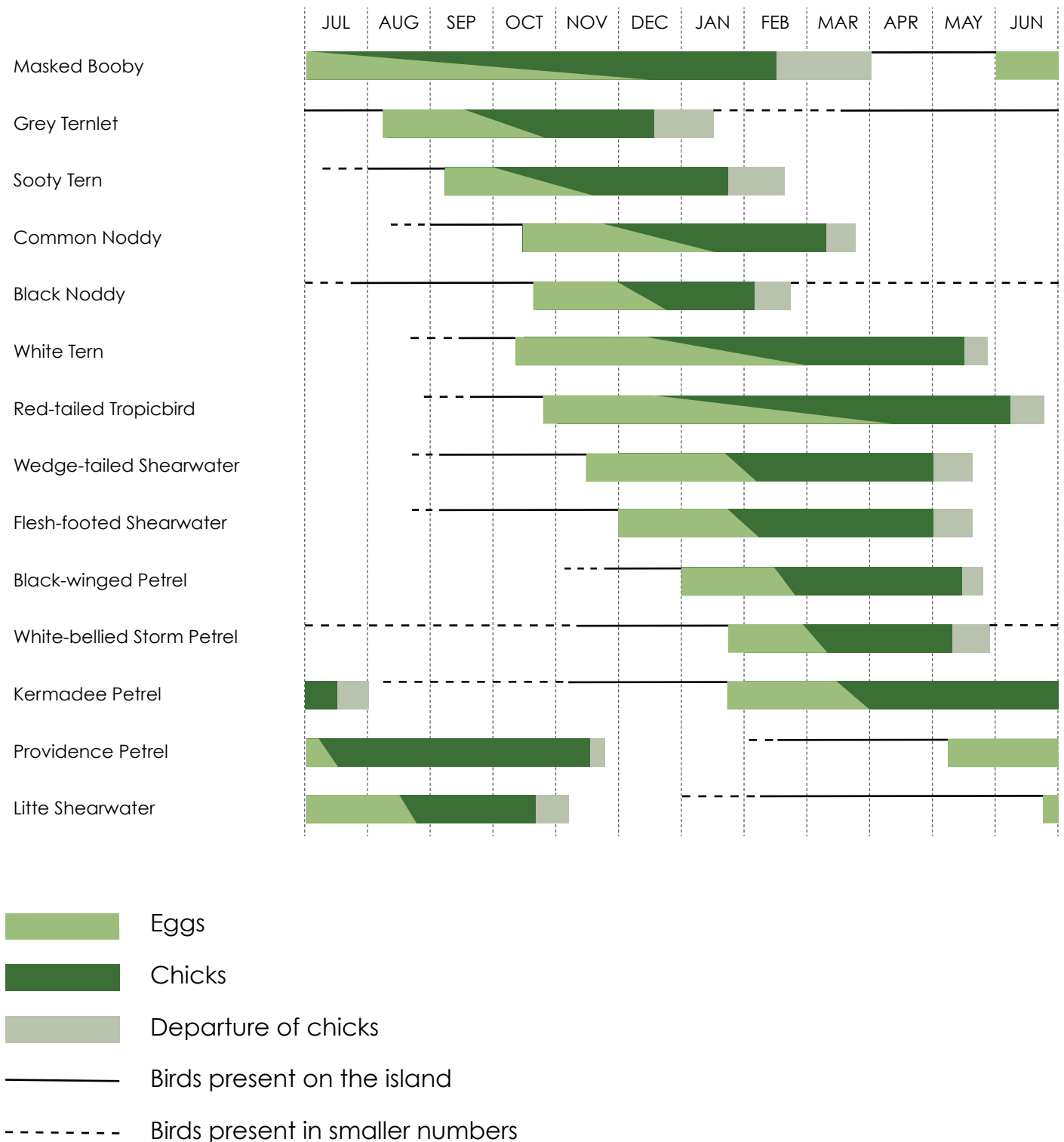
Red-tailed tropicbird

(*Phaethon rubicauda**)

Nests on the cliffs of the northern hills and southern mountains on the main island.

* threatened species

Breeding seasons of nesting seabirds



Source: Hutton, I. 1991, *Birds of Lord Howe Island, Past and Present*.



Activity Sheet 1

Plastic - a colourful killer

Read through the article "Plastic - a colourful killer" by Dr Jennifer Lavers and answer the questions below.

What types of litter are found on Lord Howe Island beaches?

.....
.....

Where does marine debris come from?

.....

Why do seabirds ingest (eat) plastic debris and what happens when they do?

.....
.....

What is the North Pacific Garbage Patch?

.....
.....

Why is the Flesh-footed shearwater an at risk species?

.....

What is the Lord Howe Island Board doing to help lessen the impacts of marine debris on the Flesh-footed shearwater?

.....
.....

What other species do you think may be impacted upon by marine debris?

.....

What can you do to decrease the amount of litter entering our waterways?

.....
.....

Fast Fact

Another threat to the flesh-footed shearwater is being taken as by-catch by long-line fishing vessels.

Activity Article

Plastic - a colourful killer

Marine debris in our backyards and oceans is slowly converting iconic sandy beaches into colourful but toxic plastic reservoirs.

Dr Jennifer Lavers, Wildlife Ecologist, CSIRO Hobart

4 February 2011

Stunning Lord Howe Island, 700 kilometres north-east of Sydney, was listed as a UNESCO World Heritage Area in 1982. It is widely regarded as a pristine environment, with over 70% of the island protected from development and visitor numbers strictly limited to 400 at any one time.

Sadly, even remote islands like Lord Howe are not immune to the impacts of human activities. Despite North Bay and iconic Ned's Beach being repeatedly recognised as some of Australia's cleanest beaches, these and many of the Lord Howe beaches are now littered with plastic bottles, lids, and derelict fishing gear.

Despite the implementation of strict international legislation aimed at reducing the amount of marine debris originating from ocean and land-based sources (e.g. MARPOL Annex V), debris, particularly plastic, continues to accumulate worldwide with an estimated 20-30 million items entering the ocean each day.

More than 200 seabird species have been reported to ingest plastic debris, presumably mistaking it for food. Adult birds then return to the breeding colony and 'off-load' the plastic they ingested to their chicks during feeding. Plastic debris is known to accumulate hydrophobic organic toxins such as polychlorinated biphenyls (PCBs) at up to 106x ambient seawater concentrations. Once ingested, debris can block or rupture the digestive tract and leak contaminants into the bird's blood stream resulting in stomach ulcerations, liver damage, infertility, and in many cases, death.



Photo: I. Hutton

Skeleton of a flesh-footed shearwater chick containing chunks of plastic. Large fragments like these almost certainly cause mortality but tiny particles also release toxins.

Activity Article

Plastic - a colourful killer

In North America, the now infamous 'North Pacific Garbage Patch' has received significant media attention. The tragic beauty of thousands of dead Laysan Albatross chicks with stomachs full of colourful bottle caps captured by photographer Chris Jordan has contributed significantly to public awareness of this serious issue.

In stark contrast, awareness of marine debris impacts in Australia is exceptionally low. But the truth is, marine debris is here. In our backyards, threatening our species and oceans and slowly converting our iconic sandy beaches into colourful, yet toxic plastic reservoirs (see image).

In 2009, the Australian government identified the ingestion of plastic debris by marine vertebrates as one of only a handful of 'Key Threatening Processes'. The flesh-footed shearwater (*Puffinus carneipes*) is one of many at-risk species, with 90% of chicks on Lord Howe Island having ingested considerable quantities of plastic.



Plastic sand! Middle Beach on Lord Howe Island may be one of Australia's "cleanest". But as this photo shows, particles of plastic debris wash up on every high tide.

Lord Howe Island is home to the world's single largest population of flesh-footed shearwater, which declined by more than 50% during 1978-2009. Repeated years of low breeding success are implicated in the decline, likely the result of chick mortality due to the ingestion of plastic. Plastic-based chemicals almost certainly contribute to this decline, with a recent study showing mercury levels in flesh-footed shearwater to be multiple orders of magnitude above what is known to be toxic to birds.

In collaboration with the Lord Howe Island Board, a field research project has been proposed for February-April 2011 with the aim of quantifying the effect of marine debris on the Lord Howe Island ecosystem, including flesh-footed shearwater, and identifying possible ways to mitigate the impacts.

Activity Sheet 2

Bird Observation

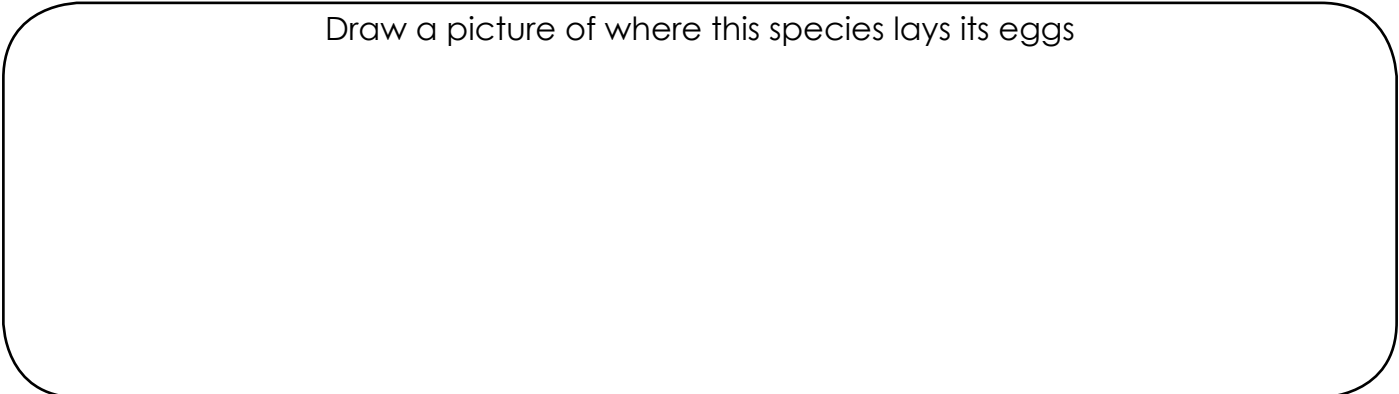
Date: Location:

Bird species	Approximate number	Resident/Migratory	Main food/prey	Adaptations

What is the most plentiful species of seabird at Neds Beach?

Why do you think this species outnumbers the others?

Draw a picture of where this species lays its eggs



How do you think humans impact upon this species?

What can you do to protect this species?

Activity Sheet 3

Litter Survey

Non-biodegradable

Type of Litter	Quantity	Possible impacts on wildlife
Plastic Film/cling wrap		
Plastic bags		
Plastic wrappers		
Plastic pieces		
Lolly wrappers		
Lolly sticks		
Glass bottles and pieces		
Plastic bottles and cups		
Plastic caps, straws and utensils		
Tetra Pack cartons		
Aluminium cans		
Styrofoam cups/pieces		
Metal caps, ring pulls and pieces		
Cigarette butts		
Cigarette packets, wrappers and foil		
Total		

Activity Sheet 3

Litter Survey

Biodegradable

Type of Litter	Quantity	Possible impacts on wildlife
Paper cups		
Food		
Paper bags		
Serviettes and tissues		
Paper pieces		
Newspaper		
Advertising materials		
Takeaway boxes		
Cardboard boxes and pieces		
Total		

Unidentified

Type of Litter	Quantity	Possible impacts on wildlife
Total		



All Stages

Teacher Activity Plan

Outcomes and Indicators

Stage 1

DAS.1.1 Performs dances demonstrating expressive qualities and control over a range of locomotor and non-locomotor movement

DAS1.2 Explores and selects movements using the elements of dance to express ideas, feelings and moods

DAS1.7 Performs simple dance sequences incorporating basic movement skills and patterns

Stage 2

MUS2.1 Sings, plays and moves to a range of music, demonstrating a basic knowledge of musical concepts

MUS2.2 Improvises musical phrases, organises sounds and explains reasons for choices

Stage 3

DRAS3.1 Develops a range of in-depth and sustained roles

DRAS3.2 Interprets and conveys dramatic meaning by using elements of drama and a range of movement and voice skills in a variety of drama forms

DRAS3.3 Devises, acts and rehearses drama for performance to an audience

Activity 1 - Play

Students are to develop a play about the impacts of threats on biodiversity using knowledge obtained from the previous modules. Students have already looked at ways in which threats can have an impact on their daily lives. Stage 1 students looked at weeds, Stage 2 the threat of rats and Stage 3 students looked at the threat of marine debris. Ask students to develop a play that expresses how they feel about the threats to Lord Howe Island and how the community as a whole can help limit or eliminate these threats. Students from each stage are to work with each other to bring together a complete play on threats to the biodiversity of Lord Howe Island. Use Activity Sheet 1 to develop the roles of students in each stage.

Stage 1 students

Ask students to create dance moves for the play. For inspiration students are to go on a mini excursion around the school grounds to get ideas. For example, to depict a tree, a student can be stationary with their arms waving slowly in the breeze. Pairs of students are to mirror each others movements. Ask students:

- What movements did the dancers create?
- What shapes did the dancers use?
- How do they use their arms?
- How do they move through space?
- What is the dance about?

Stage 2 students

Using the onomatopoeia poem and the blindfold game for inspiration Stage 2 is to develop the percussion for the play. They can use a variety of different instruments to describe the natural and built environment of their local area and tie this in with the requirements of Stage 3.



All Stages

Teacher Activity Plan

Equipment used

- A3 paper
- clean rubbish

Teacher Resources

Climate change information:

<http://www.australianmuseum.net.au/Climate-Change/>

<http://www.climatechange.gov.au/>

Classroom resources:

http://www.schools.nsw.edu.au/learning/k_6/arts/clresources.php

Stage 3 students

Students are to develop a play script, using the effects of threats on biodiversity as inspiration. They are to consider the following questions on the impact threats have on biodiversity, and through this develop the content of the play.

- What are the threats to Lord Howe Island?
- What are the social impacts of threats to Lord Howe Island?
- What are the impacts on flora and fauna?

Using the information collected from this discussion, create a mind map of the consequences of each threat on biodiversity. This will then be used to construct the play.

The key characters in the play can be a community member, a child, a scientist, a fisherman/farmer and a threatened species. Follow on from the previous class discussion to bring all elements of the play together. Ask students to decide on what threat is going to be the focus of the play? How are they going to tell the audience about the threat and inspire the audience to take action? How many characters will they need in the play? Each story has a beginning, middle and an end — what will theirs be? Who is going to be responsible for costume and set design? Will they have a narrator for the play? How long should the play be?

Students are to experiment with creating sound effects and images to captivate their audience. Use the internet to find images for the background to help tell the story.

Students are to create the costumes for the play from 'clean' rubbish found at home. This can include things such as plastic bags, bubble wrap, plastic bottles, newspapers etc.

As a school, rehearse the play for a month and then invite parents and members of the community to the school to watch the students perform the play and sing their song.



All Stages

Teacher Activity Plan

You can also showcase some of the work students have done in the previous modules, including the phasmid enclosures, seabird pamphlets and woodhen artwork etc.

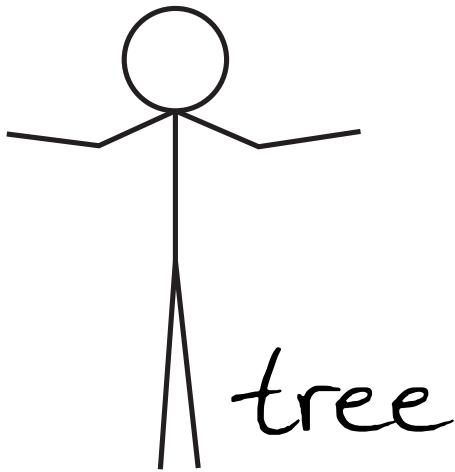
Activity 2 – Music

Expand upon what students have already learnt in the classroom to include one of the greatest threats to biodiversity — climate change. Using the Teacher Resources, introduce students to climate change, ask them to discuss how climate change will affect them directly and indirectly, and come up with ideas on how to counteract it. Working together as a class, each stage is to come up with part of a song and write it down on Activity Sheet 2. Stage 1 the first verse, Stage 2 the second verse and Stage 3 the final verse. The school can work together to create the chorus. The students will sing it all together as the finale to the play.

Activity Sheet 1

Dance, Stage 1

Using stick figures, draw how you would recreate the movements to show different parts of the environment in the play.



Activity Sheet 1

Music, Stage 2

Here are some examples of sounds made through body percussion.



Tap it!



Clap it!



Slap it!

What sounds can you make to recreate your environment?
Draw them in the boxes below and label the sounds they make.

Activity Sheet 1

Drama, Stage 3

Plan out your play in the area below and then, as a class, write your play script.

Characters	
Start	
Middle	
End	



Activity Sheet 2

Music

Write your song about climate change in the space below.

Verse 1 – Stage 1 students

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Verse 2 – Stage 2 students

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Verse 3 – Stage 3 students

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Chorus

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Fast Fact

Climate change affects habitats, ecosystems and in turn species.

Glossary

**Abiotic**

Non-living, not associated with or derived from living organisms. Abiotic factors include sunlight, temperature, wind patterns and precipitation.

Biodiversity

The variety of all living things on earth

Biotic

Of or relating to living things, especially in their ecological relations.

Bird

Warm-blooded animal with feathers and forelimbs modified to form wings.

Conservation

The preservation of culturally and scientifically significant natural areas.

Ecosystem

A community of plants and animals interacting with one another and the surrounding environment.

Endangered

At risk of becoming extinct.

Endemic

Native or confined to a certain region.

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.

Extinct

A species that has no living representative.

Fauna

Animals

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.

Habitat

The place where a plant or animal naturally lives or grows.

Invertebrate

Lacking a backbone or spinal column.

Native

Environments, plants and animals that are original inhabitants in an area.

Pest

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

Phasmid

Large cylindrical or flattened mostly tropical insects with long strong legs that feed on plants; walking sticks and leaf insects.

Species

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

Threatened species

A plant or animal that is at risk of becoming extinct.

Vertebrate

Having a backbone or spinal column.



Extinctions on Lord Howe Island

After settlement

Common name	Scientific name
bridal flower	<i>Solanum bauerianum</i>
native cucumber	<i>Sicyos australis</i>
Lord Howe swamphen	<i>Porphyrio alba</i>
white throated pigeon (Lord Howe Island)	<i>Columba vitiensis godmanae</i>
red-crowned parakeet	<i>Cyanoramphus novaezelandiae subflavescens</i>
vinous tinted thrush	<i>Turdus poliocephalus vinitinctus</i>
Lord Howe warbler	<i>Gerygone insularis</i>
Lord Howe fantail	<i>Rhipidura fuliginosa cervina</i>
robust silvereye	<i>Zosterops strenua</i>
Lord Howe starling	<i>Aplonis fuscus hullianus</i>
Island subspecies of owl	<i>Ninox novaezeelandiae undulata</i>

Natural extinction

Common name	Scientific name
terrestrial chelonian turtle	<i>Meiolania platyceps</i>
penguin	<i>Eudyptula minor</i> (probably)
white-faced storm petrel	<i>Pelagodroma marina</i>
pigmy gadfly petrel	<i>Pterodroma</i> sp.

For more information

Biodiversity

Office of Environment and Heritage

www.environment.nsw.gov.au/biodiversity/index.htm

**Australian Government - Department of Sustainability,
Environment, Water, Population and Communities**

www.environment.gov.au/biodiversity

Australian Museum

www.australianmuseum.net.au/Biodiversity

Environmental Education in Schools

New South Wales Government

www.sustainable.schools.nsw.edu.au

NSW Department of Education and Training

www.curriculumsupport.education.nsw.gov.au/env_ed/index.htm

Lord Howe Island

Lord Howe Island Tourism Association

www.lordhoweisland.info/conservation.htm

Environmental Calendar

www.environment.gov.au/about/media/events/index.html



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