

# CAVING 101

## Ngilgi Cave - Primary Student Pack, Years 4-6

Educational outdoor activities for kids that invoke wonder and respect for our amazing natural landscape.



YOUR  
MARGARET  
RIVER  
REGION





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## Booking Your Ngilgi Cave Field Trip

To book your tour of Ngilgi Cave or request a copy of our Teacher Guide contact us on the details below:

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# Overview

## **Aim:**

This package is designed to support an excursion to Ngilgi Cave and the Yallingup precinct for years 4-6 students.

## **Upon completion of this package students will:**

- have knowledge about the settlement of the southwest, discovery of the caves and the development of tourism in the region
- be familiar with the stories surrounding Ngilgi Cave from the point of view of Indigenous Australians and European settlers
- be able to identify the common cave decorations and understand the geological and chemical forces which influence the growth of caves and cave formations
- have identified and examined the flora and fauna which exist in the unique cave environments
- have examined the biological adaptations of cave fauna to suit their environment
- be able to identify how weather conditions and human interaction can change the cave environment



# Curriculum Links



## Curriculum Framework Links

The following chart summarises key curriculum achievement standards covered by this unit of work. The resource materials and activities have been developed to achieve a range of outcomes and be relevant to the new ACARA - Australian Curriculum.

## Australian Curriculum Assessment and Reporting Authority - The Australian Curriculum

Science	English	History	Cross Curriculum Priorities
<p><b>Science Understanding</b> <i>Biological sciences</i></p> <p>Living things have structural features and adaptations that help them to survive in their environment.</p> <p><i>Chemical sciences</i></p> <p>Solids, liquids and gases have different observable properties and behave in different ways.</p> <p><i>Earth and space sciences</i></p> <p>Sudden geological changes or extreme weather conditions can affect Earth's surface.</p> <p><b>Science as Human Endeavour</b> <i>Use and influence of science</i></p> <p>Scientific knowledge is used to inform personal and community decisions.</p>	<p><b>Language</b> <i>Language for interaction</i></p> <p>Understand that patterns of language interaction vary across social contexts and types of texts and that they help to signal social roles and relationships.</p> <p><i>Text structure and organisation</i></p> <p>Understand how texts vary in purpose, structure and topic as well as the degree of formality.</p> <p><b>Literacy</b> <i>Interacting with others</i></p> <p>Clarify understanding of content as it unfolds in formal and informal situations, connecting ideas to students' own experiences, present and justify a point of view.</p> <p><i>Interpreting, analysing, evaluating</i></p> <p>Navigate and read texts for specific purposes applying appropriate text processing strategies, for example predicting and confirming, monitoring meaning, skimming and scanning.</p>	<p><b>Historical Knowledge and Understanding</b> <i>The Australian Colonies</i></p> <p>Aspects of the daily life of the inhabitants (including Aboriginal Peoples and Torres Strait Islander Peoples) and how the environment changed.</p> <p>The role that a significant individual or group played in shaping a colony.</p> <p><b>Historical Skills</b> <i>Perspectives and interpretations</i></p> <p>Identify points of view in the past and present</p>	<p><b>Sustainability</b></p> <p>The biosphere, including all life forms, relies on the interdependence of social, economic and ecological systems. We recognise that by valuing and actioning sustainable practices as individuals and communities we are preserving our environment for the future.</p> <p><b>Aboriginal and Torres Strait Islander histories and cultures</b></p> <p>The Wardandi people of the southwest maintain a special relationship with the land, sea, sky and waterways. Their knowledge of the local area is extensive and they have lived in this area for tens of thousands of years. Their language and history are intrinsically linked to local flora and fauna and landscapes.</p>

# Topic Web

Your visit to Ngilgi Cave can be used as a springboard to explore a range of topics surrounding caves. You might like to consider the following:



# The Dreamtime Story of Ngilgi

Whenever there was a fierce storm at Yallingup and mighty waves crashed up the beach with reaching arms of white foam looking as if they were trying to make their way up the valley, our old people would look out across the ocean and memories would return to them of the past and what was told to them many, many years ago and told to the Elders before them. They would re-tell the story of Ngilgi (a good spirit of the ocean), the spirits of thunder, lightning, rain, waves and wind and Wolgine (the bad spirit who once lived in the cave).

The story goes like this - a long time ago the entrance to the big cave at Yallingup was near the ocean where the little brook comes out. Food was plentiful and the Aboriginal people used to collect their water from the entrance to the cave. Then an evil spirit called Wolgine began lurking in the cave. Wolgine caused the water hole to dry up, food to be scarce and drew unwary people into the great hole of darkness - never to be seen again.

Ngilgi was a good spirit who lived in the ocean and always kept a watchful eye on the tribes of Aboriginal people in the area. Feeling how sad his people were because of the loss of their loved ones and seeing the suffering of his people, Ngilgi decided to do something about Wolgine. He spoke with other good spirits of the ocean and together they planned to rid the district of the evil spirit Wolgine.

So the spirits of the waves, the wind, the rain, thunder and lightning joined together and made the most terrifying storm. Thunder and lightning went rolling and flashing across the sky and the fierce wind and rain went racing across the sea. The ocean formed itself into the biggest and highest king waves ever. The wind pushed the huge waves along and the sea rose up and up into the entrance of the cave. Never before or since had there been such a storm.

A fierce battle followed - Wolgine was frightened. He was driven further and further into the cave with the sea following him. Finally, driven to the end of the cave he knew he was beaten and begged for mercy. The spirits, being good and kind, agreed and stopped the storm. Ngilgi told Wolgine he could go providing he never came back to the area again. So Wolgine burst out of the cave (creating the entrance as we know it today) and ran away as fast as he could - never to be seen again.

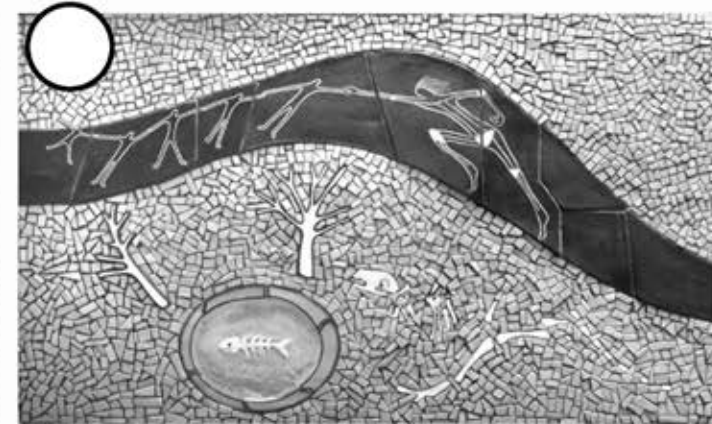
*-As told by Wardandi Elders*

# The Spirit Ngilgi

In the old days Australian Aboriginals did not use pen and paper to record history. Time and events were recorded in complex stories known as The Dreamtime or The Dreaming. The Dreamtime story of Ngilgi is a creation story for the cave and was passed on by elders of the Wardandi Tribe whenever there were large storms washing over the Yallingup region.

**1. The pictures here represent the events of the 'Story of Ngilgi' but are not displayed in the right order. Look at the pictures and read the story with your class.**

**2. After reading the story, number the pictures from 1 - 5 in the order you think they belong. Discuss your decision with your classmates.**



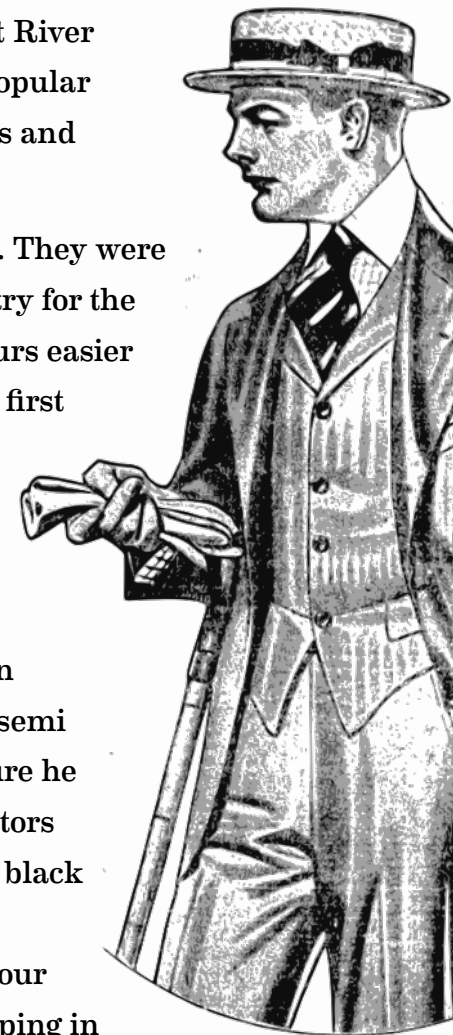
**3. Does anybody know any other Dreamtime stories they could share with the class?**

# Cave Wonderlands

The caves of the South West were first recorded by Mr G. Turner in 1848. He found two caves near Augusta and by the mid 1880s as groups of pioneers settled in the region many more caves were found. This area which became known as Margaret River was primarily known for its wood, wool, whale oil and cattle. In the 1890s however, the caves were becoming more popular and Mrs Fanny Brockman approached the Government to have these “underground treasures protected from vandals and thoughtless persons”.

In 1899 the Government reported that there were forty five caves in all, several of which could be developed for tourism. They were enthusiastic and saw the caves as a way of attracting visitors from interstate and overseas to build a major tourist industry for the state. A Caves Board was put together and stairways, ladders and platforms were fitted in a number of caves to make tours easier for visitors. Caretakers and cave guides were appointed and electric lighting systems were installed in several caves, the first being Ngilgi Cave. As a result of these improvements, visitor numbers doubled from 1400 in 1904 to 2875 in 1905. To further enhance the attractiveness of the cave’s reserve areas, a herd of wild deer were released into the forests. The idea was that wealthy visitors could come to the area, hunt deer and go caving. They have since died out.

Ngilgi became the first tourist attraction in Western Australia. It was discovered by Edward Dawson around 1899 and he remained head guide for over 37 years! Tours in those days were remarkably different to now. In 1906, admission was one shilling (approximately ten cents) and upon entering the cave, visitors stumbled along roughly cut pathways in semi darkness with only candles or kerosene lanterns to guide their way. When a guide wanted to point out a particular feature he lit a magnesium flare which gave off a brilliant light and illuminated the cavern for several seconds before plunging visitors back into darkness. Sometimes they used the stems of grasstrees to light up the cave but these gave off huge amounts of black smoke which was uncomfortable for viewers and stained the pure white formations. It was actually very fortunate that electric lighting was installed early on to limit the damage caused by other light sources. Visitors purchased a package tour which included travel from Perth to Busselton by steam train, a horse ride to Yallingup and accommodation either camping in the bush, staying with a pioneer family or at Caves House Hotel. Also, as it was quite a formal affair and mainly wealthy people used to visit the caves, men were commonly dressed in 3 piece suits and the women in dresses with sleeves and collars.





# Cave Tourism

Read the “Cave Wonderlands” article with your class and answer the questions below.

1. Which statements are true or false?

The caves were used to attract tourists to Western Australia. True / False

Ngilgi Cave was the first to receive electric lighting. True / False

In the early days, cave visitors travelled from Perth to Busselton by horse. True / False

2. What group was first responsible for protecting the caves and why? .....

.....

3. Name two ways cave guides would light up caverns before electric lighting was installed. Why was this a problem? .....

.....

4. How many more tourists were encouraged to visit Ngilgi Cave when electric lighting was installed? .....

.....

5. What animal was released into the surrounding forests and why? .....

.....

6. The caves of the south west were the first developed tourist sites in Western Australia. Do you think it is a good idea for

caves to become commercial tourist sites or should they be closed up, protected and preserved? Explain your answer.

.....

.....

.....

.....

.....

# Spotlight



Below is a list of words associated with our beautiful cave.

Find all the words below and see which one is left over.

The words run forwards, backwards, up, down and diagonal.

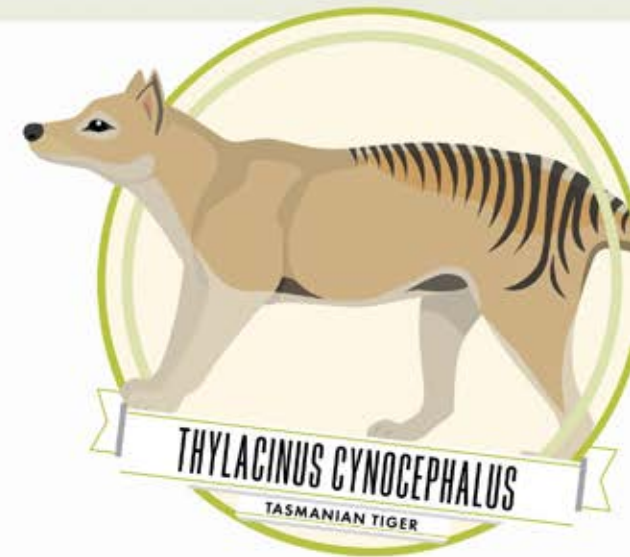
T S T O F L O S O E L A P V E M K  
 A S T A L A C T I T E T W L E I C  
 N B V G O G R A N C I S O I N N O  
 N S H A W L Y L L A G R L M I E E  
 I H O T S O S A O C L A G E C R L  
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 N M U L O C A M W A G T N T L L S  
 E V O C N I L I A R N A E O Y N S  
 O C N D E A S T D T H Y L N H O O  
 E T I T C I L E H S K Y R E T Y F

- |            |            |         |           |
|------------|------------|---------|-----------|
| Stalactite | Stalagmite | Shawl   | Flowstone |
| Cave       | Calcite    | Column  | Straw     |
| Tannin     | Limestone  | Karst   | Paleosol  |
| Wolgine    | Ngilgi     | Crystal | Thylacine |

*“Caves are very delicate natural systems and are virtually incapable of self repair. The very air you breath will upset the carbon dioxide balance of the cave, your boots will destroy the habitats of cave life, any rubbish ...will affect cave life forms.”*  
**Murray Thomas**

It takes approximately 100 years for stalactites at Ngilgi Cave to grow one centimetre long.

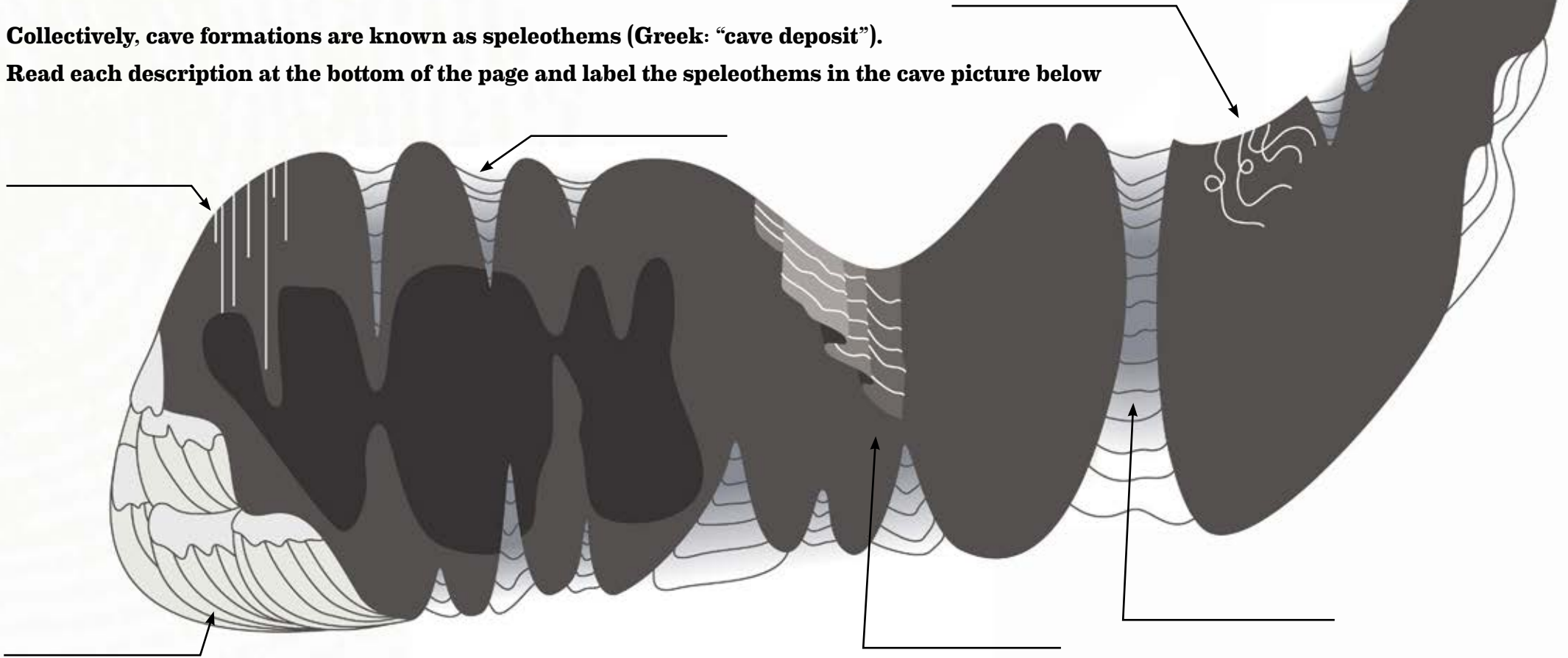
How many years would it take to grow your little finger if it was a stalactite?



# What's in a Cave?

Collectively, cave formations are known as speleothems (Greek: "cave deposit").

Read each description at the bottom of the page and label the speleothems in the cave picture below



**Stalactite** A decoration hanging from the cave roof, formed by dripping water

**Shawl** A sheet like formation created when water runs down an incline on the cave roof. It often looks like bacon.

**Stalagmite** A decoration growing upwards from the cave floor, formed by water dropping from the cave roof or stalactites.

**Column** When a stalagmite and stalactite join together they form a column.

**Straw** A thin hollow formation which looks like a drinking straw and hangs from the roof of the cave.

**Helictite** A straw like crystal that twists and curls in all directions. They are formed by surface tension and capillary action.

**Flowstone** A sheet of calcite covering the cave floor or wall. This forms when water is continuously running over a surface in the cave. It looks like it is flowing.

# Caves of the Leeuwin-Naturaliste Ridge

From Cape Naturaliste in the north to Cape Leeuwin in the south, runs the Leeuwin-Naturaliste Ridge (LNR). It is a huge stretch of limestone rock about 10 kms in width which lies between the two points. It is a young and porous limestone which is full of beautiful caves.

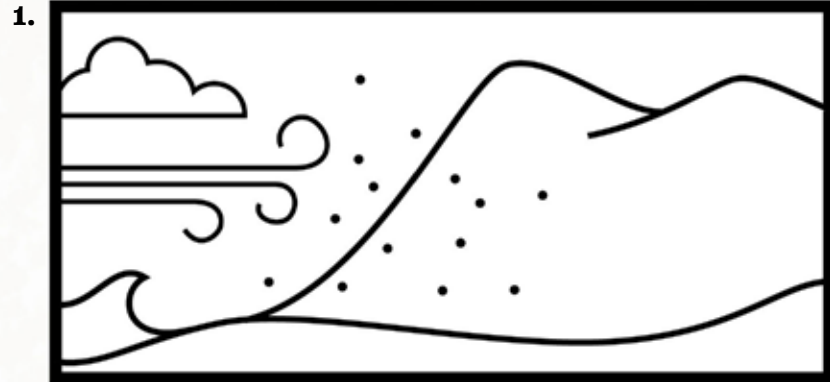
**On the diagram to the right, colour and label the following:**

- Draw a compass to the left of Cape Naturaliste. North should be pointing straight up.
- The straight distance from Cape Naturaliste to Cape Leeuwin is 100kms. Draw a scale to the right which shows 1cm = ? kms.
- Draw and label a dotted line for the Dunsborough Fault Line. It runs from Dunsborough straight down to Augusta heading just around the eastern side of Margaret River township.
- Colour in and label the land on the western side of the fault as the Leeuwin-Naturaliste Ridge.
- Using a different colour, colour and label the land on the eastern side of the fault as the Southern Perth Basin.

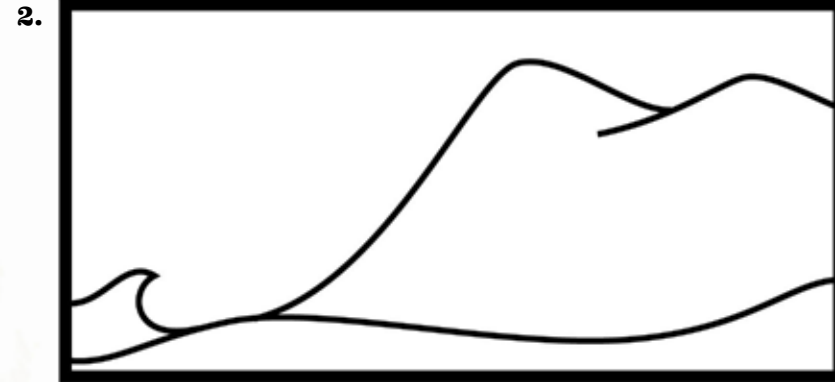


# How Caves Form

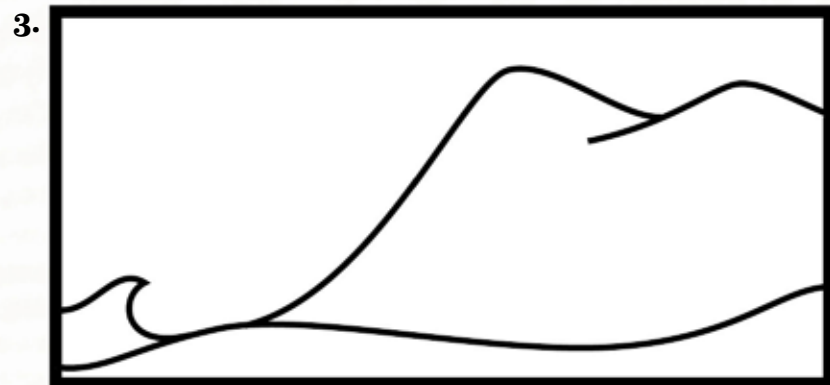
Below are four paragraphs describing how the caves in the LNR are formed. In the box above each description, draw a picture of what is happening. The first has been done for you.



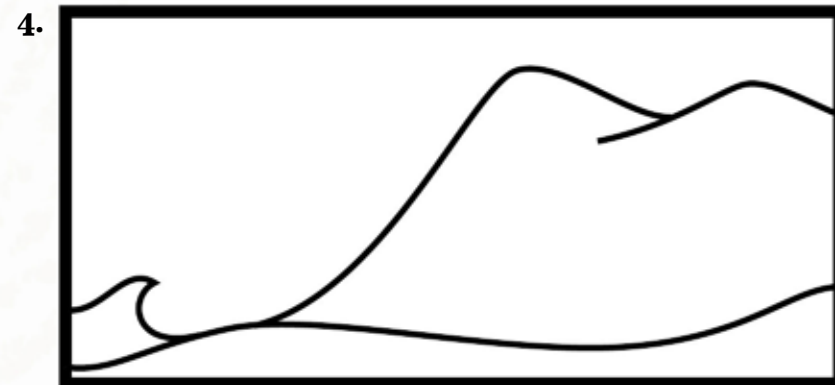
Sand, which is mainly made from broken bits of seashell (calcium carbonate) is blown up onto the shore by the wind. It forms sand dunes along the coast.



Water from rain washes through the sand dunes cementing them together and forming a thick layer of limestone in the base of the dunes.



Underground streams and waterways flow from inland through the limestone towards the ocean. They hollow out deep caves as they go.



Rainwater washes through vegetation on the surface of the dunes and dissolves the sand and limestone. This solution runs into the caves and solidifies as crystals on the ceiling, walls and floor of the caves.

# Calcite Crystal

Calcite crystal is formed through a chemical process. It is actually made of calcium carbonate, the same material as seashells, limestone or coral reef.



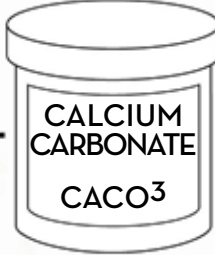
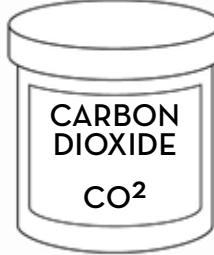


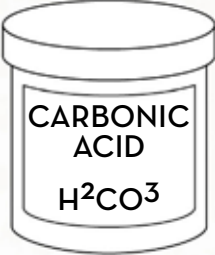




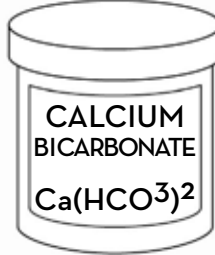


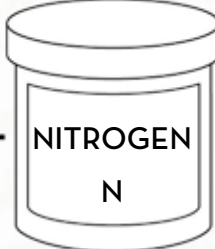
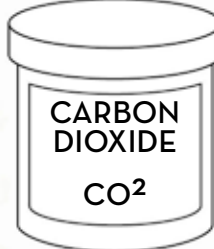
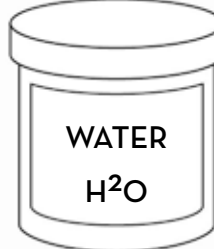

## How calcite crystal forms...

When rainwater moves through vegetation and down into the ground it mixes with **carbon dioxide** and turns into a weak acid called **carbonic acid**.

This **carbonic acid** dissolves and mixes with limestone (**calcium carbonate**). It forms a new solution called **calcium bicarbonate** which washes through the ground and possibly into a cave.

When **calcium bicarbonate** solution reaches a cave it releases **carbon dioxide** and **water**. This leaves behind a solid crystal called **calcite**.

After reading the description on the left, circle the ingredients used to make each of the following. (The last one is a bit different)

		+				=	
		+				=	
		-				=	

# Calcite Chemistry

Use the words in the box below to fill out the blanks in the chemical equations;

Carbon Dioxide  
Carbonic Acid  
Calcite Crystal  
Calcium Carbonate

1. Water + Carbon Dioxide = .....
2. Carbonic Acid + ..... = Calcium Bicarbonate
3. Calcium Bicarbonate - ..... = Water + Calcium Carbonate ( .....

## Grow your own crystals!

You can make your own crystals similar to those in our cave by using salt or sugar.

Follow the instructions below and make sure you get help from an adult when mixing hot water.

- Tie the string to a pencil. Set the pencil across the top of the glass jar and make sure that the string will hang into the jar without touching its sides or bottom. You want the string to hang nearly to the bottom.
- Boil the water. Be very careful to avoid getting splashed!
- Stir in the sugar, 1 teaspoon at a time. Keep adding sugar until it starts to accumulate at the bottom of the saucepan and won't dissolve even with more stirring. This means your sugar solution is saturated. (If you want coloured crystals, stir in a few drops of food colouring).
- Pour your solution into the clear glass jar. If you have undissolved sugar at the bottom of your container, avoid getting it in the jar.
- Place the pencil over the jar and allow the string to dangle into the liquid.
- Set the jar somewhere where it can remain undisturbed.
- Check on your crystals after a day. You should be able to see the beginnings of crystal growth on the string.
- Let the crystals grow until they have reached the desired size or have stopped growing.  
At this point, you can pull out the string and allow the crystal to dry. You can eat them or keep them.

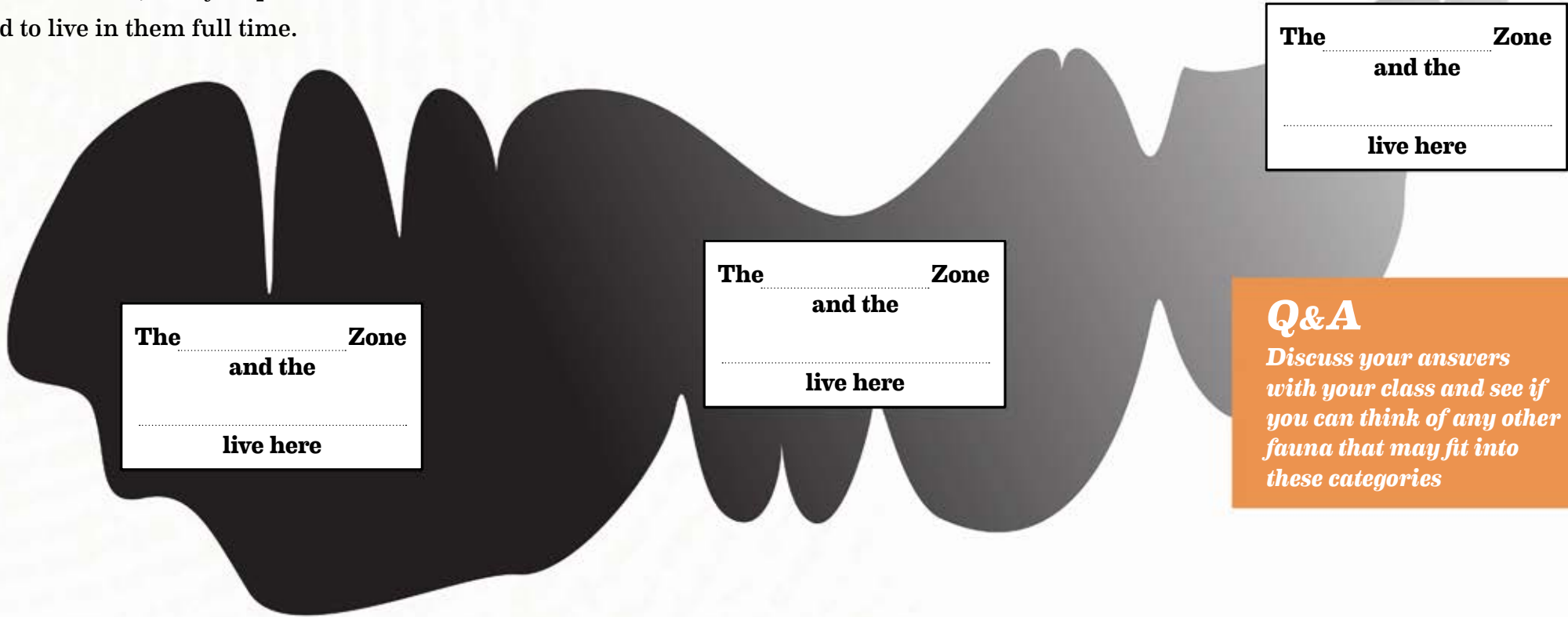
### What you will need:

- 1 cup water
- 3 cups table sugar
- 1 clean glass jar
- 1 pencil
- 1 rough string or kitchen twine
- 1 saucepan
- 1 stirring spoon



# The Twilight Zone

In a cave there is limited or no sunlight, this can make it very difficult for animals and plants to live and grow. There are however, many important flora and fauna which thrive in cave environments and some who have adapted to live in them full time.



The \_\_\_\_\_ Zone  
and the \_\_\_\_\_  
live here

The \_\_\_\_\_ Zone  
and the \_\_\_\_\_  
live here

The \_\_\_\_\_ Zone  
and the \_\_\_\_\_  
live here

**Q&A**  
*Discuss your answers with your class and see if you can think of any other fauna that may fit into these categories*

**There are three zones identified within a cave, these are;**

**The Daylight Zone** - lots of light.

**The Twilight Zone** - limited amounts of filtered light.

**The Dark Zone** - absolutely no light.

**Label the three zones on the image of a cave above.**

**Read the descriptions and copy the animals listed below into the areas of the cave you think they may use.**

**Trogloxenes** - are animals that use caves for shelter but cannot complete their life cycle in them, for example; bats and possums.

**Troglophiles** - these animals prefer life in a cave but can exist outside. They include; beetles, worms, frogs, crickets.

**Troglobites** - they have adapted to suit the cave environment and cannot exist outside the cave.

They include; isopods, centipedes, pseudoscorpions, millipedes, spiders and mites.



# Rad-aptations

Organisms adapt over long periods of time to suit their environment. For example, giraffes have long necks so they can reach the highest leaves and access more food. This gives them an advantage over shorter animals or even shorter necked giraffes!

**Discuss the animals in the table with your classmates. Fill in the blank spaces with the adaptation and the advantage it gives them over other species.**

Animal	Adaptation	Advantage
Fremantle Dockers Player	Bigger muscles	Kick more goals
Bird		
Echidna		
Snake		
Dolphin		

**There are two types of adaptations; behavioural and physical. Use the internet to research what these mean. Give an example of each.**

**Behavioural adaptation:** .....

.....

**Physical adaptation:** .....

.....



Isopods like the one pictured above are closely related to the Garden Slater you may find in your back yard. They have adapted to suit the cave environment which is completely dark and has very little food for energy. They have longer antenna and limbs, loss of eyesight, thinner, softer shells and they reproduce less.

**Which of these isopod adaptations are Behavioural or Physical? Write them in the boxes below.**

**Behavioural:**

**Physical:**

# Cave Conservation

Cave conservation has come a long way in the last 100 years. In the old days people were encouraged to take pieces of crystal home as souvenirs! Imagine if everyone did that, there would be nothing left for anyone to see. Luckily, these days we have great ways to minimise damage to the cave environment.

**Below are a couple of paragraphs about cave conservation, written by a school student who visited Ngilgi Cave. We have taken a few of the words out and put them in the box below. See if you can work out which word goes where?**

*Caving is great fun. Climbing over and around rocks is a good ..... and even better when I get to see amazing shiny crystals up close. Cave ..... however, grow very, very slowly.*

*They need my help to preserve them for the future so that ..... can use them for research and visitors can admire their natural .....*. There are a couple of ways I can minimise my impact on the cave but still have great time when I visit.

*Firstly, and most importantly, do not touch the ..... I know it is tempting but every time I touch them the ..... and oils on my hands make the formations dirty and stop them growing in the future. To prevent damage I could also wear ....., long ..... and a long sleeve shirt if I am adventure caving, this will also protect me from hurting myself.*

*The second most ..... thing is to make sure I stay on the path and always follow the guide or person in front of me.*

*This ensures that I don't step on anything ....., damage any sensitive parts of the cave or wander off somewhere ..... and hurt myself.*

*Lastly, ask lots of questions, because the more you know about caves the more you want to look after them!*

**Here is a list of clothing and gear used by cavers in 1903 and in 2015. Unscramble the words and put the item in the correct box, some answers may belong in both. The first is done for you.**

- |                        |                  |                |
|------------------------|------------------|----------------|
| <del>gavine itus</del> | heltem           | blimcgin ehoss |
| poer                   | sreds            | ostob          |
| haedtroch              | slegov           | stirf dia ikt  |
| nanterl                | arcame           | ckabcapk       |
| lednac                 | trhee eciep itus | mpa            |

1903:

2015:  
Caving Suit

# Careful Caving

The top row of this chart lists some of the ways human visitors impact on the cave environment. In the column underneath each heading write some suggestions for ways to limit or prevent damage from occurring. A couple have been done for you. Use the suggestions at the bottom to help you and discuss with your class after.

IMPACT	Electric lighting causes Lampenflora to grow	Foreign fungi and bacteria spread throughout cave by human interaction	Cave fauna die from people moving soil and mud or damaging tree roots.	Speleothems are damaged by hands and feet leaving dirt on clean crystals	Feet move huge amounts of soil with large numbers of visitors
METHOD OF PREVENTION	<ul style="list-style-type: none"> <li>• Use LED lighting systems which use less electricity, create less heat and reduce lampenflora.</li> <li>• Prevent people from carrying lampenflora throughout the cave on gloves or clothing.</li> </ul>				<ul style="list-style-type: none"> <li>• Limit access to the caves.</li> </ul>

- always stick to tracks in caves.
- avoid eating or drinking in caves where possible.
- close off highly sensitive areas from public access.
- install stairs, ladders and pathways if necessary.
- do not touch or interfere with tree roots.

- educate people about how sensitive cave environments are.
- have cave guides or leaders take people through caves.
- wear clean overalls when visiting caves.
- wear clean gloves if you must touch crystals.
- wipe feet when moving through a cave.

# Solo Expedition

## *After your visit...*

**Here are some activities which you can use back at the classroom to further enrich your learning experience.**

**Grow your own crystal** - with this extremely simple and hands on experiment, students can simulate growing their own stalactites by making sugar rock crystal in the classroom. Follow the links on our Books 'n' Bytes page for instructions and record the time it takes for the crystals to grow. Compare this to the way calcium in limestone is dissolved and crystals such as stalactites and stalagmites are grown. You can even eat them when you're done!

**History of the Wardandi people's spirits** - the Wardandi people shared a close relationship with Ngilgi cave a long time before European settlers discovered it. Using the information and images in this package, students can create a visual storyboard showing the story of Ngilgi and Wolgine. Discuss the importance of storytelling as a way of imparting knowledge. Investigate other Dreamtime stories and compare them to stories from other cultures.

**Create your own cave** - students can work individually or in groups to build their own cave. Using modelling clay and some cubes of sugar students can simulate the process of cave formation. Discuss what elements are required to make a cave, how long it takes and why it is so important that we protect these natural phenomena. See the Books 'n' Bytes page for links to directions for activities.

**Explore cave fauna and create your own Troglobite** - Investigate the fauna which exists in the daylight, twilight and dark zones of the cave. Find out the main characteristics of these rare cave fauna including, physiology, habitat and diet. Students create their own Troglobite, draw an illustrated picture of it, explain its diet and how it evolved to suit its environment.

**European exploration and cave conservation** - Do a fact finding investigation about the biggest, longest, deepest, oldest caves in the world. Research the history of European interaction with caves in the southwest of Western Australia. List and compare the positive and negative aspects of cave exploration and tourism. With internet research identify some of the ways caves are being protected now and some ways individuals can help to preserve them.

# Books 'n' Bytes

## *After your visit...*

Here are some great resources to assist you with your investigations:

### *Books...*

**Discovering Caves of Western Australia** - DEC, 2009, DEC

**Caves (Nature in Action)** - Kramer, S 1994, First Avenue Editions, Minneapolis

**Cave Wonderlands of Western Australia** - Rolsh Productions, 1995, Albany

### *Online resources...*

**[www.dpaw.wa.gov.au](http://www.dpaw.wa.gov.au)** - Department of Parks and Wildlife, viewed 22 October 2015. Search DPaW's website for a range of excellent cave related information.

**[www.glenwoodcaverns.com/pdfs/How-Caves-Form.pdf](http://www.glenwoodcaverns.com/pdfs/How-Caves-Form.pdf)** - How Caves Form, viewed 28/8/14. This great PDF simply shows students how limestone caves are formed.

**[www.glenwoodcaverns.com/pdfs/Create\\_A\\_Cave.pdf](http://www.glenwoodcaverns.com/pdfs/Create_A_Cave.pdf)** - Create a Cave, viewed 28/8/14. Part of the Glenwood Caverns Adventure Park website this information pack provides information and instructions for students to create their own cave using modelling clay and sugar.

**[chemistry.about.com/od/growingcrystals/ht/blsugarcystal.htm](http://chemistry.about.com/od/growingcrystals/ht/blsugarcystal.htm)** - About Chemistry.com: How To Grow Sugar Crystals - Make Your Own Rock Candy, viewed 28/8/14. This website provides instructions for students to create their own sugar rock crystals.

**[video.about.com/chemistry/How-to-Make-Rock-Candy.htm](http://video.about.com/chemistry/How-to-Make-Rock-Candy.htm)** - About Chemistry.com: How to Make Rock Candy, viewed 28/8/14  
This link leads to video footage explaining the process mentioned above.

