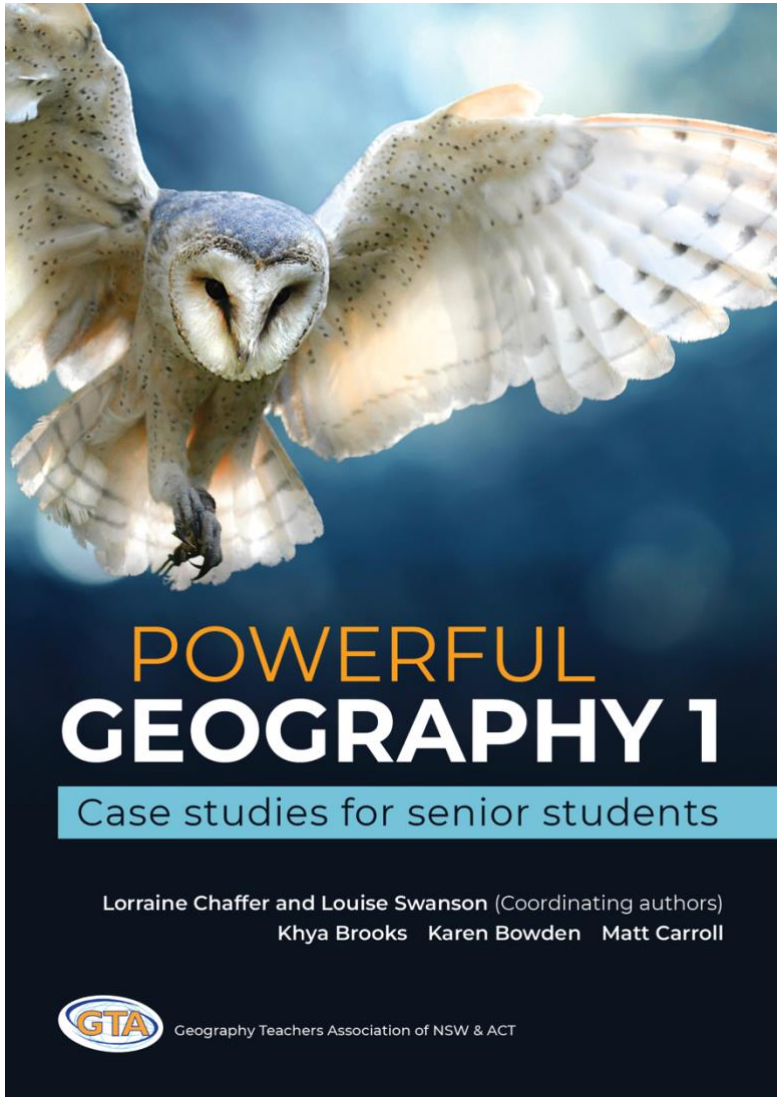

TEACHING AND LEARNING PROGRAM

Focus Area

EARTHS NATURAL SYSTEMS

Students work sequentially through the Earth systems drawing on a variety of material from Powerful Geography 1, including Visualise This, GEOstories and Case studies to understand a variety of processes, cycles and circulations and interconnections between them.

Differentiated student activities, tools and skills, key concepts and ideas for fieldwork are integrated throughout.

Order here: Powerful Geography 1 - Order Site (eventsair.com)
Follow the Authors Blog HERE for teaching ideas and support.

Stage 6 Year 11	**Unit Name:** Earth's natural systems & Geographical Investigation	**Teacher:**	**Unit Duration:** **Term 1, 2024 Weeks 1 - 11**

Unit Description		**Outcomes**
Students investigate the diverse landscapes of the Earth's surface and its distinctive physical features. They examine the cycles, circulations, interconnections and spatial patterns that combine to form the Earth's integrated system, and investigate natural processes, cycles and circulations that change the Earth's land and water cover. This focus area includes an overview of the uniqueness and diversity of the Earth. It is intended to provide a broad perspective as a context for studying the focus area. Allocate a maximum of 4 hours to this part of the focus area.	*Learning across the Curriculum* *General Capabilities* • Critical and creative thinking • Ethical understanding • ICT • Intercultural understanding • Literacy • Numeracy • Personal and social competence *Cross-curriculum priorities* • Aboriginal and Torres Strait Islander histories and cultures • Asia and Australia's engagement with Asia • Sustainability and environment *Other learning across the curriculum areas* • Civics and Citizenship • Difference and Diversity • Work and Enterprise	**GE-11-01** examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time **GE-11-02** explains geographical processes and influences, at a range of scales, that form and transform places and environments **GE-11-05** analyses and synthesises relevant geographical information from a variety of sources **GE-11-06** identifies geographical methods used in geographical inquiry and their relevance in the contemporary world **GE-11-07** applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments **GE-11-08** applies mathematical ideas and techniques to analyse geographical data **GE-11-09** communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms

Subject Skills		

Geographical inquiry skills
 	
● Develop geographical questions to inform a plan for inquiry
● Acquire quantitative and/or qualitative data and information using ethical practices by:
  ● collecting and recording primary geographical data using a range of tools
  ● gathering and organising geographical information from secondary sources
	Maps
	● Determine area and grid references, and degrees and minutes of latitude and longitude
	● Interpret contour lines
	● Calculate the local relief of an area
	● Calculate the gradient of a slope as a ratio
	● Construct and annotate a cross-section from a topographic map
	● Calculate and interpret the vertical exaggeration of a cross-section
	● Determine aspect, altitude, river flow, features within quadrants, directions, bearings and sight lines between 2 points
	● Use scale to calculate distance and area
	● Recognise the key features of changing pressure patterns on weather maps
	
	Spatial technology skills
	● Use GPS to collect location data
	● Use spatial information to determine connections, impacts and change over time
		Fieldwork
		● Formulate geographical questions for investigation
		● Identify, collect and record geographical data and information
		● Construct a log of events and activities that records the development of a fieldwork activity
		● Synthesise and interpret fieldwork data
		● Evaluate a fieldwork activity
		
		Graphs and Statistics
		● Interpret frequency distributions and diagrams
		
		Visual Representations
		● Use aerial photographs and satellite images to describe the rate and extent of change
		● Identify and describe spatial patterns and associations, interactions and change using a range of visual representations

Assessment FOR Learning	Assessment OF Learning	Assessment AS Learning
Diagnostic pre-tests, class brainstorms and application tasks	Assessment 1: Scenario Task; Weight: 30 % Outcomes:*GE-LS-03, GE-LS-05, GE-LS-12*	Processes, Cycles and Circulations writing task

SCOPE AND SEQUENCE	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11
Content	*Overview of uniqueness and diversity*		*Processes, cycles and circulations connecting natural systems*			*Natural systems and land cover change*				*Geographical Investigation*	
Intended Outcomes	GE-11-01, GE-11-09		GE-11-02, GE-11-05, GE-11-07, GE-11-08			GE-11-06, 11-07, GE-11-08, 11-09				GE-11-01, GE-11-02, GE-11-05, GE-11-06, GE-11-07, GE-11-08, GE-11-09	

<table>
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<tr><th>Core</th><th>Application</th><th>Extension</th></tr>
<tr><td colspan="2">Week 1
Overview of uniqueness and diversity (4 hrs)</td><td>How can we value nature?</td><td>Why do people have different connections with nature?</td><td>How are people's values of nature changing?</td><td></td><td></td></tr>
<tr><td>Nature as a source of wonder

- Inspirational Landscapes
- Biodiversity Hotspots
- Wildlife migrations</td><td>GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time</td><td colspan="3">Teacher places various satellite, ground level, vertical and oblique aerial photographs of nature around the room (e.g. Treehugger). Students use PMI through a gallery walkthrough on the characteristics and features of those places. Students share to find commonalities, then select one and develop 5 questions about it (e.g. where is this?)

Students assess the biodiversity hotspot map to explain its spatial distribution. Students research ONE biodiversity hotspot and complete a diagnostic structured paragraph to the question: Explain the importance of biodiversity hotspots.

Students read Powerful Geography GEOSTORY 1.1 Inspiring wildlife migrations' and complete the activities. Students write a summary to explain how wildlife migrations demonstrate nature as a source of wonder.</td><td>Examine environments for characteristics

Explain spatial patterns of biodiversity hotspots

Examine natural phenomena spatial patterns</td><td></td></tr>
<tr><td>People's connection to the natural world and why it can vary; eg:

- Proximity to nature
- Worldview
- Indigenous groups
- Aboriginal Peoples connection to country
- the 'overview' effect</td><td>GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time

GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</td><td colspan="3">Teacher distinguishes between worldviews and the values that can influence perspective through the lens of anthropocentrism, biocentrism and ecocentrism. Students create a checklist to test their peers and determine their worldview.

Using the Bishnoi group's protection of trees in the Thar Desert (India) as an example, students select a natural place and explain how THREE of the following perspectives would see and connect to that place differently, and why.
<table><tr><td>Military perspective</td><td>Business perspective</td><td>Political perspective</td><td>Environmentalist perspective</td></tr><tr><td>Traveller perspective</td><td>Indigenous group perspective</td><td>Ecologist perspective</td><td>Other (optional)</td></tr></table>
Using the following scenario, students complete the activities: A traveller becomes ill whilst hiking and comes across an Indigenous tribe who use traditional medicine to treat him. The awed traveller then meets with an investor who funds research into the medicinal properties. A pharmaceutical company then uses this to develop a product.
a) Identify the connection to the natural world for each of these stakeholders.
b) Using your own worldview, which stakeholder owns the most rights to this medicine, and why?</td><td>Examine worldviews influence on environmental value

Apply worldview and values to examine places and environments

Apply worldviews and values to determine connections to environments</td><td></td></tr>
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<tr><td>The universal value of Earth's environments

- Intrinsic value
- Global Commons</td><td>GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time

GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms</td><td colspan="3">Students read the 'Powerful Geography VISUALISE THIS 11: Global Commons' and complete the activities. Students then:

Describe two different types of global commons and the goods and services they provide. | Students brainstorm the different goods and services provided by the global commons and then categorise these into environmental, social, economic. Students then identify how ONE worldview perceives the role of global commons. | Students construct a paragraph from the stance of one worldview justifying the governance of the Global Commons.

Optional: Teacher explains what the UNESCO World Heritage list is and models how the criteria is used to justify the labelling of two sites. Students then complete one of the levelled activities:

Students annotate a photograph of one of the modelled examples to explain why it is a UNESCO site. | Select one of the sites on the website and create a presentation explaining why it is a world heritage site and people's connections to it | Select a place in the world that is not on the UNESCO Heritage list. Using evidence and photographs, justify why it should be using at least two of the criteria.

Students then identify evidence to 'change my mind' on the following statement: Environments that do not provide services for humans, do not hold any value.</td><td>Examine the value of the Global commons

Examine the criteria of UNESCO World Heritage

Utilise evidence to justify human valuing of environments</td><td></td></tr>
<tr><td colspan="2">Weeks 2-5
Processes, cycles and circulations connecting natural systems</td><td>What are the processes, cycles and circulations in Earth systems?</td><td>How interconnected are the processes, cycles and circulations for Earth systems?</td><td>How will human impacts to processes, cycles and circulations impact the future of the Earth's systems?</td><td></td><td></td></tr>
<tr><td>Characteristics of Earth's natural systems and factors affecting their functioning

- Latitude.
- Seasonality
- Altitude
- Continentality.
- Oceanity</td><td>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments

• Maps: Determine area</td><td colspan="3">In pairs, students create a Frayer Model for each of the terms processes, cycles and circulations. Students use Source 1.2 in Powerful Geography Visualise This 1: Earth's natural systems and existing knowledge to brainstorm examples of natural biophysical interactions. Students then categorise the examples into processes, cycles and circulations.

Students brainstorm the factors that may affect/influence the processes, cycles and circulations of Earth's natural systems.

Students are provided a topographic map, a climate zone map and a biomes map of Australia. Students must predict why there are differences in the types of natural systems across the continent, referring to the maps. Teacher explains</td><td>Define terminology for application to natural systems

Determine factors for Earth's natural systems</td><td></td></tr>
</table>

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<tr><td></td><td>and grid references, and degrees and minutes of latitude and longitude

• Maps: Identify and describe spatial patterns and associations, relationships, networks, linkages and evidence of change, within and between regions or areas, using a range of maps</td><td colspan="3">the influence of latitude (including a practise game), seasonality, altitude, aspect, continentality and oceanity on natural systems across Australia using Hobart, Alice Springs, Cairns and Mt. Kosciuszko as key examples . Students complete one of the following:
<table><tr><td>Explain how latitude and seasonality influence differences in the natural systems in Cairns and Hobart.</td><td>Select an environment in Australia and create a 4 minute presentation that explains how latitude, seasonality, altitude and proximity to ocean influence its:
- Climate (using a climate graph)
- Vegetation and animals, including their natural behaviours
- Processes and/or cycles
Students are to use graphs, maps and diagrams where possible</td><td>Justify how a change in one of the factors, such as latitude or altitude, would influence the natural systems of ONE environment in Australia.</td></tr></table>
Students read Powerful Geography chapter 3.3: Factors influencing forests and complete activities. Students use their understanding to annotate photographs of the Boreal and the Congo forests to compare how altitude, latitude, aspect and seasonality influence the forests differently.</td><td>Applying mapping skills for the determination of factors affecting system functioning

Annotation of photographs applying factors affecting system functioning</td><td></td></tr>
<tr><td>The processes, cycles and circulations connecting natural systems; including:

atmospheric systems</td><td>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</td><td colspan="3">Students complete a diagram that summarises the main 5 layers of the atmosphere, identifying their height, temperature ranges and explaining where weather occurs and where the ozone layer is. Students then create a pie or sector graph to summarise the distribution of gases in each layer. Referring to their diagram, students explain how the formation of the layers influences earth systems (altitude and adiabatic lapse rate).

Global atmospheric circulation
Students assess a map of world biomes with a map of climate zones and map of ocean circulation systems. Students identify patterns and attempt to explain how processes, cycles and circulations influence these patterns.

Students read and conduct activities from Powerful Geography: Visualise This 2: Global Atmospheric Circulation.
Students complete a diagram of the Earth to annotate the Hadley, Ferrel and Polar cells, identifying where the global high and low pressure systems are (high is descending, low is ascending). Students then:
<table><tr><td>Explain how global atmospheric circulation influences two different</td><td>Use a map of the continent of Africa and explain how global atmospheric</td><td>Complete the ‘core’ activity, but also annotate the map to explain</td></tr></table></td><td>Use graphs and diagrams to explain processes and interactions

Identification of patterns within atmospheric system

Explain influence of GAC as a atmospheric process</td><td></td></tr>
</table>

Content	Outcomes AND Skills	Teaching Activities			Evidence of Learning	Register
		Core	Application	Extension		
		environments in the world.	circulation has influenced the pattern of biomes across it.	how seasonality further influences this (savannas at different times of the year)		
	- *Maps: Recognise the key features of changing pressure patterns on weather maps* - Interpret frequency distributions and diagrams **GE-11-02** explains geographical processes and influences, at a range of scales, that form and transform places and environments	**Weather systems** Teacher overview of the influence of the Coriolis effect on wind direction and differential heating at a global and regional scale. Teacher overview of how this relates to synoptic charts (including high and low pressure between north and south, isobars, hPa, cold/warm fronts, ridges and troughs, wind speed and direction), and students use the BOM to explain the weather changes for the next four days in three locations across Australia. Students then predict how this would be different in a different season. Teacher models how to use the pressure, temperature and wind layer on Zoom Earth to identify weather. Students predict if where they live is experiencing a high or low pressure system and then check it on Zoom Earth. Students then: Use information from Zoom Earth to explain what the weather looks like where they live. / Use Zoom Earth to explain the difference in weather between one place in the Northern Hemisphere and one place in the Southern Hemisphere. Students must refer to the following in their explanations: the hPa, wind direction, high/low pressure, Coriolis effect. / Students use the wind rose tool to explain the average wind direction and speeds for a location in Canada. They assess the weather in that location now using Zoom Earth and determine whether it correlates with the normal patterns, justifying why. Students investigate how differential heating is influenced on a local scale, by factors such as albedo, solar access and wind tunnels . Students assess diagrams of sea-land breeze and attempt to explain why the high and low pressure systems form differently in day from night. Students brainstorm other ways these processes are affected (eg urbanisation). Students predict where microclimates could be in the school, based on albedo, solar access, wind tunnels etc. They use hygrometers, thermometers and anemometers to test the inquiry question: How do land use changes in the school influence its microclimates?		Connecting processes impact on weather Explanation of hemisphere differences Examine local factors determining variations to atmospheric system Fieldwork inquiry into functioning of microclimates	

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<tr><td></td><td></td><td>The teacher explains whether the hypothesis was correct or incorrect, and the student needs to use a piece of evidence from the fieldwork to justify.</td><td>Summarise whether the original hypothesis was correct or incorrect, and use fieldwork data to explain why.</td><td>Use the findings to assess one change that can be made to improve the microclimate of a part of the school</td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="3">Revision activity (optional):
Annotating one photograph of an environment, explaining how atmosphere processes have influenced it. | Annotate two photographs to explain how atmospheric processes shape two environments differently | Predict how changes to the composition of the atmosphere can influence the atmospheric processes in two places.</td><td>Explanatory summary of atmospheric processes functioning in environments</td><td></td></tr>
<tr><td>hydrological systems
• precipitation patterns and cycles
• catchment functioning
• water storages and flows.</td><td>GE-11-08 applies mathematical ideas and techniques to analyse geographical data
- interpret frequency distributions and diagrams

GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments</td><td colspan="3">Water storage and flows and catchment functioning
Students complete a water cycle diagram and then discuss what this looks like on a local to global level. On their diagram, students identify the inputs, storage and outputs of water at different points in the cycle.

Students watch a video summarising water catchments and/or video on how rivers have water and create an illustration to demonstrate how catchments and rivers work, and how humans can impact these natural processes. Students use the graph at Figure R7 to explain how seasons influence the flow of water in rivers.

Students get into groups of three and allocate each person a type of rainfall: orographic, frontal and convectional. Students become experts on their type of rainfall and teach it to the others in their group until all students know about all three. Collectively they construct a diagram or annotate one to explain the different types and how they influence environments.

Students watch ‘We flooded a forest’ and identify the hydrologic processes, cycles and circulations that occur. Using their notes, students create a written response to the following:
Explain the natural cycles and circulations of the hydrosphere in the Danube river. Refer to the terms | Analyse the impact of human activities on the natural cycles and circulations in the Danube. | Assess how the human driven flooding of the Danube supported its natural processes, cycles and circulations.</td><td>Use diagrams and statistics to explain water storage on different scales

Interpret frequency graphs and diagrams to explain processes

Explain the impacts of rainfall processes on places

Explain how changes to hydrological cycles can impact places and environments</td><td></td></tr>
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<tr><td></td><td></td><td colspan="3"><table><tr><td>- storage, catchment, velocity and biosphere in your answer.</td><td></td><td></td></tr></table>
Atmosphere-ocean circulations
Students read and complete activities from Powerful Geography- Visualise This 3: Global Ocean Circulations.

Students investigate how proximity to the ocean can affect the climate of a place. They construct a climate graph of 3 places on the same line of latitude but at different proximities to the ocean; Ibiza (an island), San Francisco (coastal) and Wichita, Kansas USA (inland). They use their climate graphs to:<table><tr><td>Describe the differences in climate between the locations.</td><td>Assess the extent to which proximity to the ocean influences the precipitation and climate of an area
(teacher support: Ibiza will be influenced by the Mediterranean climate, San Francisco will experience a mild maritime climate due to its coastal location, and Wichita will have a continental climate with more extreme temperature variations due to being inland)</td><td>Students complete the core activities and then assess if there are any anomalies to these patterns anywhere in the world.</td></tr></table>Students use their knowledge and additional research to answer the following question: Why is London warmer than New York, even though it is a higher latitude?
Students construct a diagram of ENSO using Powerful Geography Visualise This 3: Global Ocean Circulations as a guide. On their diagram, they explain how changes in the cycle of ENSO influences the precipitation patterns in Australia and South America.</td><td>Construct climate graphs and annotate them to explain differences in characteristics and cycles and processes between places

Students apply knowledge of circulations and cycles

Communicate understanding through a diagram</td><td></td></tr>
<tr><td>geomorphic systems

• processes at tectonic boundaries
• volcanic eruptions
• soil formation</td><td>GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to</td><td colspan="3">Processes at tectonic boundaries
Students watch the theory of continental drift and write a summary justifying why it is scientifically sound theory. They use their notes from the video to complete diagrams of the different tectonic boundaries and the way those boundaries influence environments.</td><td>Justification of theory merit</td><td></td></tr>
<tr><td></td><td>GE-11-01 examines places, environments and natural and human phenomena, for their characteristics, spatial patterns, interactions and changes over time</td><td colspan="3"></td><td></td><td></td></tr>
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<td>• coastal and river processes
• cycles of weathering, erosion and deposition.</td>
<td>investigate places and environments
- Spatial Tech: Use spatial information to determine connections, impacts and change over time
- Maps: Determine area and grid references, and degrees and minutes of latitude and longitude
- Maps: Interpret contour lines
- Maps: Calculate the local relief of an area
- Maps: Calculate the gradient of a slope as a ratio
- Maps: Construct and annotate a cross-section from a topographic map</td>
<td colspan="3">Students use satellite images and Google Earth to construct a transect of the environment from Northern India to Mongolia. Students identify how tectonic processes and other processes, cycles and circulations (such as orographic rain and global atmospheric circulation) have influenced this transect.
Students assess topographic maps of volcanoes, such as Hawaii or this one here, and complete various diagnostic mapping activities. The teacher uses the data from this task to inform future explicit teaching and practice of these skills. Questions could address the contour interval, local relief, gradient, distance, line of sight, cross sections and vertical exaggeration etc.

Optional: Students complete the activity written by Earth Science Week on ArcGIS, assessing the impact of tectonic plates between the Northern and Southern hemispheres.

Cycles of weathering, erosion and deposition
Teacher overview of chemical and mechanical weathering, types of erosion and deposition. Students annotate photographs from coastal and desert environments to explain how weathering and erosion have influenced those environments.

Students conduct an inquiry to look at how soil depth influences the size of trees in the school. Students use a soil rod and rope to measure the depth of soil and width of trees at 5 locations at a high point (ridge) in the school, and 5 in a lower point (valley). Students:
<table>
<tr><td>Students identify a pattern in the data set.</td><td>Calculate the averages of the data sets and determine whether the weathering, transportation and deposition of soils increases soil thickness in a valley, and if this influences the biosphere.</td><td>Students complete the core activity and then assess the validity of the data collected.</td></tr>
</table>
Students read the Powerful Geography GEOstory 1.4 Blown Away: The story of dust and complete the activities.</td>
<td>Transect analysis determining geomorphic influence

Diagnostic mapping skills

Comparison of hemisphere tectonic plates

Annotations and corresponding explanations of geomorphic process

Fieldwork inquiry measuring geomorphic processes influence

Geomorphic circulation activity</td>
<td></td>
</tr>
<tr>
<td>ecological systems
• energy flows
• nutrient cycles</td>
<td>GE-11-05 analyses and synthesises relevant geographical</td>
<td colspan="3">Teacher overview of energy flows in an ecosystem, and the cycling of nutrients. Teacher overview of biological productivity (and NPP). Students assess a map of biological productivity and use their understanding of processes, cycles and circulations to write a structured response to the following question: How do global processes, cycles and circulations influence the spatial patterns of biological productivity. Students then:</td>
<td>Assessing of energy flows influence on productivity</td>
<td></td>
</tr>
</table>

Content	Outcomes AND Skills	Teaching Activities			Evidence of Learning	Register
		Core	**Application**	**Extension**		
• *biological productivity* • *land-based and marine ecosystems* • *natural phenomena such as species migration.*	information from a variety of sources **GE-11-09** communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms	Label a food chain to demonstrate the movement of energy through an ecosystem	Label two food chains and compare them to show the movement of energy in a high biomass v low biomass ecosystem referring to Whittaker and Gerschel models (examples for teachers can be found in the Cryosphere and Forest chapters of Powerful Geography or the Wetlands example from MDBA).	Students apply the Whittaker and Gerschel models to compare the biomass of THREE different ecosystems, map them across a globe to identify patterns and predict the future change for ONE of those ecosystems Students read *Powerful Geography Chapter 3.2: Forests as ecological systems* and complete the activities. Students read *Powerful Geography GEOstory 1.3: Whales as ecological engineers* and complete the activities Teacher explains paragraph structuring (eg PEEL, PBEIHT, STEEL etc) and how to apply evidence to form a judgement. Students respond to the following short answer question using the scaffold: Explain how two of Earth's natural systems interact to influence ONE environment. Students then peer mark on another and provide a suggestion for improvement. Students complete a set of short answer questions, applying feedback from the previous activity. Example questions include: - Determine the significance of hydrologic systems in influencing the atmosphere - Explain the role of weathering and erosion in influencing the nature of environments - Analyse the role of energy flows for the diversity of environments	Examination of ecologic system processes in forests Response and refinement of judgement related to system interactions Application of feedback to refine connection of natural systems	
Weeks 6-9 *Natural systems and land cover change*		*How do processes, cycles and circulations shape land cover?*	*How have natural processes, cycles and circulations shaped land cover in the Boreal Forest of Canada?*	*How will changes to natural processes, cycles and circulations shape land cover in the Boreal Forests of Canada in the future?*		
The nature and extent of Earth's land cover, including water	**GE-11-06** identifies geographical methods used in geographical inquiry and their relevance in the contemporary world	**The nature and extent of Earth's land cover** Teacher overview of nature and extent of global land cover across marine and terrestrial environments. Students distinguish between land cover and land use. Students use Land Cover Viewer to determine the nature and extent of land and water coverage for each major continent.			Determine changes to land cover using graphs and photos	

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<tr><td rowspan="2">Natural processes, cycles and circulations that change Earth's land and water cover, including:
● climatic and glacial cycles
● the invasion and ecological succession of vegetation communities</td><td>- Maps: Estimate the scale of aerial photographs and satellite images
- Maps: Calculate areas of land use as a ratio

GE-11-07 applies geographical inquiry skills and tools, including spatial technologies, fieldwork, and ethical practices, to investigate places and environments

GE-11-08 applies mathematical ideas and techniques to analyse geographical data

GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms

- Spatial Tech: Use spatial information to determine connections, impacts and change over time</td><td colspan="3">Students use the ARCGIS 'wayback' tool and toggle the swipe mode (a button on the left). Students visit 10 different environments on Earth, at varying scales, and compare the oldest and newest image at each site. Students note down changes to the nature and extent of land cover. Example places: Northern Canada, Aral sea, St Helens, Sumatra, Oran Park NSW. Students then:

<table><tr><td>Students annotate two of the images to explain changes to the nature and extent.</td><td>Use a clear 1cm grid over a satellite image of an area, such as Connecticut River. Students create a colour code chart for different land uses, such as forest, farm, cities, water, other. Students lay the grid over the image and colour in each square based on what is mostly found in it. Students then calculate the approximate area of land cover for each land use in Km2 and the percentage of land cover for each land use type.</td><td>Complete the core activity and then construct the same activity on an older satellite image of the same area (using ArcGIS wayback). Students calculate the ratio of land uses and use this to assess how the land cover has changed. Similar lesson overview here.</td></tr></table>
Glacial and interglacial periods
Teacher overview of glacial and interglacial cycles of Earth. Students read Powerful Geography Visualise This 4: Glacial and Interglacial cycles and complete the relevant activities. Students then:

<table><tr><td>Annotate historic temperature graphs to identify glacial and interglacial periods on Earth</td><td>Annotate historic temperature and gas graphs to identify patterns between gas composition and the world's climate. Use these patterns to predict the future of interglacial and glacial periods on Earth.</td><td>Using evidence from temperature and gas graphs, predict the implication of changes to the natural cycle of glacial and interglacial periods.</td></tr></table></td><td>Use mapping skills to calculate the change of land cover on small scale and then larger scale maps

Interpret various graphs and statistics to make informed judgements on patterns in the atmosphere and glacial/interglacial periods

Communicate information visually</td><td></td></tr>
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<tr><th rowspan="2">Content</th><th rowspan="2">Outcomes AND Skills</th><th colspan="3">Teaching Activities</th><th rowspan="2">Evidence of Learning</th><th rowspan="2">Register</th></tr>
<tr><th>Core</th><th>Application</th><th>Extension</th></tr>
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<td>The natural processes, cycles and circulations that have shaped the land and/or water cover of ONE place</td>
<td>- Maps: Identify and describe spatial patterns and associations, relationships, networks, linkages and evidence of change, within and between regions or areas, using a range of maps

GE-11-09 communicates and applies geographical understanding, using geographical knowledge, concepts, terms and tools, in appropriate forms

- Visual Repr: Use aerial photographs and satellite images to describe the rate and extent of change

- Maps: Determine area and grid references, and degrees and minutes of latitude and longitude</td>
<td colspan="3">Optional: Students read Powerful Geography Visualise This 6: Permafrost, complete the relevant activities and then create a diagram that explains how glacial and interglacial cycles influence permafrost.

Ecological Succession
Teacher explains how ecological succession occurs following a glacial period. Students read Powerful Geography Visualise This 5: Ecological Succession and complete the activities. Students are given one of the scenarios below to create their own timeline illustration of primary and secondary succession over a fifty year period, and annotate their diagrams to explain the difference.
Scenario examples:
- A person throws a cigarette into some dry bushland and starts a fire in a grassland in southern NSW.
- A hiker from another country walks through the Daintree Rainforest with a weed seed on their shoe. How could that seed result in secondary succession?
- Mount St Helens has erupted in Washington. The eruption resulted in volcanic ash and pyroclastic debris across 300Km2. Draw what would happen to that area over time.
- A cyclone devastates the eastern part of the Congo rainforest. Explain the succession process.

Natural changes to the Earth’s land cover
Students read Powerful Geography Chapter 2.4 Changing Land and Sea cover and assess changes to the Arctic through satellite imagery. Students:

<table>
<tr><td>Complete core knowledge activities</td><td>Complete core and/or application activities. Students then explain how changes to global atmospheric processes can influence succession in cryospheric environments.</td><td>Complete application and extension activities. Students then predict what the future of land cover will be like in areas with permafrost if global warming increases further, referring to real world examples.</td></tr>
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Boreal Forest systems
Teacher introduces the Boreal Forests in Northern USA and Canada. Students watch The Taiga and identify processes, cycles and circulations identified in the video. Students review how to construct a climate graph and test their</td>
<td>Communicate information in a range of visual formats to explain how succession changes environments over time

Compare photographs and satellite images to describe the rate and extent of change on Earth

Construct graphs to display information about the characteristics and</td>
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Maps: Interpret contour lines
Maps: Calculate the local relief of an area
Maps: Calculate the gradient of a slope as a ratio
Maps: Construct and annotate a cross-section from a topographic map
Maps: Calculate and interpret the vertical exaggeration of a cross-section
Maps: Determine aspect, altitude, river flow, features within quadrants, directions, bearings and sight lines between 2 points
Maps: Use scale to calculate distance and area

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understanding of climate graphs on this quiz. Students create a climate graph of Alberta, Canada, where Boreal Forest is found using data from Eldorado. Students annotate the graph to explain how natural global processes, cycles and circulations have contributed to that climate and influence place.

Students watch 5 Big Reasons to Conserve and Protect the Boreal Forest. Students identify the ecosystem services and values of the Boreal Forest. Students construct food chains and food webs on the Boreal using worksheets here.

Students read Powerful Geography Chapter 3.4 Canada's Boreal Forests and:
<table>
<tr>
<td>Complete core knowledge activities</td>
<td>Complete core and/or application activities. Students then create a structured response to the question:
Analyse the role of natural processes, cycles and circulations that have shaped the land cover of Canada's Boreal Forests.</td>
<td>Complete application and extension activities. Students then read Chapter 3.5 Congo Forest and students create a Venn Diagram to compare the role of processes, cycles and circulations on the Congo vs. the Boreal.</td>
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</table>
Students predict how climate change is impacting Boreal forests. They read the Conversation and watch CBC News, listing the ways Climate Change is affecting the processes, cycles and circulations in the Boreal. Students then rank these impacts from most impactful to least, justifying their rankings.

Students read Powerful Geography Chapter 3.6 Challenges to natural forest systems and complete the appropriate activities.

Students use the satellite imagery at NASA to explain the extent of impact fire has to the natural processes and cycles in Canada.

Students complete a range of mapping activities on a 2017 topographic map of a section of Boreal forest in Wiseman, Alaska using TopoView. These activities can include:

Calculate the distance the water travels from GR914264 before it reaches the North Fork Koyukuk River
Identify the highest point on the map in the Northwest quadrant
If the spot height at GR923254 is 4450. What is the local relief between there and GR919259?

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processes in places and environments

Identify characteristics and processes in env

Communicate and applies geographic terminology to explain processes, cycles and circulations in Boreal forests

Applies mathematic skills to predict future challenges

Communicates ideas

Uses photographs to explain change

Conducts various mapping skills to assess land use change and impacts
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<tr><td></td><td></td><td colspan="3">- Calculate the gradient between GR905225 and GR913234?
- Determine the river flow in AR8728
- What is the aspect at 895183?
- What is the aspect at AR8829?
- Which slope would receive more sunlight and why: AR8527 or AR9221?
- Calculate the approximate area of the North Fork Koyukuk River from North of GR894275.
- Conduct a cross section from GR855248 to GR906254. Calculate the vertical exaggeration of the cross section.
- Extension: Identify this section of map on the 1971 version, which is at a smaller scale.

Optional: Students read Powerful Geography Visualise This 6: Permafrost and use the information to explain how human induced changes are affecting the functioning of Boreal forest processes, cycles and circulations.</td><td>on processes, cycles and circulations in an area of Boreal forest</td><td></td></tr>
<tr><td colspan="2">Weeks 10-11
Geographical Investigation</td><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Identify an area for geographical inquiry

Develop geographical questions and formulate a plan; including:
• what is the focus of the research?
• what is the geographic extent of the investigation?
• how should the investigation be sequenced?
• what time should be allocated to the various steps?

Develop geographical questions to inform a plan for inquiry</td><td>GE-11-02 explains geographical processes and influences, at a range of scales, that form and transform places and environments

GE-11-05 analyses and synthesises relevant geographical information from a variety of sources</td><td colspan="3">Students read Powerful Geography Chapter 13.1 Geographical Investigation introduction and self-identify an area of the research process they may need the most support with.

Students read Powerful Geography 13.2.1 and 13.2.2 Identifying an area and Developing Geographical questions and complete the activities. Students then analyse various photographs of environments and work in pairs to brainstorm different geographic inquiry questions.

Students brainstorm issues, concerns or inquiries they have about the local area. The class shares their answers in a collaborative brainstorm, and students categorise the ideas. Students individually select an idea they are interested in and begin background research.

Students read Powerful Geography 13.2.3 Ethical Practices and complete the activities. Teacher overview of secondary research: how to assess the reliability, validity and bias of sources. Students:
<table><tr><td>Use the ABC source checker criteria to assess a secondary source</td><td>Use the ABC source checker criteria to rank 5 provided different</td><td>Find 5 sources of different validity, including journal articles, and use the</td></tr></table></td><td>Understands foundations of inquiry

Development of relevant local area issues list

Guided development of high quality secondary source selection</td><td></td></tr>
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<tr><td rowspan="2">Acquire quantitative and/or qualitative data and information using ethical practices by:
● collecting and recording primary geographical data using a range of tools
● gathering and organising geographical information from secondary sources</td><td rowspan="2">GE-11-06 identifies geographical methods used in geographical inquiry and their relevance in the contemporary world

- GI: Formulate geographical questions for investigation
- GI: Identify, collect and record geographical data and information
- GI: Construct a log of events and activities that records the development of a fieldwork activity</td><td colspan="3">
<table>
<tr><td></td><td>secondary sources from most reliable to least.</td><td>ABC source checker criteria to rank them from most reliable to least.</td></tr>
</table>

Teacher overview of primary research methods. Students assess the effectiveness of a sample set of interview questions, observation notes and questionnaires and collectively identify three ways to improve each of the research methods to improve its usefulness. Then:
<table>
<tr><td>Teacher provides an example of a GI question and students explain how questionnaire or observation could be used to support it</td><td>Teacher provides example geographic inquiries and students justify the top two primary research methods that would support that inquiry.</td><td>Teacher provides an example of a Geographical Investigation, and the students evaluate the effectiveness of the primary research methods use and develop one strategy for how its validity and reliability could have been improved.</td></tr>
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Students use their secondary research to identify a focus of their research. They identify the extent of the geographic investigation, plan their investigation (including timing) and construct a draft log of events.

Students formulate a draft of their first primary research method.</td><td>Application of most appropriate primary research method for inquiry scenario

Development of geographical inquiry question

Construction of primary research methodology</td><td></td></tr>
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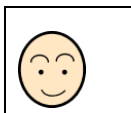
Teacher Evaluation				Comments/Variations
How did the unit 'rate' in these areas?				
Time allocated for topic				

Student understanding of content				
Opportunities for student reflection on learning				
Suitability of resources				
Variety of teaching strategies				
Integration of Quality Teaching strategies				
Integration of ICTs				
Literacy strategies used				
Numeracy strategies used				
Differentiation for Learning Support students				
Differentiation for HPGE students				
Appropriateness of associated Assessment Task				
Student Engagement				

Date commenced:	**Date completed:**
Teacher's signature	**Head Teacher's signature**