# Geography elective – physical geography



This resource has been designed to support teachers by providing a range of tasks based on syllabus content. Tasks can be incorporated into context driven teaching and learning programs in full or can be used to supplement existing programs. All content is textbook non-specific to ensure equity.

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## Outcomes

A student:

* **GEE5-1** explains the diverse features and characteristics of a range of places, environments and activities
* **GEE5-2** explains geographical processes and influences that form and transform places and environments
* **GEE5-3** analyses patterns associated with natural phenomena and human activity at a range of scales
* **GEE5-4** assesses the interactions and connections between people, places and environments that impact on sustainability
* **GEE5-5** accounts for contemporary geographical issues and events that impact on places and environments
* **GEE5-8** acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry
* **GEE5-9** communicates geographical information to a range of audiences using a variety of strategies and geographical tools

**Related Stage 4 outcomes:** GEE4-1, GEE4-2, GEE4-3, GEE4-4, GEE4-5, GEE4-8,
GEE4-9

**Related Life Skills outcomes:** GEELS-1, GEELS-2, GEELS-3, GEELS-4, GEELS-5, GEELS-8, GEELS-9

[Geography Elective 7–10 Syllabus](https://educationstandards.nsw.edu.au/wps/wcm/connect/b800c80e-721c-4924-ad9a-83428697372c/geography-elective-years-7-10-syllabus-2019.pdf?MOD=AJPERES&CVID=) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2019.

## Subject concepts

* Place – the significance of places and what they are like
* Space – the significance of location and spatial distribution, and ways people organise and manage the spaces that we live in
* Environment – the significance of the environment in human life, and the important interrelationships between humans and the environment
* Interconnection – no object of geographical study can be viewed in isolation
* Scale – the way that geographical phenomena and problems can be examined at different spatial levels
* Sustainability – the capacity of the environment to continue to support our lives and the lives of other living creatures into the future
* Change – explaining geographical phenomena by investigating how they have developed over time

## Learning sequence 1 – plate tectonics

Students:

* investigate the processes involved in volcanic and earthquake activity, folding and faulting, for example:
* location of major tectonic plates and their boundaries **M ST**
* discussion of evidence of tectonic plate movement **GS VR**
* explanation of the relationships between plate boundaries and major physical features **VR**.

### Plate tectonics

**Teacher note:** explicitly teach the concept [geographical process](https://www.australiancurriculum.edu.au/senior-secondary-curriculum/humanities-and-social-sciences/Glossary/?term=Geographical+processes). You may like to use examples of geographical processes most applicable to this sequence as examples, like earthquakes, volcanoes, erosion and deposition.

Students will need to be provided with a blank world map in this sequence, you may wish to access [World Map Blank](https://worldmapblank.com/blank-map-of-world/) for a printable blackline master.

You may need to explicitly teach the concept ‘correlations’ prior to commencing this learning sequence.

* Access [Ice Age: Continental Drift | Ice Age 4: Scrat Continental Crack Up](https://youtu.be/zocutif0cQY) (2:40) and with a partner identify the geographical processes the short clip illustrates.
* Access [National Geographic Plate Tectonics](https://www.nationalgeographic.org/encyclopedia/plate-tectonics/) and use the information provided to define each of the following terms
* plate tectonics
* lithosphere
* asthenosphere
* continental drift.
* Watch [The Theory of Continental Drift (11:56)](https://youtu.be/_5q8hzF9VVE) and outline Wegener’s theory of continental drift. Include in the response the 4 key pieces of evidence used to support the Continental Drift Theory.
* Access [Earthquakes and Volcanoes Interactive](https://www.pbslearningmedia.org/resource/buac17-68-sci-ess-quakevolint/earthquakes-and-volcanoes-interactive/) and explore the location of plate tectonics, earthquakes and volcanoes. On the blank world map provided by your teacher identify and draw the location of the world’s plate tectonic boundaries.
* Using the [Earthquakes and Volcanoes Interactive](https://www.pbslearningmedia.org/resource/buac17-68-sci-ess-quakevolint/earthquakes-and-volcanoes-interactive/) and your completed map of the world’s plate tectonics answer the following questions
* What do you notice about the distribution of earthquakes?
* What do you notice about the distribution of volcanoes?
* Do you see any correlations or patterns?
* Can you think of a possible explanation for the patterns you see?

**Teacher note:** the following plate tectonic balloon activity focuses on where plates are located on the Earth's surface and how they fit together. By completing this activity students will be able to show the size, shape and location of tectonic plates and where their boundaries are found.

This activity will take more than one period and the resources listed below are to make the papier-mâché, the alternate could be to use balloons or paper lanterns.

Resources required include: balloons, newspaper, glue, paint and permanent markers

* Use the following process to create a model of the earth that illustrates the plate boundaries
* blow up a balloon to a round shape and tie it off
* glue strips of newspaper to the balloon; several layers may be needed to form a strong paper mâché
* let the paper mâché dry overnight
* when the paper mâché is dry, use paint to highlight the land (green) and oceans (blue)
* when the paint is dry, use a permanent marker to draw the tectonic plate boundaries – the [tectonic plates jigsaw](https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/140017) from Geoscience Australia can be used to help draw these on the globe
* the final product you create can be used as a reference when looking at the locations of volcanic activity and earthquakes by either comparing to other maps or by also locating on the globe major hot spots of these hazards.

### Tectonic plate movement

* Access [Mountain Maker, Earth Shaker](https://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.shake/mountain-maker-earth-shaker/) interactive and complete the following summary table outlining the characteristics of divergent, convergent and transform plate boundaries.

Table 1 – tectonic plate boundary description

|  |  |  |
| --- | --- | --- |
| Plate boundary | Illustration | General description |
| Divergent |  |  |
| Convergent |  |  |
| Transform |  |  |

* Reflect on your descriptions of divergent, convergent and transform plate boundaries and identify key differences
* Using evidence from [Mountain Maker, Earth Shaker](https://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.shake/mountain-maker-earth-shaker/) interactive explain in 2 paragraphs how tectonic plates move.

### Plate boundaries and major physical features

**Teacher note:** the following section of Learning sequence 1 – plate tectonics, provides an overview of physical features of each plate boundary type. Students will explore the different landform features and identify examples from around the globe.

It is important to recognise that the impact of natural disasters such as loss of life in earthquakes will be addressed in this section of the learning sequence. Teachers may need to adjust accordingly for their school’s social situation.

Teachers may need to revisit types of photographs used in geography, aerial, oblique, ground and satellite.

Students will need to be provided with a blank world map in this sequence, you may wish to access [World Map Blank](https://worldmapblank.com/blank-map-of-world/) for a printable blackline master.

* Use the [Volcanoes, explained](https://www.nationalgeographic.com/environment/article/volcanoes) images of volcanoes to complete the following table:

Table 2 – examples of landscapes formed due to tectonic plate activity

|  |  |  |
| --- | --- | --- |
| Location | Type of photograph | Description |
|  |  |  |
|  |  |  |
|  |  |  |

* Watch [Why there’s a ring of natural disasters around the Pacific (6:34)](https://youtu.be/DrwYtGf40hA) and complete the following activities
* on the world map provided by your teacher locate and label the Ring of Fire
* explain what causes the volcanic activity in the Ring of Fire.

**Teacher note:** a class [Padlet](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/592#.YigdZbyzQQw.link) is required for the following learning activity. Teachers will need to allocate students to a group.

Suggested locations of investigation for the Ring of Fire include Japan, the San Andreas Fault, New Zealand, Indonesia and the Mariana Trench.

At the conclusion each group will contribute to a peer assessment using the 2 phrases, target and praise. Target, areas of improvement and praise, what was clear and outlined well.

* Your teacher will allocate groups to research different locations in the Ring of Fire. Each group will contribute to a class [Padlet](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/592#.YigdZbyzQQw.link) answering the following activities for their allocated location
* location description
* description of the key tectonic activities taking place
* outline how the plate boundary has shaped the physical features
* prediction of future tectonic activity
* where appropriate include images, data and graphs to illustrate.
* Each group will be conducting a peer assessment of another group. This peer assessment will focus on target and praise. Use the following table as a template for peer feedback.

Table 3 – peer assessment, target and praise

|  |  |  |
| --- | --- | --- |
| Group | Target - what could have been improved | Praise – what was outlined well |
|  |  |  |
|  |  |  |

## Learning sequence 2 – physical processes

Students:

* investigate the processes of weathering, erosion, deposition and mass movement, for example
* explanation of physical and chemical weathering processes and the role of weathering in shaping the landscape VR
* description of types of mass movement VR
* discussion of the role played by humans in mass movement
* examination of erosion and deposition including the role of water, wind and ice in transforming the land F.

### Weathering, erosion, deposition and mass movement

* Watch [Weathering, Erosion, and Deposition](https://youtu.be/2X9B_ocBIaQ) (duration 5:34) and [Weathering, Erosion, and Deposition Part 1](https://youtu.be/ewj629B4Oe8) (duration 16:48) and use these to help compose a 1-2 sentence definition for each of the following geomorphic processes
* weathering
* erosion
* deposition
* mechanical weathering
* chemical weathering
* frost action
* exfoliation
* abrasion
* root wedging.

**Teacher note:** to complete the following learning tasks students will require a topographic map. A local topographic map is preferable as it is easier for students to recognise physical features. However, any topographic map that illustrates varied landforms and creek flow direction would be appropriate.

Teachers might like to access [NSW Government Spatial Collaboration Portal](https://maps.six.nsw.gov.au/) where you can create free custom topographic maps of any area in NSW.

Teachers may also like to access print materials and teaching resources for the [Save Our Catchment Virtual Excursion](https://sites.google.com/education.nsw.gov.au/save-our-catchment/home) used in this section of the learning sequence.

* Watch [What is a Contour (Topographic) Map (6:31)](https://youtu.be/pvw5ZM1OKcY)? and as a class discuss the key features of topographic maps
* contour lines
* contour intervals
* scale
* direction.
* Your teacher will provide you with a topographic map. In small groups observe the map closely and identify the following features
* title
* source
* scale
* direction
* key
* general physical features for example, hills, creeks, rivers, headland, floodplain.
* Watch [Determining Stream Flow Direction from a Topographic Map (6:23)](https://youtu.be/RNLXXHA8iBE) and on the topographic map provided to your group by your teacher identify 3 to 5 different creeks or rivers. For each, predict the direction the creek or river is flowing.
* As a class revisit the definitions for weathering, erosion and deposition and discuss the following question: ‘How will understanding the direction a creek or river is flowing on a topographic map inform a geographer of what is happening physically in an area being studied?’

**Teacher note:** [Earth Science](https://www.youtube.com/user/mikesammartano) website provides a variety of videos and student resources related to this area of the topic. The activities accompanying [River Erosion and Deposition (21:27)](https://www.youtube.com/watch?v=3YdEkegvJCQ) were adapted from the Earth Science website.

* Watch [River Erosion and Deposition (21:27)](https://www.youtube.com/watch?v=3YdEkegvJCQ) and [Think, Pair, Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645#.YmoeYZ8kw6s.link) the following questions
* What is a watershed?
* How do tributaries change as you move down stream?
* What factors affect the velocity of a stream?
* What are some key characteristics of a young river system?
* What are some key characteristics of an old river system?
* Identify where on a river erosion is most likely to occur.
* Identify where on a river deposition is most likely to occur.
* Why do larger sediments get deposited faster than smaller sediments?

**Teacher note:** provide students with a printed copy of the Clarence River NSW from [Google Earth](https://earth.google.com/web/%400%2C0%2C0a%2C22251752.77375655d%2C35y%2C0h%2C0t%2C0r).

* Watch Save Our Catchment – virtual excursion [Episode 03 Geography of the Clarence River Catchment (3:55)](https://www.youtube.com/watch?v=ytUyohnl4fg). On the Clarence River image provided by your teacher locate and label the following physical features
* tributaries
* location where erosion is likely to occur
* location where deposition is likely to occur
* floodplain
* river meander
* oxbow lake.

**Teacher note:** when taking students into the field and off school premises ensure you follow your school excursion policy and the [NSW Government Policy Library Excursions policy](https://education.nsw.gov.au/policy-library/policies/pd-2004-0010).

The following fieldwork activity requires a site of study that provides an adequate example of creek or river geomorphology for example meanders, erosion, deposition, floodplain, waterfall. Students will be conducting a field sketch of a local stream, creek or river with the aim of identifying physical features.

Resources required for this activity include clipboards, paper, pencils and erasers.

Alternatively, if fieldwork is not accessible, replace the field sketch exercise with a photo sketch of a river, creek or river.

* Your teacher will identify a suitable location to [undertake a field sketch](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/hsie-curriculum-resources-k-12/hsie-7-10-curriculum-resources/conducting-a-field-sketch) of a stream, creek or river. Use the following instructions to construct a field sketch
* select an appropriate area to sketch
* observe key human and natural features
* identify an area on the site that will be sketched into a rectangle frame on your paper
* divide the rectangle on your paper into foreground, middle ground and background
* sketch each section starting with the foreground, secondly middle ground and finally background
* label all relevant observations
* give your field sketch a title.
* Watch [Erosion and Deposition – Gravity](https://youtu.be/fCOrup5MSSI) (duration 10:15) and define the term mass movement. For each of the 4 types of mass movement, sketch and describe the process of mass movement
* soil creep
* debris flow
* mud flow
* rock fall.
* Use the following resources and school resources to conduct a scavenger hunt of examples of mass movement and share on class [Google slides](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/70#.Ymoejudh6nU.link)
* [One Geology Kids – creep](https://onegeology.org/archive/eXtra/kids/english/earthprocesses/creep.html)
* [What is a Debris Flow?](https://geology.com/articles/debris-flow/)
* [Debris and Mud Flows](https://coloradogeologicalsurvey.org/hazards/debris-flows/)
* [Rockfall](https://coloradogeologicalsurvey.org/hazards/rockfall/)
* Read [What causes landslides and mudslides?](https://earthsky.org/human-world/what-causes-landslides/) and identify the key human action that results in mass movement in the form of a slide.

**Teacher note:** the following activity glacial processes shaping the landscape could be shortened to only include the more commonly known glacial features of U-shaped valley, glacial striation, kettle lake and outwash plain.

* Watch [Understanding Glaciers (9:06)](https://youtu.be/HEStq4VYJ2Y) and use the table to summarise the key glacial process involved in changing the landscape.

Table 4 – glacial processes shaping the landscape

|  |  |  |
| --- | --- | --- |
| Process | Description | Illustration |
| U-shaped valley |  |  |
| Glacial striations |  |  |
| Glacial till |  |  |
| Moraines |  |  |
| Glacial erratics |  |  |
| Drumlin |  |  |
| Kettle lake |  |  |
| Outwash plain |  |  |

* Using the information summarised in the table outline how glaciers shape and change the landscape.

**Teacher note:** the [Lake Mungo virtual excursion](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/virtual-excursions-hsie-stages-4-6/lake-mungo-virtual-excursion) consists of a series of 19 videos filmed on Country. It is not a requirement to watch the series in its entirety. It is important to note that some of the films main contain images of deceased persons and cultural sensitivity in the context of your school may need to apply.

Teachers will need to supply students with a printed blank map of NSW in this section of the learning sequence. You can find a blank map of NSW on [d-maps NSW](https://d-maps.com/pays.php?num_pay=1181&lang=en).

* Watch [Wind and Water Erosion (3:23)](https://youtu.be/-43_HBy9huc) and access [National Geographic Society - Erosion](https://www.nationalgeographic.org/encyclopedia/erosion/). Outline in one paragraph the types of landforms commonly formed by wind and water erosion.
* Use a school atlas or [Google Earth](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/620#.YmoejqUI7tU.link) to search for Lake Mungo, NSW. Label the following on a blank map of NSW provided by your teacher
* Sydney
* Mildura
* Mungo.
* Watch [Lake Mungo virtual excursion – Landscape formation (2:02)](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/virtual-excursions-hsie-stages-4-6/lake-mungo-virtual-excursion#/asset5) and [Lake Mungo virtual excursion - Lake Mungo today (4:05)](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/virtual-excursions-hsie-stages-4-6/lake-mungo-virtual-excursion#/asset12). Outline in 2 paragraphs how wind and water has changed the Willandra Lakes region.

**Teacher note:** [Exit tickets](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/543#.Ymoe-Ivvtr4.link) are commonly used at the conclusion of a lesson to ask students quick reflective questions. To conclude this sequence, compose a series of exit questions that will assess student understanding of the key geographical processes taught.

## Learning sequence 3 – climate

 Students:

* investigate patterns and processes associated with climate, for example
* explanation of global atmospheric circulations: insolation, pressure, wind, temperature, precipitation M
* description of global climatic patterns M
* examination of factors affecting climate: latitude, altitude, maritime and continental influences F VR
* explanation of issues resulting from climate change **ST**.

### Patterns and processes associated with climate

**Teacher note:** students will require the following resources to draw a [climatic graph](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/hsie-curriculum-resources-k-12/hsie-7-10-curriculum-resources/climatic-graphs). Graph paper, ruler, pencil and eraser.

* Watch [The Ocean: Driving Force for Weather and Climate (6:00)](https://www.youtube.com/watch?v=SHBPtxIgHy4) and use this to define weather and climate.
* Watch [Climatic graphs (2:14)](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/hsie-curriculum-resources-k-12/hsie-7-10-curriculum-resources/climatic-graphs). Then draw a climatic graph, using data presented in the following table. The steps involved in drawing a climatic graph are outlined here
* write the temperature and rainfall information in the table at the base of the climatic graph
* using the precipitation scale on the left-hand side of the graph draw a column showing the average precipitation for each month of the year
* using the temperature scale on the right-hand side of the graph draw in the line graph. Plot the average temperature information, making sure each dot is placed in the centre of each month, and join the points with a smooth curve
* add a heading that includes the name of the place being graphed together with its latitude and longitude.

Table 5 – climatic table, Sydney

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | J | F | M | A | M | J | J | A | S | O | N | D |
| Average temperature | 28.0 | 25.8 | 24.8 | 22.5 | 19.5 | 17.0 | 16.4 | 17.9 | 20.1 | 22.2 | 23.7 | 25.2 |
| Rainfalltotal | 101.7 | 117.5 | 130.8 | 127.9 | 118.6 | 133.2 | 96.6 | 80.7 | 67.9 | 76.4 | 83.6 | 77.5 |

* Use your climatic graph for Sydney to discuss with a partner
* the overall shape of the graph
* extremes – highest and lowest temperature and rainfall
* the season where most rainfall occurs
* temperature range by subtracting the lowest figure from the highest.
* Use [Australian Bureau of Meteorology – Map of Climate zones of Australia](http://www.bom.gov.au/climate/how/newproducts/images/zones.shtml) to answer the following questions
* What climatic zone dominates Tasmania?
* What climatic zone dominates central Australia?
* What climatic zone dominates Northern Australia?
* What is the climatic zone for your location?
* Complete the summary table outlining the key characteristics of the different climatic zones across Australia.

Table 6 – climatic classifications of Australia

|  |  |
| --- | --- |
| Climatic zone | Classification |
| Equatorial |  |
| Tropical |  |
| Subtropical |  |
| Desert |  |
| Grassland |  |
| Temperate |  |

* Access the [CoastAdapt](https://coastadapt.com.au/australias-climate-drivers-variability-and-extremes) website and identify the key drivers for Australia’s variable climatic conditions.
* Conduct a class [Jigsaw](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/546#.Ymoe-Pqm-6M.link). Each person assigned to the same climatic driver will work together in expert groups to research the questions presented. Once completed, students will return to their home groups to teach them about the climatic driver allocated. Resources for this task may include
* [The Climatedogs – The six drivers that influence Victoria’s climate](https://agriculture.vic.gov.au/climate-and-weather/understanding-weather-climate-and-forecasting/the-climatedogs-the-six-drivers-that-influence-victorias-climate)
* [CoastAdapt](https://coastadapt.com.au/australias-climate-drivers-variability-and-extremes)
* [What is the El Niño-Southern Oscillation (ENSO) in a nutshell?](https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso-nutshell)
* [The three phases of the El Niño-Southern Oscillation (ENSO)](http://www.bom.gov.au/climate/enso/history/ln-2010-12/three-phases-of-ENSO.shtml)
* [The Indian Ocean Dipole (IOD)](http://www.bom.gov.au/climate/enso/history/ln-2010-12/IOD-what.shtml)
* [Meet ENSO’s neighbor, the Indian Ocean Dipole](https://www.climate.gov/news-features/blogs/enso/meet-enso%E2%80%99s-neighbor-indian-ocean-dipole)
* [The Madden-Julian Oscillation (MJO)](http://www.bom.gov.au/climate/mjo/)
* [The Climate Kelpie Blog: What goes around – may bring rain to northern Australia](http://www.climatekelpie.com.au/index.php/2020/08/10/what-goes-around-may-bring-rain-to-northern-australia/)
* [The Southern Annular Mode and the Australian climate](http://www.bom.gov.au/climate/sam/).

Table 7 – climatic drivers jigsaw template

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Questions | Group 1 | Group 2 | Group 3 | Group 4 |
|  | El Niño-Southern Oscillation | The Indian Ocean Dipole | The Australian monsoon and the Madden-Julian Oscillation | The Southern Annular Mode |
| What physical processes are occurring to create the climatic driver? |  |  |  |  |
| How does the climatic driver impact and change the weather and climate in Australia? |  |  |  |  |

* As a class discuss the following question: ‘Are any of the climatic drivers currently operating in your area and if so what features have you been observing?’

**Teacher note:** climate is so predictable because it is dependent on regularly fixed features of the Earth, including its form, the shape of its orbit around the Sun, and the tilt of its axis of rotation. Other factors are the fact that it has an ocean, continents and a layered atmosphere composed of many different gases.

To simplify the classification of the many regions or climate zones of the Earth this sequence will focus on influence of the latitude of a location and its proximity to the ocean.

Students will require a printed copy of a blank world map [World Map Blank](https://worldmapblank.com/blank-map-of-world/).

* Use [Meteoscool – Climate zones](https://content.meteoblue.com/en/meteoscool/general-climate-zones) to identify and label on the blank world map provided by your teacher the different climate zones around the world.
* Use [Meteoscool – Climate zones](https://content.meteoblue.com/en/meteoscool/general-climate-zones) image of ‘Daylength’ by Thomas Steiner to explain to a partner how solar radiation and the tilt of the Earth affects climate.
* Watch [NASA’s The Ocean: Driving Force for Weather and Climate (6:00)](https://www.youtube.com/watch?v=SHBPtxIgHy4) and [How do ocean currents work? (4:33)](https://www.youtube.com/watch?v=p4pWafuvdrY). Use these to answer the following questions
* How does heat from the sun, size of the ocean and topography of ocean floor determine Earth’s weather and climate?
* How do ocean currents influence the Earth’s weather and climate?
* Use [Effect of Altitude and Mountains on climate](https://k12.libretexts.org/Bookshelves/Science_and_Technology/Earth_Science/12%3A_Climate/12.05%3A_Effect_of_Altitude_and_Mountains_on_Climate), [How Latitude and Altitude Affect Temperature](https://sciencing.com/sun-intensity-vs-angle-23529.html) and school resources to answer the following questions
* How does altitude affect temperature?
* How does altitude affect air pressure?
* How does altitude affect precipitation?
* Describe how climate is different between low-lying regions and regions at high altitude.
* Working with a partner review [The Nature Conservancy](https://www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/climate-change-frequently-asked-questions/) website. Use information gained to create an information poster in [Canva](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/653#.YmofaiNhQZ0.link) illustrating the issues resulting from climate change.
* Based on the information posters presented by the class, write a paragraph explaining the issues resulting from climate change.

**Teacher note:** conduct a quiz at the conclusion of ‘Patterns and processes associated with climate’. You could use online platforms for quizzes such as [Kahoot](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/621#.YkUZzl_M1tw.link), [Google Forms](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/89#.YkUZzqaBGkM.link), or [Mentimeter](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/140#.YkUZzjjkDTs.link). Access [BBC Bitesize – Factors affecting climate](https://www.bbc.co.uk/bitesize/guides/zgyw4qt/test) for example quiz questions relating to the topic.

## Learning sequence 4 – weather

Students:

* investigate patterns and processes associated with weather and weather events, for example
* discussion of factors affecting temperature and humidity GS VR
* description of meteorological processes that produce different types of rainfall and extreme weather events: droughts, floods, storms M VR
* assessment of the impact of an extreme weather event on a community
* examination of Aboriginal, Torres Strait Islander and/or international Indigenous perspectives on patterns and processes associated with weather and climate.

### Patterns and processes associated with weather

**Teacher note:** teachers should present the different weather instruments discussed in the following activity to the class to increase familiarity with the tools. Weather instruments teachers could consider presenting would include thermometer, sling psychrometer, barometer, rain gauge, wind vane and anemometer.

* Conduct a quick search of the weather conditions in your town, suburb or city. What key weather information can you gain about precipitation, temperature, wind and humidity?
* Watch [Weather Instruments (2:44)](https://youtu.be/ySSyT44nma4) and complete a summary table outlining the key weather instruments used to measure and predict weather in geography.

Table 8 – weather instruments we use in geography

|  |  |
| --- | --- |
| Weather instrument | Description |
| Thermometer |  |
| Sling psychrometer |  |
| Barometer |  |
| Rain gauge |  |
| Wind vane |  |
| Anemometer |  |

* Access [The art of the chart – how to read a weather map](https://media.bom.gov.au/social/blog/2391/the-art-of-the-chart-how-to-read-a-weather-map/) and summarise the key features of a synoptic chart into the following table.

Table 9 – synoptic chart features

|  |  |
| --- | --- |
| Weather instrument | Description |
| Isobar |  |
| High pressure |  |
| Low pressure |  |
| Cold front |  |
| Warm front |  |
| Troughs |  |

**Teacher note:** provide students with a printed copy of a synoptic chart for the following activity. [The Australian Bureau of Meteorology](http://www.bom.gov.au/australia/charts/4day_col.shtml) provides a variety of charts that are regularly updated.

* Watch [How to Read Weather Maps (5:15)](https://youtu.be/bd7DcVnrSL8) and on a daily forecast map of Australia [Australian Bureau of Meteorology](http://www.bom.gov.au/australia/charts/4day_col.shtml) highlight examples of
* isobars
* a high pressure system
* a low pressure system
* fronts.
* Access [Australia Weather Map](https://www.weather-forecast.com/maps/Australia) and use your synoptic chart features table to answer the following questions
* Where on the map can you identify a high-pressure system?
* What weather will be occurring in the area subject to the high-pressure system?
* Where on the map can you identify a low-pressure system?
* What weather will be occurring in the area subject to low pressure system?
* Explain how the different pressure systems influence daily temperatures.
* Access [What is a Tropical Cyclone?](http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/understanding/tc-info/) and explain how tropical cyclones, typhoons and hurricanes form in the northern and southern hemispheres.
* Access [Tropical cyclone reports](http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/past-tropical-cyclones/) and with a partner identify and discuss any apparent trends in Australia’s cyclone history.
* Your teacher will allocate you to a small group. The group will contribute to a class [Padlet](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/592#.YkUZzmWV_IA.link) outlining the meteorological conditions present for tropical cyclones experienced in Australia. Ensure the group also includes the trajectory of the cyclone and the impact to people and the environment. The following resources will support the group work
* [Tropical cyclone reports](http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/past-tropical-cyclones/)
* [Tropical Cyclone Seth](http://www.bom.gov.au/cyclone/history/seth.shtml)
* [Tropical Cyclone Odette](http://www.bom.gov.au/cyclone/history/odette21.shtml)
* [Tropical Cyclone Lucas](http://www.bom.gov.au/cyclone/history/lucas21.shtml)
* [Tropical Cyclone Gretel](http://www.bom.gov.au/cyclone/history/Gretel.shtml)

**Teacher note:** the following activity focuses on tropical cyclone Yasi. Teachers may wish to choose any other significant cyclone experienced in Australia or adjust the sequence to give a variety of examples of other significant cyclones.

Teachers need to be aware that this learning sequence addresses the impact of natural disasters on communities and may need to adjust accordingly for their school context.

When conducting the TAG [peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549#.Yko7yR5Oe34.link) teachers may wish to have all students provide feedback or allocate one group at a time to be responsible for that role.

* In small groups, create and present a [Google Slides](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/70#.YkUZzuP5uf0.link) presentation for Tropical Cyclone Yasi. Include the following in your presentation
* meteorological conditions that caused the weather event
* the general course and direction of the cyclone
* description of the severity of the cyclone and associated weather events
* assessment of the impact to the affected communities.
* Resources that will support your research
* [Severe Tropical Cyclone Yasi](http://www.bom.gov.au/cyclone/history/yasi.shtml)
* [Tropical Cyclone Yasi, 2011](https://knowledge.aidr.org.au/resources/cyclone-cyclone-yasi-queensland-2011/)
* [10 years on from Cyclone Yasi devastating Queensland](https://youtu.be/TXAfynlXZuc) (duration 5:16)
* [Cyclone Yasi: What happened](https://www.abc.net.au/news/2016-02-03/cyclone-yasi-what-happened-in-2011/7067086?nw=0&r=Gallery)
* [Storm Science Australia – Tropical Cyclone Yasi](https://www.ausstormscience.com/tropical-cyclones/historic-tropical-cyclones/tc-yasi/).
* Use the TAG Peer feedback template to evaluate the work of other groups.

Table 10 – TAG peer feedback template

|  |  |  |  |
| --- | --- | --- | --- |
| Group | T – Tell them something you really liked | A – Ask a question to clarify what you have learnt | G – Give a suggestion to make the presentation better |
| Isobar |  |  |  |

**Teacher note:** use [Inside/Outside Circles](https://www.theteachertoolkit.com/index.php/tool/inside-outside-circles) to guide a discussion of 4 key questions pertaining to the resource [Indigenous Weather Knowledge](http://www.bom.gov.au/iwk/culture.shtml).

* Read [Indigenous Weather Knowledge: Language, culture and environmental knowledge](http://www.bom.gov.au/iwk/culture.shtml). Use this research to complete the following
* explain to a partner how traditional Aboriginal knowledge is passed from one generation to the next
* explain to a partner how the change in climate through the conclusion of the last Ice Age resulted in the nature and culture of First Nations Peoples
* discuss with a partner what can be learnt from First Nations Peoples heritage in regard to understanding the complex nature of the Australian environment
* discuss with a partner how the seasonal descriptions vary between First Nations Peoples and Europeans.

**Teacher note:** availability for seasonal calendars relevant to your school’s local area may vary. Where possible access a seasonal calendar to share and discuss with your class. The local AECG may be able to assist with accessing a local seasonal calendar.

* Watch [The Different Seasons in Australia’s Indigenous Cultures – Behind the News (3:11)](https://youtu.be/_vQVjCdq-2I) and [Think, Pair, Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645#.YqKfXEME2Ik.link) answers to the following questions
* How is the European seasonal calendar different to the variety of calendars used by First Nations Peoples?
* Why was a more detailed understanding of the weather and climate and the associated characteristics of seasons important to the First Nations Peoples?
* Why would a seasonal calendar appear different in different areas of Australia?
* Access the [Indigenous Weather Knowledge](http://www.bom.gov.au/iwk/) website and select a First Nations Peoples community you are interested in researching. Explore the seasonal knowledge relevant to your chosen area and complete the following table.

Table 11 – First Nations Peoples weather knowledge summary

|  |  |
| --- | --- |
| Group | Notes |
| Community name |  |
| Number of seasons the community recognises |  |
| Names of the distinct seasons identified |  |
| Description of distinct seasons identified |  |

## Learning sequence 5 – Biogeography

Students:

* investigate the biogeography of one vegetation community, for example
* identification of ways vegetation is classified **VR**
* explanation of soil-forming processes and the relationship between soil and vegetation **VR**
* examination of the spatial distribution and physical characteristics of one vegetation community **M VR F**
* analysis of human impact on the selected vegetation community, including that of Aboriginal Peoples **VR**.
* investigate at least one environment produced by biophysical processes and human interactions in a particular location, for example
* identification of the main biophysical processes in the selected study **F VR**
* explanation of the processes that create the features of the environment
* description of human interactions with the environment **VR**.

### Biogeography – Investigative study

**Teacher note:** biogeography is the study of living things (plants and animals) over time. This could be the study of ecosystems in an area and how changes in climate over thousands of years can contract vegetation.

This activity focuses on investigating a vegetation community in a local school context using fieldwork and can be performed in one lesson or over many lessons depending on accessibility of resources. If using a plant identification app please consider downloading this prior.

Resources needed include a vegetation community (preferably native) on school grounds or close by, plant identification app (optional), tape measure exceeding 10 meters, quadrant (1 meter by 1 metre), percentage vegetation cover template (accessible from learning materials that accompany the [Save our catchment virtual excursion](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/virtual-excursions-hsie-stages-4-6/save-our-catchment-virtual-excursion)), clip boards, paper and pencils, click wheel and clinometer.

* As a class discuss the biogeography glossary list.

Table 12 – biogeography glossary list

|  |  |
| --- | --- |
| Terminology | Definitions |
| Biogeography | The study of living things, usually vegetation communities, in a location over time. |
| Organic matter | The living material, such as plants decomposing, within soil. |
| Sclerophyll characteristics | The characteristics of native plants to prevent water loss as adaptations to Australia's hot climate, which can include: thick leathery leaves, short leaves, thick bark, leaves angled to face edge towards the hot sun. |
| Slake test | A test to measure the stability of soil using water. |
| Soil smear | A method of viewing the colour and texture of soils by spreading a small amount across paper. |
| Transect | A line or path across the Earth’s surface along which observations are made or measurements taken. |

* Draw a sketch map of the school identifying the location of buildings, gardens, carparks, concrete area, footpaths and any other significant features. Ensure you apply the rules of BOLTSS to your map. Use a click wheel to assist in measuring distance and convert to appropriate scale.
* Create an [Affinity diagram](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/576#.YkE9hSrBCX8.link) to represent the class output from a brainstorming session. The brainstorm ideas will be put into clusters or columns based on their relationships, affinity or similarity about the focus question: ‘What is the biogeography (vegetation) of the school and how is it being influenced?’.
* Select an area of the school that contains vegetation and conduct a leaf rubbing. Annotate the leaf rubbing identifying key features and observations of the plant.
* Conduct a belt transect of a section of vegetation in your school. Save Our Catchment virtual excursion [Episode 09: In the field – Data collection (4:59)](https://education.nsw.gov.au/teaching-and-learning/curriculum/hsie/virtual-excursions-hsie-stages-4-6/save-our-catchment-virtual-excursion#/asset9) provides an example of how to conduct a belt transect survey. Use a tape measure to measure 10 meters along a transect. At every metre observe and record
* vegetation type
* percentage cover (this will require a quadrant and percentage cover template)
* where appropriate vegetation height. A clinometer will assist with measuring height of vegetation.

**Teacher note:** a local plant guide or vegetation app might be helpful to teachers and students identifying vegetation along the transects.

* Draw a transect of previously recorded vegetation data. Along the transect identify
* the types of vegetation surveyed across the transect
* vegetation height and spacing
* include a key instead of true representations of the vegetation types
* an example of a vegetation transect follows.

Figure 1 – example of a vegetation transect



‘[Continuous E/W line transect diagram through the wetland](http://www.countrysideinfo.co.uk/wetland_survey/transec2.htm)’ by [Offwell Woodland & Wildlife Trust](http://www.countrysideinfo.co.uk/).

* Discuss with a partner: ‘How do you think this resembles the landcover or vegetation that was present before European settlement in Australia?’
* Watch [Slake Test Demonstrates Soil Stability](https://www.youtube.com/watch?v=FKa2oIgRuPY) (3:38) and explain in 2 sentences the purpose and benefits of a slake test.

**Teacher note:** the soil’s organic matter and stability can be observed with a slake test which is where a clump of dry soil is lowered into water. If the soil clump quickly falls apart it is an indication of low organic matter and poor stability. This is often a sign that soil has been used extensively in the past for farming or gardening and the soil structure has been broken up and nutrients may have also been lost. If the soil clump mostly holds together, this is a sign of good soil stability with higher levels of organic matter present in the soil.

* Conduct a slake test to investigate the soil conditions in the local area and record observations.

**Teacher note:** a soil smear shows the materials that makes up the soil and the organic matter within them. A general rule is the darker the colour the more likely there is to be organic matter present in the soil. The grains felt in the soil while making the smear will indicate the parent material. For example, the large grains, which may feel like sand, suggest a sandstone parent rock and indicate the soil may not hold water very well on its own. Finer grains will indicate other soil is better able to hold water and could be a clay-based soil.

* Conduct a soil smear by rubbing a small amount of soil across a sheet of A4 white paper and record observations.
* Compile and document any influences on the vegetation within the study site. This may include
* practices (such as adding fertilisers) could be affecting the growth of vegetation
* types of species present
* litter or other pollution sources
* exposure to the sun, wind or rain
* vicinity to buildings and human activities.
* Use the influences previously identified and your field work to answer in half a page the question: ‘What is the biogeography (vegetation) of the school and how is it being influenced?’

## Assessment task

**Teacher note:** the task involves students working individually to create a short environmental documentary about the biogeography of an island study of their choice. Students will need advice on using digital media tools to produce a video documentary. Apple [iMovie](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/617#.YkunOxsv1OQ.link) and [Adobe Premiere Pro](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/60#.YkunO5sWvPk.link) are the suggested movie making tools for this task.

Teachers may pose the following questions for students to consider:

* What makes an island environment unique?
* What are the big influences on island formation and environment?
* How is the island environment important in the world today?
* How have islands been impacted and protected?
* When using this task, ensure it is placed on the school template and follows all assessment requirements.

### Outcomes

* **GEE5-1** explains the diverse features and characteristics of a range of places, environments and activities
* **GEE5-2** explains geographical processes and influences that form and transform places and environments

### Syllabus content

* investigate at least one environment produced by biophysical processes and human interactions in a particular location.

### Task

* Your task will be to present an environmental documentary called ‘My Island Biogeography’. The documentary will outline why an island of your choosing is unique and how it has changed across time.
* In your response you should include the following
* an introduction, outlining the geographic location in comparison to continents, neighbouring islands and surrounding oceans
* geologic age and an explanation of the island’s formation
* description of weather and climate at different locations on the island
* identify biome, types of vegetation and how vegetation has changed in the environment over time and explain how they vary between locations on the island
* description of native biodiversity, both plants and animals. Explain how native biodiversity has adapted to the environment
* explain how human interactions have shaped the environment that exists today.

### Marking criteria

Table 13 – marking criteria

|  |  |
| --- | --- |
| Grade | Criteria |
| A | * Demonstrates extensive understanding of biophysical processes that form and transform environments
* Demonstrates extensive understanding of diverse features and characteristics of island biogeography
 |
| B | * Demonstrates thorough understanding of biophysical processes that form and transform environments
* Demonstrates thorough understanding of diverse features and characteristics of island biogeography
 |
| C | * Demonstrates sound understanding of biophysical processes that form and transform environments
* Demonstrates sound understanding of diverse features and characteristics of island biogeography
 |
| D | * Demonstrates basic understanding of biophysical processes that form and transform environments
* Demonstrates basic understanding of diverse features and characteristics of island biogeography
 |
| E | * Demonstrates elementary understanding of biophysical processes that form and transform environments
* Demonstrates elementary understanding of diverse features and characteristics of island biogeography
 |

## References

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