

# Hastings Cave and Thermal Springs



## Focus Topic: Cave Biodiversity (5–8)

This unit is designed to enable students to investigate the unique environment (abiotic factors) of a cave system, and to examine how the cave flora and fauna (biotic factors) have adapted to live there.

Students also learn about ways in which humans are impacting on the cave, both inside and out, and how scientists study the cave environment. They may conduct their own environmental investigation as part of their visit. Various recording sheets are available for students to use.



*Cave harvestman*

### Summary of Cave Visit Program

Ecological study techniques	Some possible activities:	Assessment for learning	Time
	<ul style="list-style-type: none"> <li>• Measure environmental factors inside and outside the cave.</li> <li>• Perform a linear transect survey into the cave with the Guide, looking at the plants and animals present in the zones.</li> <li>• Use appropriate field guides to identify the plants and animals in a particular area.</li> <li>• Collect evidence to identify what kinds of animals use the area, e.g. tracks and traces.</li> <li>• Take digital photos to record animals and plants and human interactions.</li> <li>• Observe behaviour of animal species.</li> <li>• Conduct scientific testing of rocks for calcium content.</li> <li>• Study physical adaptations of biota to cave habitats.</li> <li>• Compare the diversity of biota inside and outside the cave.</li> <li>• Research human activity around the cave (wood-felling and log extraction).</li> </ul>	<p>Assess students':</p> <ul style="list-style-type: none"> <li>• work as part of a team to conduct an ecological study</li> <li>• collect, record and interpret data</li> </ul>	<p>One-day field trip</p>



## Unit Reference

Standard	3/4
Stages	8–11
Year level(s)	5–8
Curriculum areas	Science
Strand(s)	<ol style="list-style-type: none"> <li>1. Science as a human endeavour (SHE)</li> <li>2. Scientific inquiry (SI)</li> <li>3. Scientific communication(SC)</li> <li>4. Science as a body of knowledge(SBK) <ul style="list-style-type: none"> <li>• Living things (LT)</li> <li>• Earth and space (ES)</li> </ul> </li> </ol>
Understanding goals	<ol style="list-style-type: none"> <li>1. Students will understand some ways in which scientists study cave environments, and why this work is important. (SHE)</li> <li>2. Students will understand how to quantifiably measure environment factors in a cave environment. (SI)</li> <li>3. Students will understand how to record and communicate the results of an ecological study. (SC)</li> <li>4. Students will understand that organisms have different characteristics which make them suited to living in particular cave environments. (SBK – LT)</li> <li>5. Students will understand the effect of humans' impact on the cave ecosystem. (SBK – LT)</li> </ol>

## Links to the Science Strands and Substrands

Strand/substrand	Possible key questions
Science as a human endeavour (SHE)	What do geologists and ecologists do? Why is their work important? How has technology influenced the way scientists work? How and why have the methods used by scientists changed over time? How does human activity impact on biodiversity in the cave system?
Scientific inquiry (SI)	What kinds of questions can be answered by ecological studies? How do scientists decide which questions they are going to investigate? How can ecological studies be conducted accurately?
Scientific communication (SC)	How do we identify different plants and animals? How can we record the results of ecological studies? How can we communicate our findings in similar ways to scientists?
Energy and force (EF)	How does energy flow through the cave ecosystem? What are the energy needs of animals with different lifestyles (e.g. inside/outside the cave)? What impacts can human energy production have on biodiversity in the short term and long term?
Matter (M)	How is matter cycled through the cave ecosystems?
Life and living (LL)	What adaptations do particular cave organisms have that suit them to their way of life/environment? What are some ways in which cave organisms interact with each other and the non-living parts of their environment? Have humans affected the population numbers of different cave organisms (e.g. extinctions, introduced species)?
Earth and space (ES)	How do changes that are occurring on Earth impact on cave organisms?

## Suggested Unit Plan

### Pre-visit

- Who discovered the caves and how were they explored?
- How are caves formed, what factors make up their environment and how do scientists measure them?
- What is different between the environment inside and outside the cave?
- Which plants and animals live in a cave and where?
- How are they adapted to life in the cave (structural, behavioural, physiological)?



### Cave visit

### Post-visit follow-up

- Develop a food/energy web for the cave system.
- Analyse the adaptations of biota to cave environment.
- Review human impact in the short/long term, including inside and outside.
- What positive and negative impacts have humans had/are they having on the cave ecosystem environment?
- Why are cave reserves important, globally and in Tasmania?
- Prepare presentation of work using multimedia (Facebook, PowerPoint, video, photos, artwork and written reports).

## Suggested Pre- and Post-visit Teaching Plan

<b>Activity</b> • concepts/main ideas	<b>Learning opportunities</b>	<b>Assessment and Teacher Notes</b>	<b>Length</b>
<p>1. <b>Pre-visit activities</b></p> <p><b>The geologist and ecologist</b></p> <ul style="list-style-type: none"> <li>• what do geologists and ecologists do?</li> <li>• Introduction to cave formation and structure</li> </ul>	<ol style="list-style-type: none"> <li>1 Ask class to brainstorm the question ‘What do Geologists and Ecologists study?’</li> <li>2 Divide class into groups. Give each group a field of study related to cave science e.g. cave exploration, finding out how caves are formed, working out how cave formations are formed, finding out how animals adapt to cave life, what makes up a cave environment.</li> <li>3 Use the internet to research what scientists in their field of study do. Some useful sites for conducting research: <a href="http://www.abc.net.au/catalyst/stories/by-date/2010/default.htm">http://www.abc.net.au/catalyst/stories/by-date/2010/default.htm</a> <a href="http://www.abc.net.au/science/ozfossil/megafauna/caves/default.htm">http://www.abc.net.au/science/ozfossil/megafauna/caves/default.htm</a> <a href="http://www.abc.net.au/science/ozfossil/megafauna/caves/activity-stalactites.htm">http://www.abc.net.au/science/ozfossil/megafauna/caves/activity-stalactites.htm</a> <a href="http://www.abc.net.au/local/audio/2010/05/10/2895127.htm?site=kimberley">http://www.abc.net.au/local/audio/2010/05/10/2895127.htm?site=kimberley</a> <a href="http://www.abc.net.au/rural/sa/stories/s1291222.htm">http://www.abc.net.au/rural/sa/stories/s1291222.htm</a></li> <li>4 Each group chooses a method of sharing their information with the rest of the class and reports back to the class (possibly as a role play, PowerPoint or photo story).</li> </ol>	<p><b>Assessment for learning</b></p> <p>Assess students’ understanding of:</p> <ul style="list-style-type: none"> <li>• the work of cave scientists</li> <li>• cave formation</li> </ul>	<p>Two x 50min lessons</p>
<p>2. <b>The cave habitats</b></p> <ul style="list-style-type: none"> <li>• Different parts of the cave habitats have different characteristics</li> <li>• Cave organisms are adapted to their environment</li> </ul>	<ol style="list-style-type: none"> <li>1. Look at <a href="http://www.goodearthgraphics.com/virtcave/helictit/helictit.html">http://www.goodearthgraphics.com/virtcave/helictit/helictit.html</a></li> <li>2. Discuss points such as:           <ul style="list-style-type: none"> <li>- how the environment inside a cave differs from outside</li> <li>- abiotic factors of cave environment such as temperature, light, humidity, substrate.</li> </ul> </li> <li>3. Divide class into four or five groups, and allot a different environment to each group. Ask each group to make a list of the living and non-living elements in their habitat. Groups choose two living and two non-living elements and write one in each corner of an A3 sheet of paper. Students then make as many connections between these elements as possible.</li> <li>4. Introduce the terms <b>adaptation</b> and <b>habitat</b>. Where possible, use illustrations or internet photos etc to show some examples.</li> <li>5. Allocate each group a particular cave organism and have students research their adaptations to the cave environment. Create a silhouette mobile or poster showing the adaptations. Present to rest of class and use as a class display. Choose an organism from the Parks and Wildlife slideshow or Hastings Cave fact sheet. <a href="http://www.parks.tas.gov.au/file.aspx?id=7062">http://www.parks.tas.gov.au/file.aspx?id=7062</a></li> </ol>	<p><b>Assessment for learning</b></p> <p>Assess students’ understanding of:</p> <ul style="list-style-type: none"> <li>• environment</li> <li>• the term ‘adaptation’</li> </ul>	<p>Three x 50min lessons</p>

<p><b>3.Optional: guest speaker – researcher</b></p> <ul style="list-style-type: none"> <li>• How cave scientists work</li> </ul>	<p>Invite a guest speaker from Southern Tasmanian Caverneers (<a href="http://www.lmrs.com.au/stc/">http://www.lmrs.com.au/stc/</a>) , Parks and Wildlife (<a href="http://www.parks.tas.gov.au/">http://www.parks.tas.gov.au/</a>) or Forestry Tasmania (<a href="http://www.forestrytas.com.au/">http://www.forestrytas.com.au/</a>) to come and talk about their work.</p>	<p><b>Assessment for learning</b></p> <p>Assess students' understanding of:</p> <ul style="list-style-type: none"> <li>• the role of guide, forester, scientist</li> </ul>	<p>One x 50min lesson</p>
<p><b>4. Post-visit follow-up Tasmanian cave reserves</b></p> <ul style="list-style-type: none"> <li>• Tasmania has declared cave reserves to conserve habitat and species, and for research, education and recreation</li> </ul>	<p>1. Discuss with students:</p> <ul style="list-style-type: none"> <li>• What is a cave reserve?</li> <li>• Has anyone visited a cave reserve? Where was it?</li> <li>• Where are the cave reserves in Tasmania? (<a href="http://www.parks.tas.gov.au/file.aspx?id=6426">http://www.parks.tas.gov.au/file.aspx?id=6426</a>)</li> </ul> <p>2. Ask students to research one cave reserve, and develop a guide for visitors (either PowerPoint or brochure), that shows:</p> <ul style="list-style-type: none"> <li>• location and directions to get there (include map)</li> <li>• what is special about the reserve, including details of notable formations and history, flora and fauna found there (include photos or video as possible)</li> <li>• why it was declared</li> <li>• activities that are and are not permitted in the reserve (e.g. logging, mining) and why these might affect the biodiversity.</li> </ul> <p>NB If internet is not available for students, print pages from the Parks and Wildlife website and copy for students as necessary.</p> <p>3. Give students a scenario in which it has been proposed a local area become a cave reserve. Ask students to list pros and cons of the proposal, and then justify their personal opinion.</p> <p>4. Select from the Activity Folder for each group to do.</p>	<p><b>Assessment for learning</b></p> <p>Assess students' ability to:</p> <ul style="list-style-type: none"> <li>• identify some of the different cave habitats/ ecosystems that occur in Tasmania</li> </ul>	<p>Three x 50min lessons</p>

<p><b>5. Food chains and webs</b></p>	<p>1. Use the online food web activities from the sites listed below to develop an understanding of food chains and webs.</p> <p><a href="http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm">http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm</a></p> <p><a href="http://www.gould.edu.au/foodwebs/kids_web.htm">http://www.gould.edu.au/foodwebs/kids_web.htm</a></p> <p><a href="http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/form.htm">http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/form.htm</a></p> <p>2. Select a Tasmanian cave species and create a food web which demonstrates the energy flow through the ecosystem it is part of. Check out <a href="http://parks.tas.gov.au/index.aspx?base=4212">http://parks.tas.gov.au/index.aspx?base=4212</a> for information and photos. A printable worksheet for this activity is available.</p> <p>Students may then present their food web as a poster.</p> <p>Optional: play the Food Chain Checkers game at <a href="http://www.windows.ucar.edu/teacher_resources/checkers_20march.pdf">http://www.windows.ucar.edu/teacher_resources/checkers_20march.pdf</a></p>	<p><b>Assessment of learning</b></p> <p>Living things. Humans interact with ecosystems, and this raises ethical and sustainability issues (stages 7–12). Assess the accuracy and complexity of food webs created by the students.</p>	<p>Two or three x 50min lessons</p>
<p><b>6. Presentation of data</b></p>	<ol style="list-style-type: none"> <li>1. Develop a comprehensive, illustrated food/energy web for the cave system.</li> <li>2. Analyse the adaptations of biota to the cave environment.</li> <li>3. Investigate and present a report on the effects of human impact in the short and long term, including inside and outside.</li> <li>4. Review the water cycle and the importance of karst areas as water sources for animals and humans.</li> <li>5. Why are cave reserves important globally and in Tasmania and how is global warming likely to affect their biodiversity?</li> <li>6. Prepare a detailed report, using a <b>Futures Wheel or Diamond Ranking</b>, on the biodiversity of caves, using a variety of media. (<a href="http://www.globaleducation.edna.edu.au/globaled/go/pid/1845">http://www.globaleducation.edna.edu.au/globaled/go/pid/1845</a>)</li> <li>7. Undertake an <b>Additional Science Activity from the Activity folder</b> about caves and cave formation.</li> </ol>	<p><b>Assessment for and of learning</b></p> <p>Assess students' ability to :</p> <ul style="list-style-type: none"> <li>• identify a question that can be investigated as an ecological study</li> <li>• collect data that will allow them to answer the question they posed</li> <li>• communicate their scientific information</li> </ul>	<p>Several lessons</p>

**Possible Web Resources**

<http://waitomocaves.com/newwebpages/EDlessons.htm>

<http://www.reec.nsw.edu.au/geo/cave/caves/textcave/10cavewb.htm>

[http://www.blm.gov/wo/st/en/res/Education\\_in\\_BLM/Learning\\_Landscapes/For\\_Teachers/science\\_and\\_children/caves/index.html](http://www.blm.gov/wo/st/en/res/Education_in_BLM/Learning_Landscapes/For_Teachers/science_and_children/caves/index.html)

[http://www.jenolancaves.org.au/jenolan\\_facts.php](http://www.jenolancaves.org.au/jenolan_facts.php)

<http://www.goodearthgraphics.com/virtcave/>  
<http://www.capricorncaves.com.au/pdf/schoolprogram.pdf>  
<http://www.howecaverns.com/live-in-the-cave>  
[http://www.marengocave.com/schools/cave\\_map.php](http://www.marengocave.com/schools/cave_map.php)  
[http://www.caves.org/committee/education/science\\_topics.htm#hydro](http://www.caves.org/committee/education/science_topics.htm#hydro)  
<http://cavingintro.net/science.html>

**See also: Teachers Resources** and

<http://www.parks.tas.gov.au/file.aspx?id=7062>