



## **Biology**

# **Biodiversity: Eco-rescue**

Human activities are putting the rich diversity of life on Earth under pressure. With human requirements only likely to grow we will have to be smart to meet our needs and protect our natural heritage.

In this lesson you will investigate the following

- What is biodiversity and why is it so important?
- How do human activities threaten biodiversity?
- How can we conserve biodiversity?
- Where should our next national park be located?

So, let's join the battle against extinctions!



This is a print version of an interactive online lesson. To sign up for the real thing or for curriculum details about the lesson go to [www.cosmosforschools.com](http://www.cosmosforschools.com)

# Introduction: Biodiversity (P1)



**As the human population grows and we build houses, roads and farms on their natural habitats, wild animals have less room to live.** This has led to extinctions on a scale we have never seen before.

To try and save some places for animals we set aside land in national parks. But in a new study scientists say that we aren't doing a very good job with this, protecting few of the most threatened species.

Protected areas now cover 13% of the world's land surface and the target for 2020 is 17%. That may sound good, but it will adequately protect only 21% of the world's threatened species. That's because the land chosen for parks is usually what's left after the best land has been taken for human purposes. It comes down to money, and it would cost a lot to fully protect all threatened species – \$35 billion a year the scientists estimate. That's compared to \$4.9 billion a year to set aside low-value land.

But it is not all bad news.

The scientists say that we could protect half the world's threatened species at just 1.5 times the cost of the way we do things now. Governments would still need to set aside some high-value land, but with such a benefit in the number of species protected, people may well be happy to accept the cost.

After all, biodiversity is valuable for everyone, even if that value can't always be measured in money terms.

Read the full *Cosmos* magazine article [here](#).



What's more valuable: bushland or a new hospital?

### Question 1

**Argue:** Your local government is proposing to build a new hospital to service the needs of a growing population. The intended site for the hospital is currently native bushland. Write two reasons that might be given in favour of building the hospital at this location, and two reasons that might be given to find another site.

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# Gather: Biodiversity (P1)

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## What is biodiversity?

*Biodiversity* – short for biological diversity – refers to the variety of life on Earth.

Biodiversity is all around us, from high altitudes to deep ocean trenches. It includes organisms of all types, from microscopic bacteria, fungi and algae to complex plants and animals.

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### *Did you know?*

One study estimated that there are approximately 8.7 million species on the planet, but only a fraction of these have been named.

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## Poll 1

**Predict:** Before answering Question 1 predict the number of currently named species.

**i** The poll only works in Stile, sorry!

Less than 1,000,000

Between 1,000,000 and 2,000,000

Between 2,000,000 and 5,000,000

More than 5,000,000

## Question 1

**Calculate:** Examine the illustration below. What percentage of known species are mammals?

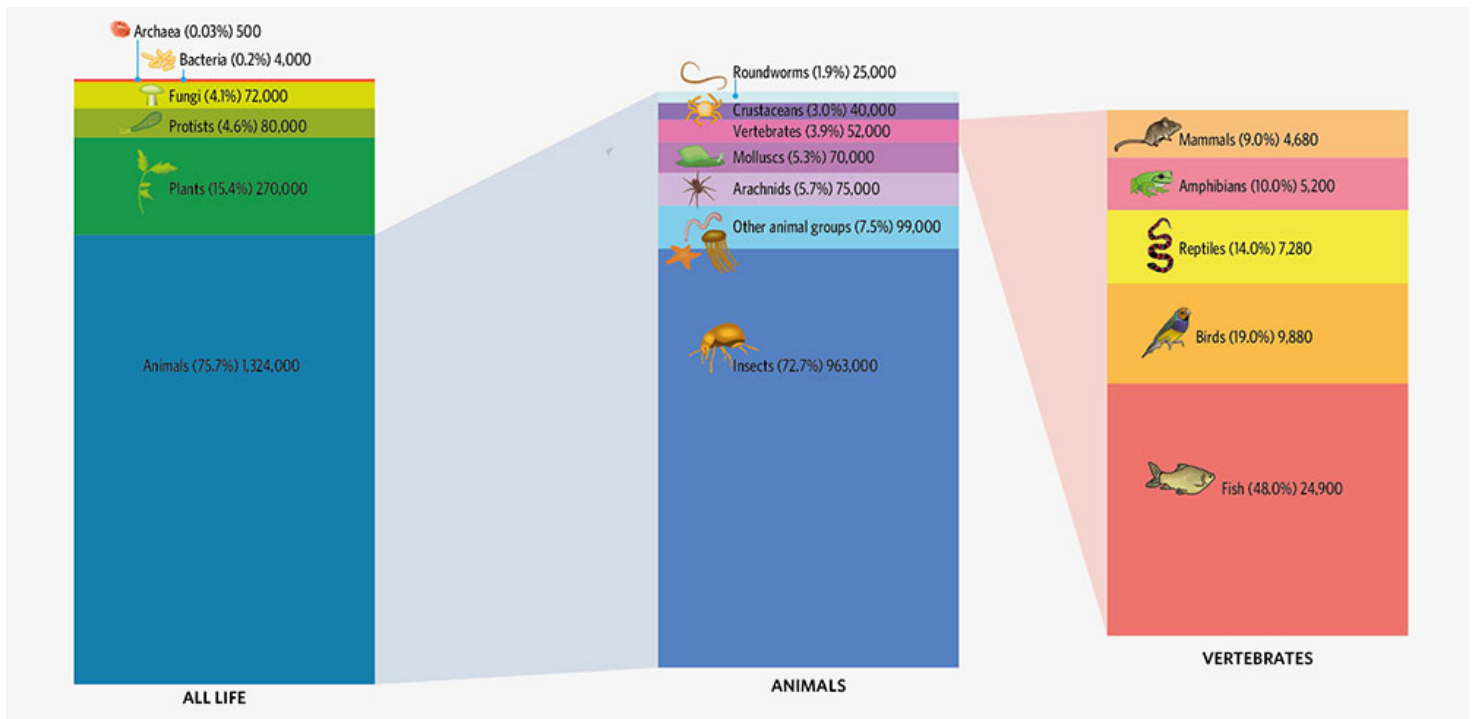
*Hint: An estimate of the total number of known species is shown in the diagram.*

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There are over 1,750,000 known species, with more being discovered all the time. This graphic shows you the percentage and number of species known for all life, animals and vertebrates. Illustration by Kate Patterson / MediPics and prose.

## Question 2

**Calculate:** A study in 2009 found that there are 21,171 plant species in Australia and that 86% of these are *endemic*, meaning that they are found nowhere else on Earth. Calculate how many known Australian plant species are endemic.

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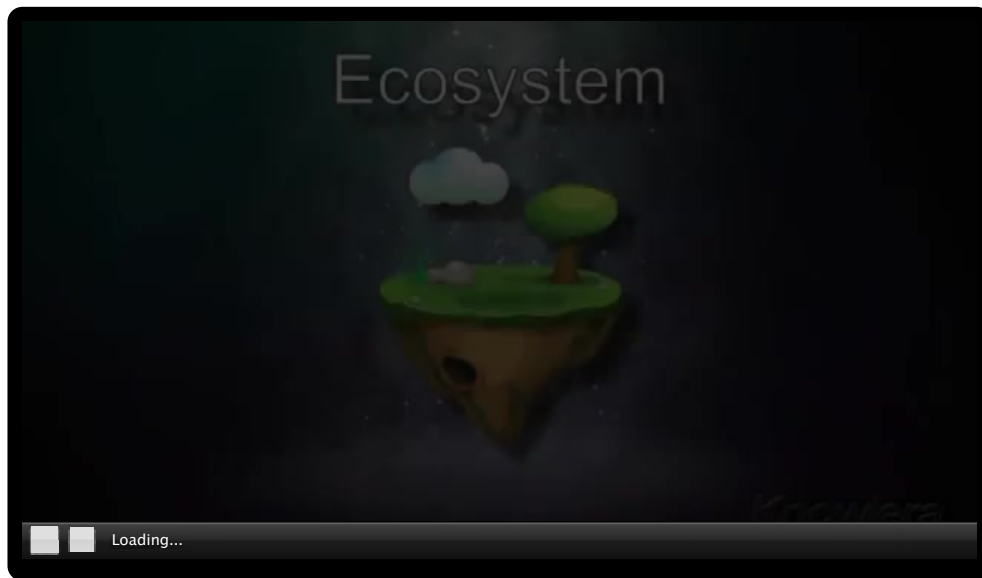
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## Levels of biodiversity

Biodiversity is usually considered at three different levels: *species diversity*, *genetic diversity* and *ecosystem diversity*.



 Question 3

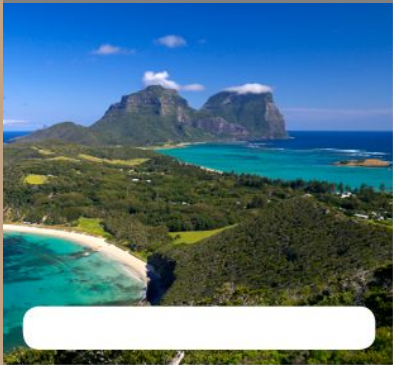





**Define:** In the sketchpad below draw lines that match the terms with their definitions.

GENETIC DIVERSITY	Describes the variety of ecosystems within a geographic area, or the whole Earth
SPECIES DIVERSITY	Describes the variety of genetic information within a species
ECOSYSTEM DIVERSITY	Describes the variety and relative abundance of species living within an ecosystem

 Question 4

**Classify:** Which level of biodiversity (*species, genetic* or *ecosystem*) is represented in each of the following images?

*Hint: There are two of each level.*

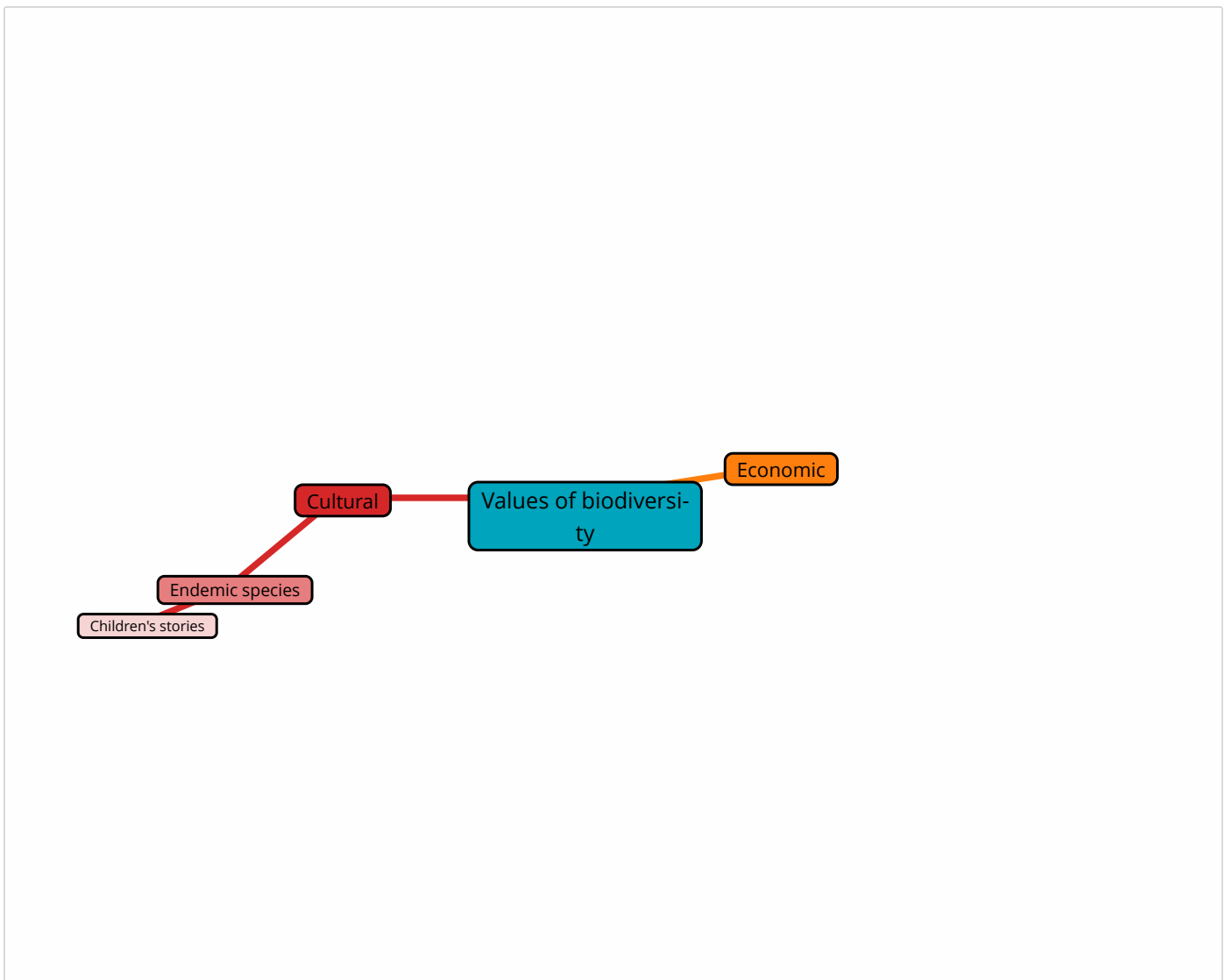
 <input type="text"/>	 <input type="text"/>	 <input type="text"/>
 <input type="text"/>	 <input type="text"/>	 <input type="text"/>

## Why is biodiversity important?



### Question 5

**Classify:** Complete the following mind map illustrating why biodiversity is valuable to us. Use examples from the video and add any other points you may think of.





## How is biodiversity being threatened?

The scientific community has linked an accelerated rate of biodiversity loss to human activity.



### Question 6

**Classify:** Habitat loss and invasive species are the two most significant threats to biodiversity in Australia. Describe some actions that can be taken to address these threats.

Threat to biodiversity	Actions to address this threat
<i>Habitat loss</i>	
<i>Invasive species</i>	

### Question 7

**List:** State two additional threats to Australia's biodiversity.

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# Process: Biodiversity (P1)

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## How can we conserve biodiversity?

There are two main approaches to conserving biodiversity:

1. *In-situ* conservation – protecting species within their natural environments. This can involve nominating areas as nature reserves and national parks.
2. *Ex-situ* conservation – managing species away from their natural habitats by placing them, for example, in botanic gardens, wildlife parks and zoos.

Environmental scientists generally agree that both approaches have a positive role to play in conserving biodiversity.



## Question 1

**Judge:** Using national parks and zoos as examples of *in-situ* and *ex-situ* conservation approaches, which of these two approaches do you believe is more effective for conserving biodiversity?

*Hint: You may share ideas about this task in the discussion board at the bottom of this page. If it is closed ask your teacher to open it.*

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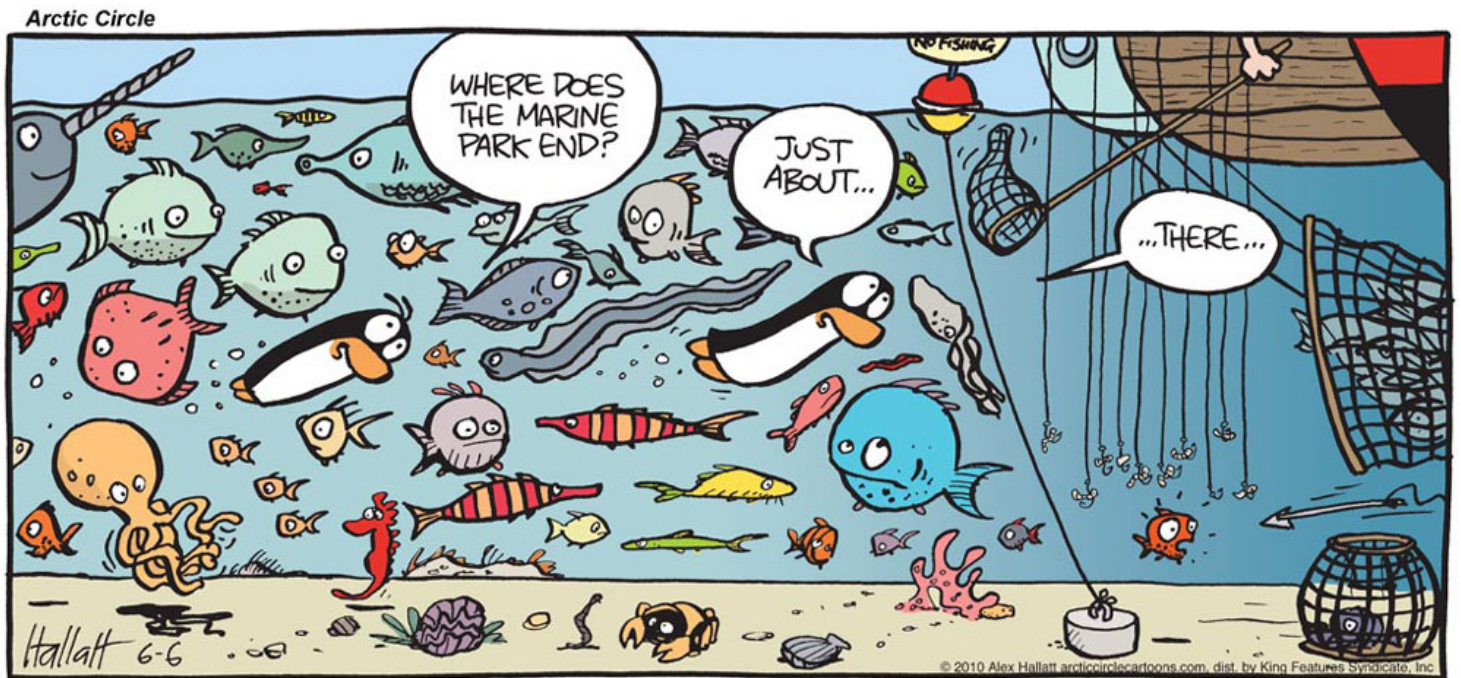
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The *Cosmos* article "How to make national parks more efficient at saving animals" highlights two main challenges facing the expansion of protected areas:

- National parks and nature reserves do not often cover the regions where the most vulnerable species live;
- The land can be used for other purposes, often agriculture.

Making the right decisions about which areas to protect is critical for preserving biodiversity. The decision-making process can become even more challenging when the areas being considered for protection are oceans.



## Question 2

**Infer:** What messages do you think the cartoonist is intending to communicate in the above cartoon?

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### Question 3

**Relate:** Many different people and organisations can be affected, both positively and negatively, by a decision to designate a new marine park. These people and organisations are collectively referred to as *stakeholders* and may include fishermen, government, conservation groups, scientists and tourists.

Propose one way that each of these stakeholders might be affected, either negatively or positively, by the proposal of a new marine park.

Stakeholder	How the stakeholder might be affected by the marine park proposal
Fishermen	
Government	
Conservation groups	
Scientists	
Tourists	

### Question 4

**Imagine:** Compared to the ocean fish tanks have very little biodiversity. If you were a fish, where would you rather live? Why is that?

Create a promotional poster to invite other fish to join you in your preferred habitat. Reference at least one aspect of biodiversity on your poster.

*Hint: You may wish to complete your poster in the project space below or complete it on paper, scan it then upload it as an image.*

# Apply: Biodiversity (P2)

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Where should our next national park be located?



Imagine you are a member of a team employed by the Australian Minister for the Environment. You have been assigned the task of researching possible locations for Australia's next national park.

As part of your preliminary research you have met with a team of scientists, headed by Professor David Lindenmayer, from the Australian National University. These scientists are campaigning for a new national park in the central highlands of Victoria.



Campaign for The Great Forest National Park, central highlands of Victoria.

However, the new national park would mean an end to native timber harvesting in the highlands and the potential for many jobs lost in towns reliant upon the timber industry – the timber industry employs 24,000 people in the state of Victoria. There are also concerns that heavy equipment used to fight forest fires would not be able to access the area if it was set aside as national park.



## Question 1

**Evaluate:** As part of your decision-making process you should evaluate the following factors:

- why the central highlands of Victoria might be a suitable location for a new national park;
- how this new national park could preserve the values and benefits of biodiversity; and
- what challenges might be encountered in creating this new national park and how these might be addressed.

You may choose to present your findings to the minister as a written report or a poster. Your report or poster may be compiled in the project space below or uploaded as a separate file.

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You may find the following websites helpful for your evaluation.

*Against the new national park:*

- [VicForests information PDF](#)
- [The Age article](#)

*In favour of the new national park:*

- [Great Forest National Park website](#)
- [ABC article](#)
- [The Conversation article](#)

# Career: Biodiversity (P2)



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**Lucas Joppa grew up in a tiny town in the backwoods of northern Wisconsin, USA – a town so small it was nearly 50 km to the closest set of traffic lights.** So it's no surprise he spent most of his time outdoors and was captivated with nature. He was especially curious about why animals live where they do.

Now he is a computational ecologist and head of the Conservation Science Research Unit at Microsoft Research. His job is to develop mathematical and statistical models that can predict how ecological systems work, and how other factors – such as climate change and deforestation – impact them. Then he brainstorms new ways to conserve them, and figures out how to make the best ideas work.

There is no “average work day” for Lucas – but that’s what he likes most about his job. Sometimes he can be found in his office writing computer code or drafting research papers; other times he is travelling around the world to meet with PhD students, wealthy businesspeople or government officials.

But he loves any day that new toys get delivered to his doorstep. As the founder of the Technology for Nature Unit at Microsoft, Lucas gets to tinker with quadcopters, unmanned aerial vehicles and robots. His unit looks at creative new ways to use technology to help wildlife conservation efforts around the world. He is now focused on using quadcopters to help track species populations by flying them over national parks to collect data from animals tagged with GPS tracking devices.

Lucas still loves doing the same things he did growing up – spending time outdoors hiking, biking, or canoeing. He especially loves when he gets to spend time with his family while exploring nature – the two things he cares about most.



## Question 1

**Propose:** Lucas' job has a great contrast built into it – he's using computers and high-tech gadgetry to help keep ecosystems in their natural state. Describe some of the ways that you know of that technology is helping to conserve nature. Can you think of other ways that technology could help, possibly with technologies of the future?

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***Biodiversity: Eco-rescue credits***

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**Video credits:** MonkeySee, CSIRO, NSWNatParks, Chloe Rossman, drawingthelinefilm, ABC, Great Forest National Park and YouTube.