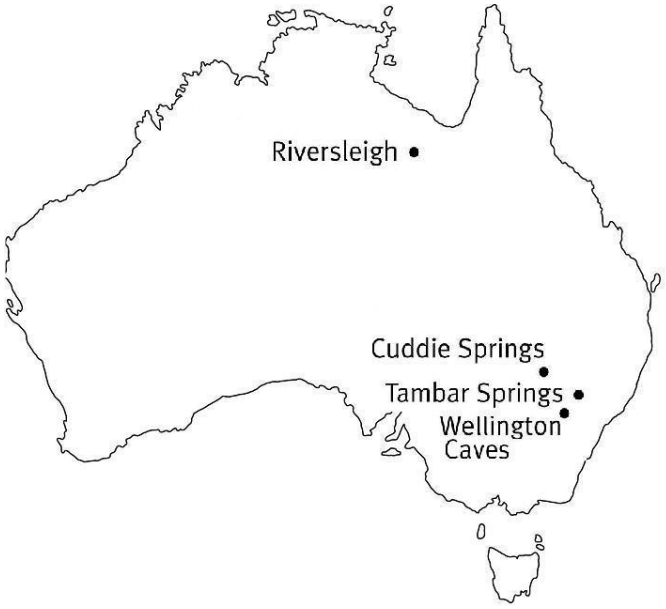
Activity 1: Examining a fossil site

Identifying fossils from Wellington Caves

1. All the fossils in this activity were found at Wellington Caves, NSW.

   Use the megafauna information cards to help you match each fossil listed below with its appropriate body part and type of megafauna by drawing connecting lines (one has been completed for you).



Fossil	Body part	Megafauna
1	toe	
2	rib	Marsupial lion
3	lower jaw	*Diprotodon*
4	vertebra	
5	lower jaw	*Megalania*
6	incisor tooth	
7	molar tooth	Giant Short-faced Kangaroo
8	lower jaw	
9	vertebra (large)	Tasmanian Devil
10	foot bone	*Genyornis*

Estimating the size of *Megalania*

2. The megafauna information card shows an illustration of *Megalania* – the Giant Goanna – which is now extinct. Using the fossil vertebra of *Megalania*, you can estimate its full size by using a ratio based on the proportions of modern goannas.
   Measure the length of the *Megalania* fossil vertebra (from the outer edge of the socket to the outer edge of the ball). Then multiply the fossil measurement with the modern lizard ratio numbers.

	Length of vertebra (cm)	**Distance between front and back legs (cm)**	**Total length of animal (cm)**
Modern lizard ratio	1	18	90
Megalania			

3. What generalisation can you make about the size of *Megalania* and the other megafauna whose fossils were found at Wellington Caves?

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Interpreting the fossil deposits in Wellington Caves

4. We have not given you the whole picture. What extra pieces of information would help to both reconstruct the environment these animals lived in, and investigate how these animals ended up in Wellington Caves? List five things.

   Hint: It wasn't a big party of animals that all fell into the cave at once!

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Back at School

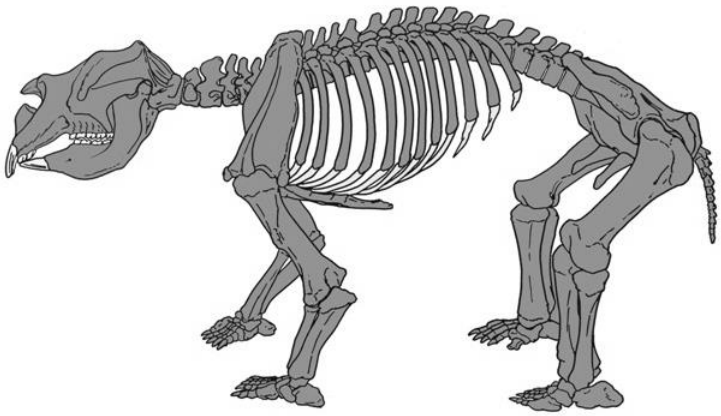
Describe the diversity and number of organisms found in Wellington Caves. You might like to look at the Naracoorte Caves website (http://www.naracoortecaves.sa.gov.au). What similarities can you find between the Naracoorte Caves and Wellington Caves fossils?

Activity 2: Why did the Megafauna become extinct?

AUSTRALIAN MUSEUM

Diprotodon fossils

1. Look closely at the skull and teeth specimens of the extinct *Diprotodon*.
   Describe its teeth in the table below.



Teeth	Description
molars (back teeth) • number • general height of ridges	
incisors (front teeth) • number • arrangement within the upper and lower jaws	

2. Read the **Evidence A** card. What group of herbivores do you think the *Diprotodon* belonged to? What kind of food would it have eaten?

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_____

3. Explain how examining the teeth may give us a clue to why these megafauna became extinct?

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Reasons for Extinction – Climate Change

4. Read the **Evidence B** card. Explain how a change to drier conditions might have affected the larger animals in the environment.

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Damage caused to a *Diprotodon* rib

5. Look at the **Evidence C** card. This is a photo of a fossilised *Diprotodon* rib and a close-up of one end showing damage from an object with a **sharp tip**.

   The mark was made either immediately **before** the *Diprotodon's* death or **soon after** because it was made on 'green' bone. Marks made on dry bone look very different.

6. Examine the mark. What objects **may** have caused this mark? For each possibility you come up with state your reasons or observations. Provide two potential causes from environmental reasons and two from human impact.

Possible cause	My reason	Problems
Bullet from a gun	It's quite a deep, round hole and about the right size.	Guns were not invented at this time.

7. Does this rib provide evidence that the *Diprotodon* was hunted by Indigenous people? Use your suggestions from the table above in your answer.

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Cuddie Springs

8. Examine the diagram in the **Evidence D** card, "Layers of the Past", which describes the findings at Cuddie Springs, an ancient lake bed in inland NSW.

9. If you read from top to bottom of this profile are you moving back in time or forward? Explain?

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10. Summarise the data from the evidence card into the table below.

Depth below surface	**Time** (years ago)	**Climate**	**Layer contained**
Less than 100cm			
	28,000		
		Becoming drier	
			• marshy plant material • tools with megafauna bones
More than 172 cm			

11. Using the evidence comment on whether it shows any interaction between Australia's first peoples and megafauna.

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12. Do you think this provides evidence that the megafauna were hunted to extinction?

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Human arrival and megafauna extinctions

13. Examine the **Evidence E** card. It compares the onset of megafauna extinctions with **human arrival times** in Australia, North America and New Zealand (**note** the white circles on the diagram).
    Complete the table below to show how much time elapsed between these two events in the three countries.

	Approximate arrival of humans (years ago)	**Approximate megafauna extinction begins** (years ago)	**Approximate end of the main megafauna extinction period** (years ago)	**Approximate length of extinction period** (years)
New Zealand	2,000			
North America		13,000		
Australia			35,000	

14. Did megafauna become extinct after the arrival of humans in each of these countries?

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15. Describe any difference in extinction pattern between the countries.

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16. Which country do you think presents the strongest case for human impact on megafauna extinction? Explain?

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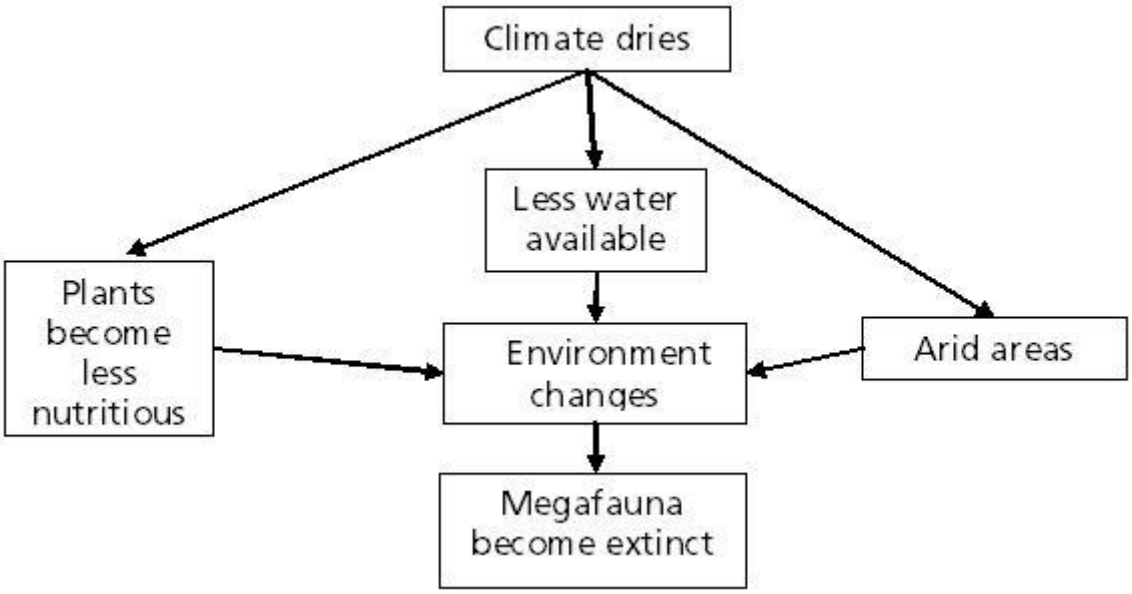
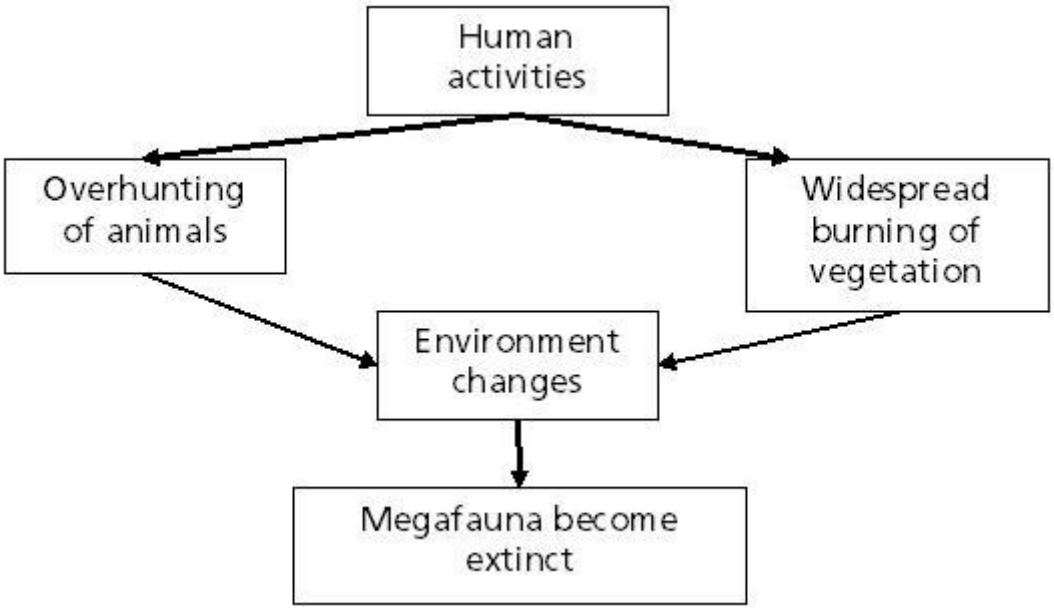
Summary

There are two mains lines of thinking about megafauna extinctions.

Climate change hypothesis



Human impact hypothesis



17. Examine the flowcharts and analyse which of the two hypotheses is better supported.