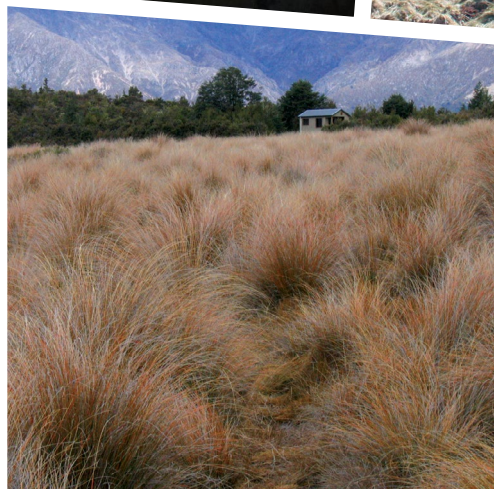
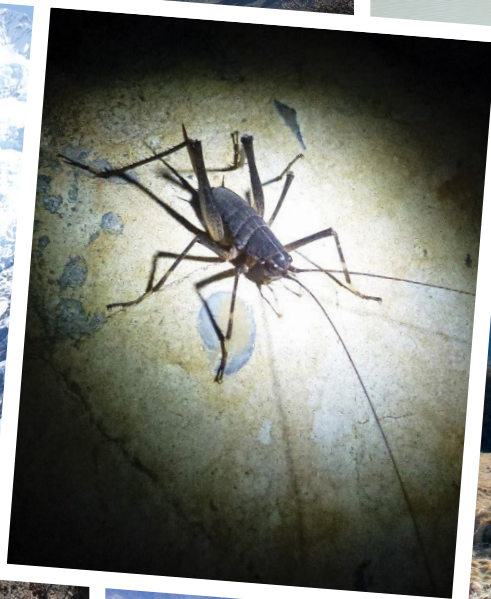


# Investigating alpine environments

SECONDARY EDUCATION RESOURCE YEARS 9–13



Department of  
Conservation  
*Te Papa Atawhai*

Illustrations: Lisa Paton

Cover photos clockwise from top left: Students learning in Aoraki/Mt Cook, *S Smith*;  
Field trip in Aoraki/Mt Cook, *S Smith*; Field trip in Aoraki/Mt Cook, *S Smith*  
Whio/blue duck family, Tongariro National Park, *T Smith*; Red Hills Hut, Richmond Forest Park, *M Deutsch*  
Alpine gentian, Kahurangi National Park, *M Deutsch*; Students on their visit to Aoraki/Mt Cook, *A Studholme*  
(centre) Alpine wētā, *W Chinn*

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Photos: Staff and students learning in Aoraki/Mt Cook, *S Smith*; Fox Glacier/Te Moeka o Tuawe, south Westland, *M Deutsch*

# INTRODUCTION



New Zealand's alpine environments include some very special and vulnerable habitats. Alpine plants and animals have had to adapt to extremely cold, windy and dry conditions. As a result, they have developed unique adaptations including freeze resistance, flightlessness and omnivorous diets.

Māori iwi, hapū and whanau have strong and significant links to their local alpine environments – whakapapa links oral history and stories back to the maunga, which also serve as a visible landmark for defining geographic regions and their cultural values and resource use.

Alpine environments also have a huge social significance and are highly prized for recreation purposes (such as tramping, skiing, etc.) by New Zealanders. They are also popular tourist destinations, sought out and appreciated by many visitors to New Zealand.

Due to the impacts of climate change, increased predation and tourism, DOC and various community groups have identified an increasing need to manage and protect alpine biodiversity. Teaching young people about our alpine environments and providing opportunities for them to experience them first-hand is essential to ensure that more people know and care about our unique alpine environments.

## ABOUT THIS RESOURCE

This conservation education resource is designed to introduce secondary students to New Zealand's extraordinary alpine environments, and support them to take action to help protect them.

Tongariro National Park (see [doc.govt.nz/tongariro](http://doc.govt.nz/tongariro)) is presented as the key study site/context for learning in this resource; however, the key concepts and activities can be used to support teaching and learning about and in alpine environments across the country.

## Key concepts

Using this resource, students can:

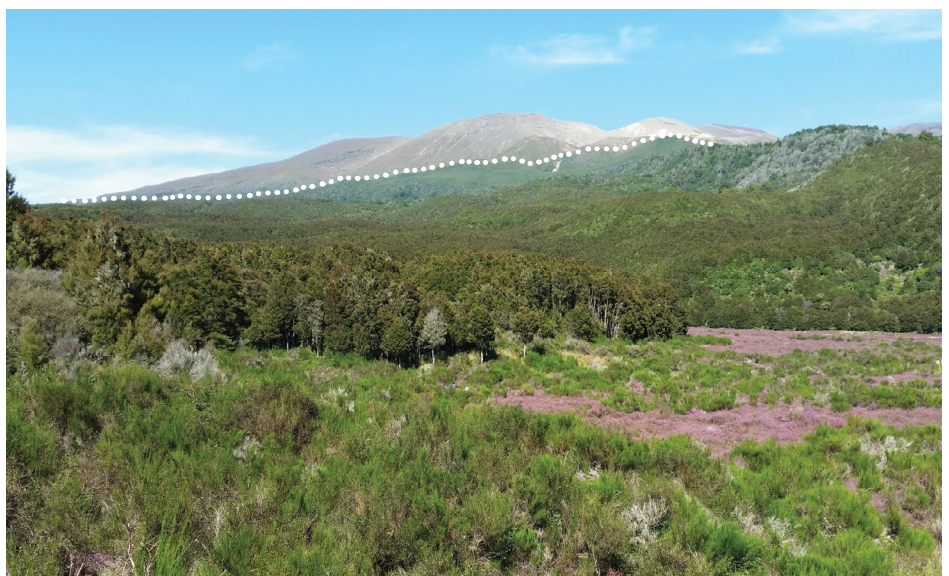
- Carry out practical investigations and gather scientific data on at least one aspect of an alpine environment (ecology, geology, geography, sustainability).
- Learn about some unique alpine plants and animals, and understand how they are connected within alpine ecosystems.
- Learn about the history and cultural heritage of Tongariro National Park.
- Investigate the interrelationships between people and alpine environments.
- Learn about threats to alpine environments and how people contribute to these.
- Identify how they can contribute to protecting alpine environments and take conservation action.

## Structure of this resource

<b>Section 2:</b> Learning activities pre- and post-field trip	This section provides activities to excite and engage students in learning about alpine environments. They have been designed to help determine student prior knowledge and interest. Some activities could be repeated or extended after your field trip to an alpine environment, to help reinforce and reflect on learning. They can all be adapted for different curriculum areas and levels.
<b>Section 3:</b> Years 11–13 NCEA assessment resources	This section has the unpacked the internal assessment information for NCEA levels 1–3 Achievement Standards (all outlined in the table on page 13–14 below). The internal assessment tasks could be based specifically on Tongariro National Park or on any New Zealand alpine environment. <b>Editable assessment templates for teachers to customise</b> Email <a href="mailto:conserved@doc.govt.nz">conserved@doc.govt.nz</a> to receive internal assessment templates for teachers to customise (student instructions and marking schedules).
<b>Section 4:</b> Learning in Tongariro	This section is specific to learning in Tongariro National Park. It includes information to support planning your field trip and outlines the study sites that have been set up especially for students to carry out their own investigations and data collection. Similar sections specific to different New Zealand alpine environments will be added to this resource over time. Keep an eye on <a href="http://doc.govt.nz/education-alpine">doc.govt.nz/education-alpine</a> for updates.
<b>Section 5:</b> Understanding alpine environments	This section provides background information on alpine ecology, geology, tourism and sustainability.
<b>Section 6:</b> Taking action to protect alpine environment	This section provides ideas to support planning and to take action to help protect alpine environments.

## WHAT IS AN ALPINE ENVIRONMENT?

The word ‘alpine’ is often used to refer to anything to do with high mountains. The alpine zone is defined as the area between the upper limit of trees (the treeline) and the lower limit of permanent snow. In New Zealand, the treeline is around 1500 metres above sea level in the north, and lowers to 900 metres above sea level at the bottom of the South Island. This variation in treeline is caused mainly by latitude and distance from the coast.



Tongariro treeline. The dotted line highlights the treeline. Photo: Marie McDonald DOC.

Alpine environments cover about 11% (30,000 square kilometres) of the country. Most of the alpine zone is in the South Island, where several mountain peaks in the Southern Alps/Kā Tiritiri o te Moana are higher than 3,000 metres. In the North Island, the alpine zone is limited to the volcanoes of the central plateau (Ruapehu, Ngauruhoe and Tongariro), Mount Taranaki (Mount Egmont) to the west, Hikurangi to the east, and the crest of the axial ranges Kaweka, Kaimanawa, Ruahine and Tararua. As the North Island's mountains are mainly volcanic, they support a much lower diversity of alpine plants than the South Island mountains.

Explore the alpine areas of New Zealand on Te Ara—The Encyclopedia of New Zealand at [www.TeAra.govt.nz/en/map/11022/alpine-areas-of-new-zealand](http://www.TeAra.govt.nz/en/map/11022/alpine-areas-of-new-zealand).



Hugh Wilson, 'Alpine plants – Alpine New Zealand', Te Ara – the Encyclopedia of New Zealand, [TeAra.govt.nz/en/map/11022/alpine-areas-of-new-zealand](http://TeAra.govt.nz/en/map/11022/alpine-areas-of-new-zealand) (accessed 30 June 2017).

# WHAT IS CONSERVATION EDUCATION?



Figure 2: Outline of the three dimensions of environmental education for sustainability (EEfS).

Conservation education is a component of the larger umbrella that is environmental education for sustainability (EEfS).

Integrated into EEfS are the three dimensions shown in the diagram below. Best practice conservation education (i.e., education about, in and for) results in a range of outcomes. Through students applying acquired knowledge, skills and values, they can actively take a leadership role for a range of real-life local conservation issues. These educational outcomes lead to tangible, on-the-ground conservation outcomes such as increased biodiversity, predator-free environments and the accumulation of data for citizen science initiatives.

Conservation is about our place now, while also encompassing the past and future of Aotearoa. Teaching conservation education is not an added extra or more work. It is about providing your students with a real-life context on which to base their learning, and an opportunity to apply their learning to authentic local community opportunities. Our natural environment is unique, special and fascinating! Conservation is about the future of our country. What kind of Aotearoa New Zealand do you want to see in 50 years' time?

## The Big Picture

There are between 30 and 50 trillion stars out there in somewhere between 80 and 140 billion galaxies, but Earth is the only place we call home. It's all we have (that is, until we catch up with Star Trek). For life to survive and thrive here, we need to understand that we are all part of one natural world.

Without fresh air, water, seas, fertile soils, forests, mountains, animals and plants, we humans couldn't survive. Everything, even the tiniest of bugs, has a role to play, and that includes us. You are part of your local environment. You, your school and your neighbourhood are all part of a bigger ecosystem. Everything is connected – from the deepest ocean to outer space – and what we do does make a difference.



For more information about the 'big picture' values and concepts, see the Big Picture video clips at [www.doc.govt.nz/bigpicture](http://www.doc.govt.nz/bigpicture).



## CURRICULUM LINKS

This resource has been developed to support Year 9-13 science and social science teachers planning to use an alpine environment as a real-life context for learning. Learning about and in an alpine environment could link to multiple learning areas of the New Zealand Curriculum. It is intended for teachers to use or adjust material in the resource to best suit their students' needs and interests.

Level 5	Strand	Achievement objectives	Suggested learning activities
<b>Social Sciences</b>	Social Studies	<ul style="list-style-type: none"> <li>• Understand how people's management of resources impacts on environmental and social sustainability.</li> <li>• Understand how the ideas and actions of people in the past have had a significant impact on people's lives.</li> </ul>	Co-operative Grid Consequence Wheel Say-it Grids Investigating the impact of waste Web of Life People and alpine environments
<b>Science</b>	Nature of Science  Living World  Planet Earth and Beyond  Physical World	<p><b>Participating and contributing</b></p> <ul style="list-style-type: none"> <li>• Develop an understanding of socio-scientific issues by gathering relevant scientific information in order to draw evidence-based conclusions and to take action where appropriate.</li> </ul> <p><b>Life processes</b></p> <ul style="list-style-type: none"> <li>• Identify key structural features and functions involved in the life processes of alpine plants and animals.</li> </ul> <p><b>Earth systems</b></p> <ul style="list-style-type: none"> <li>• Investigate the composition, structure, and features of the geosphere, hydrosphere, and atmosphere.</li> </ul> <p><b>Using physics</b></p> <ul style="list-style-type: none"> <li>• Explore a technological or biological application of physics.</li> </ul>	Co-operative grid Consequence wheel Say-it Grids Home and Expert Tricky Tracks Web of Life Shake, Rattle and Roll Mountain Tracks Definition Whispers What am I? Investigating the impact of waste What Rocks What?

Level 6	Strand	Achievement objectives	Suggested learning activities and achievement standards
Science	Nature of Science	<p><b>Investigating in science</b></p> <ul style="list-style-type: none"> <li>• Develop and carry out more complex investigations, including using models.</li> </ul> <p><b>Participating and contributing</b></p> <ul style="list-style-type: none"> <li>• Develop an understanding of socio-scientific issues by gathering relevant scientific information in order to draw evidence-based conclusions and to take action where appropriate.</li> </ul>	<p>Co-operative grid</p> <p>Consequence wheel</p> <p>Say-it Grids</p> <p>Home and Expert</p> <p>Web of Life</p> <p>Mountain Tracks</p> <p>What Rocks What?</p> <p>Definition Whispers</p>
	Living World	<p><b>Life processes</b></p> <ul style="list-style-type: none"> <li>• Relate key structural features and functions to the life processes of plants, animals, and micro-organisms and investigate environmental factors that affect these processes.</li> </ul>	<p>AS 90951 v3 (1.12)</p> <p>AS 90952 (1.13)</p> <p>AS 90955 (1.16)</p>
	Planet Earth and Beyond	<p><b>Ecology</b></p> <ul style="list-style-type: none"> <li>• Investigate the impact of natural events and human actions on a New Zealand ecosystem.</li> </ul>	
	Physical World	<p><b>Earth systems</b></p> <ul style="list-style-type: none"> <li>• Investigate the external and internal processes that shape and change the surface features of New Zealand.</li> </ul> <p><b>Physical inquiry and physics concepts</b></p> <ul style="list-style-type: none"> <li>• Investigate trends and relationships in physical phenomena (in the areas of mechanics, electricity, electromagnetism, heat, light and waves, and atomic and nuclear physics).</li> </ul>	
Social Sciences	Geography	<ul style="list-style-type: none"> <li>• Understand that natural and cultural environments have particular characteristics and how environments are shaped by processes that create spatial patterns.</li> <li>• Understand how people interact with natural and cultural environments and that this interaction has consequences.</li> </ul>	<p>Co-operative grid</p> <p>Consequence wheel</p> <p>Say-it Grids</p> <p>Home and Expert</p> <p>Web of Life</p> <p>Mountain Tracks</p> <p>Definition Whispers</p> <p>People and alpine environments</p> <p>AS 91009 v3 (1.3)</p> <p>AS 91012 (1.6)</p>

Level 7	Strand	Achievement objectives	Suggested learning activities and achievement standards
Science	Nature of Science	<p><b>Investigating in science</b></p> <ul style="list-style-type: none"> <li>• Develop and carry out investigations that extend their science knowledge, including developing their understanding of the relationship between investigations and scientific theories and models.</li> </ul> <p><b>Communicating in science</b></p> <ul style="list-style-type: none"> <li>• Use accepted science knowledge, vocabulary, symbols, and conventions when evaluating accounts of the natural world and consider the wider implications of the methods of communication and/or representation employed.</li> </ul>	<p>Co-operative grid Consequence wheel Say-it Grids Home and Expert Web of Life Definition Whispers Choose your weapon</p>
	Living World	<p><b>Participating and contributing</b></p> <ul style="list-style-type: none"> <li>• Use relevant information to develop a coherent understanding of socio-scientific issues that concern them, to identify possible responses at both personal and societal levels.</li> </ul> <p><b>Life processes</b></p> <ul style="list-style-type: none"> <li>• Explore the diverse ways in which animals and plants carry out the life processes.</li> </ul>	
	Planet Earth and Beyond	<p><b>Ecology</b></p> <ul style="list-style-type: none"> <li>• Explore ecological distribution patterns and explain possible causes for these patterns.</li> </ul> <p><b>Earth systems and interacting systems</b></p> <ul style="list-style-type: none"> <li>• Develop an understanding of the causes of natural hazards and their interactions with human activity on Earth.</li> </ul>	<p>AS 91153 (2.1) AS 91154 (2.2) AS 91155 (2.3) AS 91158 v2 (2.6) AS 91189 v2 (2.3) AS 91190 v2 (2.4)</p>

<b>Social Sciences</b>	Geography	<ul style="list-style-type: none"> <li>• Understand how the processes that shape natural and cultural environments change over time, vary in scale and from place to place, and create spatial patterns.</li> <li>• Understand how people’s perceptions of and interactions with natural and cultural environments differ and have changed over time.</li> </ul>	<p>Co-operative grid Consequence wheel Say-it Grids Home and Expert Web of Life Definition Whispers</p> <p>AS 91240 (2.1) AS 91244 (2.5) AS 91245 (2.6)</p>
<b>Education for Sustainability</b>	<p>Knowledge and understanding</p> <p>Attitudes and values</p> <p>Actions</p>	<ul style="list-style-type: none"> <li>• Investigate how to enhance and maintain biophysical systems and improve biodiversity.</li> <li>• Investigate the aspects of sustainability in different contexts.</li> <li>• Examine the values and behaviours that will contribute to a sustainable future.</li> <li>• Plan, implement, and evaluate personal action for a sustainable future</li> </ul>	<p>Using digital tools Co-operative grid Consequence wheel Say-it Grids Home and Expert Web of Life Definition Whispers Investigating the impact of waste People and alpine environments</p> <p>AS 90811 v2 (2.2) AS 90813 v2 (2.3)</p>

Level 8	Strand	Achievement objectives	Suggested learning activities and achievement standards
<b>Science</b>	<p>Nature of Science</p> <p>Living World</p> <p>Planet Earth and Beyond</p>	<p><b>Participating and contributing</b></p> <ul style="list-style-type: none"> <li>• Use relevant information to develop a coherent understanding of socio-scientific issues that concern them, to identify possible responses at both personal and societal levels.</li> </ul> <p><b>Life processes, ecology, and evolution</b></p> <ul style="list-style-type: none"> <li>• Understand the relationship between organisms and their environment.</li> </ul> <p><b>Earth systems and interacting systems</b></p> <ul style="list-style-type: none"> <li>• Develop an in-depth understanding of the interrelationship between human activities and the geosphere, hydrosphere, atmosphere, and biosphere over time.</li> </ul>	<p>Co-operative grid Consequence wheel Say-it Grids Home and Expert Web of Life Definition Whispers</p> <p>AS 91602 (3.2)</p>

<b>Education for Sustainability</b>	Knowledge and understanding	<ul style="list-style-type: none"> <li>• Evaluate social, economic, and technological measures that could be taken to sustain natural resources and improve biodiversity now and for the future.</li> </ul>	Using digital tools Co-operative grid Consequence wheel Say-it Grids Home and Expert Web of Life Definition Whispers People and alpine environments
	Attitudes and values	<ul style="list-style-type: none"> <li>• Analyse the impact of strategies and initiatives for a sustainable future.</li> <li>• Analyse the values of different groups of people, how these values are expressed in various practices, and the present and future consequences for sustainability.</li> </ul>	AS 91735 (3.2)
	Actions	<ul style="list-style-type: none"> <li>• Analyse actions necessary for sustainability and plan, implement, and critically evaluate personal action for a sustainable future</li> </ul>	
<b>Social Sciences</b>	Geography	<ul style="list-style-type: none"> <li>• Understand how interacting processes shape natural and cultural environments, occur at different rates and on different scales, and create spatial variations.</li> <li>• Understand how people's diverse values and perceptions influence the environmental, social, and economic decisions and responses that they make</li> </ul>	Co-operative grid Consequence wheel Say-it Grids Home and Expert Definition Whispers People and alpine environments  AS 91431 (3.6)

## Level 1–3 NCEA Assessment resources

The Achievement Standards included in this resource relate to Level 1–3 internal assessments, however it is likely that learning about and in alpine environments could also contribute to various external assessments. Below is a list of the achievement standards you will find in section 3 as well as the assessment conditions and teacher guidelines. Also available by emailing [conserved@doc.govt.nz](mailto:conserved@doc.govt.nz) are internal student assessment tasks/templates (student instructions and marking schedules) that you can edit and customise for your students.

<b>Level 1</b>	
<b>Science</b> (includes Biology and Earth and Space Science (ESS))	<ul style="list-style-type: none"> <li>• AS 90951 v3 (1.12): Investigate the biological impact of an event on a New Zealand ecosystem.</li> <li>• AS 90952 (1.13): Demonstrate understanding of the formation of surface features in New Zealand.</li> <li>• AS 90955 (1.16): Investigate an astronomical or Earth science event.</li> </ul>

<b>Geography</b>	<ul style="list-style-type: none"> <li>•AS 91009 v3 (1.3): Demonstrate geographic understanding of the sustainable use of an environment.</li> <li>•AS 91012 (1.6): Describe aspects of a contemporary New Zealand geographic issue.</li> </ul>
<b>Level 2</b>	
<b>Biology</b>	<ul style="list-style-type: none"> <li>•AS 91153 (2.1): Carry out a practical investigation in a biology context, with supervision.</li> <li>•AS 91154 (2.2): Analyse the biological validity of information presented to the public.</li> <li>•AS 91155 (2.3): Demonstrate understanding of adaptation of plants or animals to their way of life.</li> <li>•AS 91158 v2 (2.6): Investigate a pattern in an ecological community, with supervision.</li> </ul>
<b>Education for Sustainability (EfS)</b>	<ul style="list-style-type: none"> <li>•AS 90811 v2 (2.2): Explain how human activity in a biophysical environment has consequences for a sustainable future.</li> <li>•AS 90813 v2 (2.3): Demonstrate understanding of how different personal values have implications for a sustainable future.</li> </ul>
<b>Earth and Space Science (ESS)</b>	<ul style="list-style-type: none"> <li>•AS 91189 v2 (2.3): Investigate geological processes in a New Zealand locality.</li> <li>•AS 91190 v2 (2.4): Investigate how organisms survive in an extreme environment.</li> </ul>
<b>Geography</b>	<ul style="list-style-type: none"> <li>•AS 91240 (2.1): Demonstrate geographic understanding of a large natural environment.</li> <li>•AS 91244 (2.5): Conduct geographic research with guidance.</li> <li>•AS 91245 (2.6): Explain aspects of a contemporary New Zealand geographic issue.</li> </ul>
<b>Level 3</b>	
<b>Biology</b>	<ul style="list-style-type: none"> <li>•AS 91602 (3.2): Integrate biological knowledge to develop an informed response to a socio-scientific issue.</li> </ul>
<b>Education for Sustainability (EfS)</b>	<ul style="list-style-type: none"> <li>•AS 91735 (3.2): Evaluate measures that may be taken to sustain and/or improve a biophysical environment.</li> </ul>
<b>Geography</b>	<ul style="list-style-type: none"> <li>•AS 91431 (3.6): Analyse aspects of a contemporary geographic issue.</li> </ul>
<b>Māori Environmental Practices</b>	<ul style="list-style-type: none"> <li>•US 6142: Explain kaitiakitanga in relation to the way Māori interact with the natural environment.</li> </ul>
<b>Māori Environmental Practices</b>	<ul style="list-style-type: none"> <li>•US 6143: Carry out a local kaitiakitanga activity with direction.</li> </ul>