NSW Department of Education

Geography 7–10 – thinking and working geographically

Fieldwork

Contents

About this resource

This resource is designed to help teachers in the development of fieldwork activities in Geography 7–10. This involves gaining an understanding of:

- thinking and working geographically
- geographical concepts
- geographical inquiry skills
- geographical tools.

This guide provides advice and guidance for the delivery of geographical inquiry skills and the application of geographical tools in the context of fieldwork.

The information and graphics used in this resource will assist teachers to develop fieldwork strategies that can applied in each school context in alignment with relevant focus areas.

Syllabus content

Content addressed in this guide is sourced from the Geography 7–10 Syllabus.

Outcomes

A student:

- **GE4-TAP-01** selects and uses geographical tools to acquire and process geographical information
- **GE5-TAP-01** applies and evaluates a range of geographical tools to acquire and process geographical information

The importance of fieldwork

Note: fieldwork is an essential part of the study of geography. All students must undertake fieldwork in Stage 4 and Stage 5 and complete approximately 10 hours per stage. Fieldwork could include pre- and post-fieldwork activities.

Students with disability may require adjustments or additional support to engage with inquiry skills and tools, including fieldwork.

Geographical inquiry allows them to think and work geographically, using a wide range of skills, including acquiring, processing and communicating geographical information. Engagement in fieldwork, involving the use of tools, is fundamental to geographical inquiry, and provides opportunities for students to learn about and apply ethical research practices. (Geography 7–10 Syllabus, NESA 2024)

Fieldwork should never be an end in itself – it should always be part of a geographical inquiry, starting with pre-fieldwork activities and setting geographical questions, followed by field activities and post-fieldwork to interpret and analyse primary data and communicate conclusions.

Effective fieldwork should:

- be planned
- be mapped to student outcomes and focus areas for relevance
- contain guided activities to support students in their inquiry
- involve students being active participants in the collection of geographical data
- provides opportunities for students to learn about and apply ethical research practices.

Accessing the field in Geography 7–10

Fieldwork can be undertaken at school, in the local area or at more distant places. Experiences can range from part of a lesson, a full-day excursion to an overnight camp. Fieldwork sites could include:

- school grounds
- local Environmental and zoo education centres
- a local neighbourhood
- natural areas, for example national parks, reserves
- beaches, estuaries, wetlands, agricultural areas
- towns and cities.

School grounds

The school site is a great place to embed fieldwork into geography. It does not require offsite documentation and reduces constraints such as cost and transport. School grounds fieldwork activities could include:

- field sketches
- recording temperature and humidity
- finding direction
- orientation of maps
- observation of vegetation patterns or flora habitats
- measuring slopes
- soil and water testing
- an incursion with local Environmental and zoo education centres.

Local neighbourhood

Students are encouraged to be curious and imaginative in investigations and fieldwork and think creatively about the ways places and spaces are used. The syllabus aims to develop a sense of curiosity about the world and develop a lifelong interest in geography. The local neighbourhood provides a cost-effective opportunity for students to make real-world connections with geography. Fieldwork activities could include:

- conducting a field sketch to study the changes in the local environment
- local library research of a local geographic community
- observation of pollution in a local creek
- measuring the gradient of a slope in the park
- photographing litter pollution in a local street
- surveying neighbours or interviewing residents about a local issue
- identifying features of places or observing the connections between people and places in your local area.

Day or extended excursions

Short day excursions outside of the school are integral for geographical understanding. Students are given the opportunity to enhance their knowledge through observing, mapping, measuring and recording real-world phenomena and consider their responsibilities to protect other forms of life that share the environment. Excursion opportunities might include:

- a visit to an Environmental and zoo education centre
- a visit to NSW National Parks and Wildlife Service (NPWS)
- fieldwork in urban places such as the local town or suburb
- visiting coastal environments to observe environmental change
- visiting a farm to investigate food production
- visiting a local town to assess wellbeing or liveability

- visiting an Aboriginal community or organisation
- visiting an ecotourism business
- visiting a local renewable energy facility
- visiting sites where volunteers care for their local environment by participating in conservation activities
- a cross-curricular day trip as part of a science or history excursion.

Virtual excursions

Virtual excursions, also known as virtual field trips, are educational experiences where students explore real-world locations or engage with interactive content through digital platforms, such as videos, virtual reality (VR), augmented reality (AR), or live streaming. These excursions can range from virtual excursions to virtual wildlife explorations. Virtual excursions can be accessed through a wide variety of digital platforms:

- Dart Learning
- Environmental and zoo education centres
- NSW HSIE Curriculum Virtual excursions HSIE.

Aboriginal and Torres Strait Islander significant sites

When proposing fieldwork for Aboriginal or Torres Strait Islander sites, consult with local communities and your local Aboriginal Education Consultative Group (AECG). Students, teachers and accompanying parents and carers need to be familiar with protocols for visiting the site and working with Aboriginal communities. Refer to Aboriginal education on the NESA website for more about community consultation.

Excursions policy

Access Excursions via the Policy library along with your school's policy when planning and delivering an excursion. To plan for and implement effective excursions in your school context, HSIE teachers will need to be familiar with their school procedures for:

- variation of routine
- risk management
- overseas excursions planning
- private tours, events and activities
- good practice in billeting
- inbound overseas visitor groups.

Geographical inquiry

Through geographical inquiry, students deepen their understanding of geography. Individual or collaborative investigation starts with questions and observation. Students collect, evaluate, interpret and analyse information to form a conclusion and propose actions. Students apply geographical skills and use geographical tools during an inquiry process to acquire, process and communicate information, develop proposals to investigate issues, and act on them where appropriate.

Geographical inquiry skills should be integrated with syllabus content. The focus areas provide context for developing and applying inquiry skills. Inquiries may vary in scale and geographical context. Students may be involved in geographical investigations that occur in class or through fieldwork.

The stages of a complete inquiry are:

- Acquiring geographical information
  - identify an issue, problem or challenge
  - formulate geographical questions
  - plan an inquiry that identifies appropriate geographical methods and concepts
  - collect, select and record relevant geographical data and information from a variety of sources, using ethical practices
- Processing geographical information
  - interpret geographical data and information, using geographical tools as appropriate
  - evaluate reliability and potential bias of data
  - represent data in preferred communication forms, such as plans, graphs, tables, sketches and diagrams
  - represent different types of geographical information by constructing maps that conform to cartographic conventions, using geographical tools as appropriate
  - identify spatial distributions, patterns and trends, and infer relationships to draw conclusions as appropriate

- Communicating geographical information
  - take account of environmental, economic and social considerations, and predict the expected outcomes in a proposal
  - explain the predicted outcomes and consequences of proposed actions
  - reflect on learning and apply active citizenship to propose change in response to contemporary geographical issues
  - communicate geographical understanding for a range of purposes, audiences and contexts
  - present findings and ideas in a range of communication forms and technologies, using relevant geographical concepts and terminology.

Geographical tools

Geographical tools are used by geographers during an inquiry to acquire, process and communicate geographical information.

Students are to be provided with opportunities to engage with each of the geographical tools during each stage of learning. The Geography 7–10 Syllabus (2024) has mapped geographical tools to the intended learning for the stage. Some students with a disability may require adjustments to access the selected geographical tool.

It is intended that students progressively move from using tools to interpret geographical data and information in the earlier stages of learning, to being able to develop and create tools for representing, synthesising and communicating the findings of geographical inquiry.

Geographical tools include:

- maps
- fieldwork
- data and graphs
- spatial technologies
- additional geographical representations.

Students participating in inquiry-based learning are expected to think geographically and work geographically.

Fieldwork instruments

There is a variety of fieldwork instruments that schools can purchase. Due to the potential expense, faculties will often purchase fieldwork instruments over a period of years or share resources with other faculties within a school. Below is a list of possible places where you can access fieldwork equipment:

- the HSIE or social sciences faculty
- other faculties including science, maths and PDHPE
- via an excursion to Environmental and zoo education centres or borrowing instruments from your local environmental education centre.

Schools can purchase fieldwork instruments from educational or science equipment suppliers. It is also possible to make some tools, such as a clinometer, quadrat or dip net. HSIE faculties may like to use Table 1 to conduct a fieldwork stocktake assessment to inform planning and preparing for any future fieldwork.

Table 1 – fieldwork equipment stocktake

Equipment	Currently have	Can borrow	Purchase order
Compasses			
Thermometers			
Hygrometer			
Light meter, sound level meter			
Magnifying glass			
Weathervane			
Dip nets and buckets			

Equipment	Currently have	Can borrow	Purchase order
Water quality testing kit			
Turbidity tube			
Trundle wheel			
50 m retractable tape measure			
Spade			
Stream flow meter			
Clipboards			
Stop watches			
Clinometer			
Soil testing kit			
Quadrats (1 m^2)			
Hand and soil sampling auger			
Anemometer			
Native vegetation, animal and weed identification charts			
Water quality testing kits			

Equipment	Currently have	Can borrow	Purchase order
Local area topographic map			
360° camera			
Drone			
Camera or phone			

The following descriptions of common geographical fieldwork instruments may be used to support student understanding and purpose of some of the common types of fieldwork equipment. Field instruments (5:01) and Selecting and using equipment provide a variety of stimulus material applicable to the following overview of field instruments.

How to use a clinometer

Clinometers are used to measure the angle of elevation. In geography, clinometers may be used to calculate the gradient of a slope or height of a tree.

Use the following steps to use the clinometer.

1. Look through the sight to the top of the slope. Line it up with the top of the slope.
2. Keeping the clinometer very still, read the angle that the string makes with the protractor. This is the angle of your slope.
3. Record the slope of the hill in degrees and use the table below to interpret your results.

Table 2 – terms used to describe gradient

Angle	Description
0°	Flat
1° – 10°	Gentle
11° – 20°	Moderate
21° – 30°	Quite steep
31° – 40°	Very steep
41° – 70°	Extremely steep
71° – 100°	Cliff

Students can make a clinometer using simple materials. Teachers may like to access Clinometer (How to make and use) (2:10) for instructions on how to make a clinometer and Fieldwork instruments part 3: Slope, aspect, position (2:36) on how to use a clinometer.

Using a barometer

Barometers are used to measure air pressure. Air pressure can vary with elevation (height above sea level) and changes in air pressure can be used to predict short-term changes in the weather. Falling air pressure may indicate that bad weather is approaching; rising air pressure will see clear skies and cooler temperatures.

Use the following steps to use a barometer.

1. Hang the barometer vertically on a wall or a post (it will not work properly lying flat on a table).
2. Let it hang for a few minutes before taking a reading (using the outer scale).
3. The pointer shows the current air pressure.

Using a compass

A compass is a device that indicates direction. It is used for navigation when travelling from one point to another.

The earth has magnetic fields, almost like a bar magnet, where the 2 ends are called the North Pole and South Pole. A compass has a light needle; the whole compass needle is magnetised and aligns with the magnetic field of the earth. The south pole of the compass needle magnet is pointing to the north pole of the earth's magnetic field and the north pole of the compass needle is aligned to the south pole of the earth's magnetic field. The opposite poles of the magnets are drawn to each other and the similar poles repel.

True north is the direction in which you would travel along the earth’s surface to reach the North Pole, so sometimes small adjustments need to be made to your direction. True north and magnetic north are not the same thing.

Using a compass correctly takes practice. A compass can give direction (cardinal points) or can be used for bearings. Teachers may like to access Using or Reading a Compass and Map, How to Navigate with a Compass (2:04) and Fieldwork instruments part 3: Slope, aspect, position (2:36) for instruction on how to use a compass to determine position and aspect.

Using a hygrometer

A hygrometer is an instrument used to measure humidity, or amount of water vapour in the air. High humidity is associated with cyclones as air with high moisture content is required for cyclones to develop.

A hygrometer is made up of 2 thermometers – a dry bulb and a wet bulb thermometer. The wet bulb thermometer is covered with a damp cloth dipped in water.

Use the following steps to use a hygrometer.

1. Fill the water bottle and screw it on to the instrument.
2. Hang the hygrometer (by the loop at the top) on a wall or a tree, for instance, for at least 5 to 10 minutes before taking the measurements. The instrument should not be in direct sunlight.

The difference in temperature between the dry bulb and wet bulb is used to calculate the relative humidity of the air.

Use the following steps to work out the level of humidity.

1. Record the dry bulb temperature (for example 15 degrees).
2. Record the wet bulb temperature (for example 10 degrees).
3. Calculate the wet bulb depression (for example 15 − 10 = 5 degrees).
4. From the chart on the face of the hygrometer, read down from the wet bulb depression (5) and across from the dry bulb temperature (15) to where both meet. This will give you the relative humidity as a percentage (in this case it will be 49%).

A relative humidity of 100 per cent is when the air has as much water vapour as it can hold at a particular temperature.

If you are using a digital hygrometer, measure the humidity at a height of one metre above the ground. Allow 3 minutes for the hygrometer to detect the air temperature.

Using a quadrat

Quadrats are sample areas marked out on the ground that are used to record the number of species present or count individuals of various species. In situations where the quadrats are fixed in position, they can be used to detect changes over time.

Quadrats can be any size. A one-metre square quadrat can be useful to count individual small plants to monitor a direct seeding project. However, a 10-metre square quadrat will be more suitable for recording plant species present in mature bushland.

Use the following steps to use a quadrat.

1. Randomly select an area over which to place the frame.
2. Record the species you can see and their location within the frame.
3. Estimate the percentage of vegetation cover within the frame. See the table below for an example of vegetation classification. Some frames consist of an internal grid of smaller squares for this purpose.
4. Repeat this process at different points within the area you are investigating so that you have enough data to make valid conclusions.

Table 3 – vegetation classification

Vegetation coverage	Description of density
< 5 squares	Bare ground
5–10 squares	Sparse cover
10–15 squares	Scattered cover
15–25 squares	Continuous cover

Quadrats are an important tool for measuring the abundance of organisms in one area. Often quadrats are used in conjunction with transect lines and set down at regular intervals, for example every 5 metres. For more accuracy, a quadrat can be broken up into smaller squares.

Teachers may like to access [Save our catchment virtual excursion] for a worked example of quadrants used in conjunction with a transect to record percentage cover.

Creating a transect

Transects are used when you wish to illustrate a linear pattern along which plant or animal communities change. People who work in conservation and other similar fields use line transects and other sampling methods such as quadrats for monitoring species abundance.

Use the following steps to create a transect.

1. Identify the characteristics of the vegetation which may be compared and measured (especially if you intend to use 2 or more transects to compare different areas).
2. Select 2 points out in the field, usually 10–30 metres apart.
3. Place poles at these points and connect them with a line (often a piece of rope or tape measure).
4. Start at the first marker and begin to walk along the line.
5. Record any plants along the line, including their distance from the first marker (use a grid on a piece of paper with a scale, for example 3 cm = 1 metre).
6. Make sure you write down notes about any important features you see that are relevant to your fieldwork investigation.

In most cases a study of vegetation will require a comparison to be made, for example, vegetation changes on parallel dunes. It is therefore necessary to isolate characteristics of vegetation which may be compared and measured.

If you are using a transect to investigate vegetation affected by human activity, you could also create another transect in an area that has been less disturbed by humans and compare the number of species between each transect. Quadrats can be used at intervals along the transect.

You could combine the transect method with another fieldwork tool, such as taking soil samples at different points along the transect line. This might help you to establish a link between changes in vegetation and soil characteristics. Consider using a vegetation identification chart. If you cannot identify a plant, call it Species 1, Species 2 and so on, taking photos so that you can identify them later.

Using a rain gauge

A rain gauge is an instrument you can use to measure the amount of rainfall your area receives in each period. Rain gauges measure precipitation in millimetres.

Use the following steps to use a rain gauge.

1. Place it in an open area (if the rain gauge is near any trees or buildings, extra runoff could flow into the cylinder).
2. The gauge could be dug into the ground but with most of the cylinder above ground level.
3. Leave the rain gauge outdoors for 24 hours.

4. After 24 hours, read the amount of rainfall in the cylinder, always at eye level to avoid distortion errors (the cylinder will be marked along the side in millimetres).
5. Calculate the average hourly rainfall by dividing the daily total by 24.

If you are recording the rainfall over several days, take the readings at the same time each day and then empty the cylinder.

A school water meter is a great resource. Students can use it to calculate the average student water use per day.

Table 4 – rainfall description table

Rainfall	Description
0–2.5 mm per hour	light
2.5–7 mm per hour	moderate
More than 7.5 mm per hour	heavy

Using a thermometer

A thermometer is a device used for measuring temperature. We measure temperature in units known as degrees Celsius (°C). There are various types of thermometers, the 2 most common being liquid and digital.

Use the following steps to use a thermometer.

1. Go outside and wait 2 minutes before you take a reading to allow the thermometer to adjust to the outside air temperature (hold the thermometer at the top, away from the bulb).
2. Keep the thermometer dry.
3. Take outdoor readings away from any buildings and out of direct sunlight (in the shade if possible).
4. Hold the thermometer close to eye level; it should never be on the ground.

If you are using a digital thermometer, measure the air temperature at a height of one metre above the ground. Allow 3 minutes for the thermometer to detect the air temperature. Record the air temperature in degrees Celsius (ºC). By taking several measurements in the same location, you can monitor diurnal (daily) temperatures. A good way to represent your data is in a line graph.

Teachers may like to access Fieldwork instruments part 2: Soil texture, soil pH and soil temperature (2:48) for instructions for measuring soil temperature using a soil temperature probe.

Using a trundle wheel

A trundle wheel is a measuring device with a circumference of exactly one metre so every time the wheel makes a full rotation, it means that a distance of one metre has been travelled along the ground. They are most often used to get approximate distances over rough ground or larger distances; however, they are not as accurate as other measuring devices.

Use the following steps to measure distance using a trundle wheel.

1. Push the wheel along the area you wish to measure.
2. Be careful that the wheel does not slip or go off course. It should be used over a good surface; otherwise extra distance may be added to the final reading.
3. Count the number of clicks that you hear (each click means that a distance of one metre has been travelled). It may be useful to use a tally counter to keep a track of the distance.

Using an anemometer

An anemometer is used to measure both wind speed and wind pressure. They are commonly included in weather stations and are an important tool for pilots, engineers and climatologists.

Use the following steps to use an anemometer.

1. Remove the clear plastic lid from the top.
2. Select the kilometres per hour (km/h) scale.
3. Hold the instrument up in the air above your head (this will ensure the flow of the wind is not interrupted by your body).
4. Use the button to stop the cups rotating so that a reading can be taken.

There are also digital anemometers that you can use in the field. Most are easy to operate and come with instructions.

Using a Global Positioning System (GPS)

GPS information is used for preparing accurate surveys and maps, tracking position or location, and for navigation. It uses satellite technology to accurately locate a given position on the earth's surface, determining the latitude and longitude of the location being identified.

Each model of GPS receiver has a slightly different appearance and user functions (a bit like mobile phones).

Use the following steps with your GPS device.

1. Turn the GPS on and a screen will automatically appear that displays your location and gives you options for further use such as travelling to another location.
2. Once you know your position, find directions to another place.
3. Press the 'go to' key (or similar) on your receiver.
4. Select your second location.
5. Your receiver will give you directions and a map.

If you've used Google Earth, you can do much the same thing because it provides data from a GPS.

Calculating distance using GPS

A Global Positioning System (GPS) can calculate the distance between any 2 points once their coordinates (latitudes and longitudes) have been marked as a landmark or waypoint and stored in the GPS.

A waypoint is a landmark, point of destination or point along a route on the way, noted and recorded using mapping and navigation coordinates. You will need to follow the instructions on your GPS about how to mark and store a waypoint.

Assuming you have an auto-routing GPS, or one that will navigate roadways – if you're in 'Automobile' mode, the GPS will calculate the distance along a route determined by your criteria (shortest route, fastest route, avoid tolls or school zones). The distance it comes up with will be the actual distance along the roadway.

In marine or other modes, depending on the GPS, the distance will be a straight line, without slope correction.

Data and graphs

Graphs, also called charts, take many forms and include digital and non-digital media. Examples include, but are not limited to:

- tally charts
- pictographs
- column graphs
- line graphs
- pie graphs
- weather charts
- climate graphs
- population profiles.

Statistics also take many forms and include digital and non-digital media. You will begin with basic data tables and progress to complex representations of statistics on common themes.

Graphs and statistics are used to collate, organise, illustrate, summarise and compare patterns, relationships and trends in geographical data and information. Table 5 summarises the stage appropriate data and graphs as outlined in the Geography 7–10 Syllabus.

Table 5 – data and graphs Geography 7–10

Stage 4	Stage 5
• Construct and interpret data tables and graphs • Interpret sector graphs • Interpret population profiles • Use a range of graphs and tables • Use quantitative data and graphs to	• Construct and interpret a range of data tables and graphs • Construct and interpret population profiles • Construct and interpret sector graphs • Use scatter plots and bubble charts to

Stage 4	Stage 5
identify patterns and trends • Identify maximum, minimum, total, mean, range and rank order	identify correlations within data • Use a range of graphs and tables • Use quantitative data and graphs to identify patterns, trends and changes • Identify and calculate maximum, minimum, total, mean, median, mode, range and rank order

Using tally cards

Tally cards are used to keep a record or count of items. They allow simple marks to be added to a template from which totals can be calculated at the end of the observation period.

When completing a visual survey, you need to decide on what is being measured. List things you would expect to see. For your survey to be valid these must be predetermined.

You then need to decide on a good location and time to conduct your visual survey. For your survey to be reliable, someone else needs to be able to conduct the same survey using identical start and finish times but on a different date and expect similar results. Table 6 provides a sample tally record table that students can copy and complete when conducting a tally data recording activity.

Table 6 – sample tally cover page

Measurement information	Details
Name of observer	
Location	
Type of item to be measured	
Date	

Measurement information	Details
Start time	
Finish time	

Table 7 provides an example of a recording sheet for a tally of vehicles.

Table 7 – vehicle tally record sheet

Items	Frequency	Total	Percentage
Trucks			
Cars			
Buses			
Motorcycles			

Every time one of your specified items is observed, make a mark in the correct column. You need a range of items but not too many; otherwise you may miss recording items.

When you're finished, you can calculate the percentages of what you saw, interpret the results and provide reasons for your results.

Estimating cloud cover

Cloud cover can be estimated using the tables below. The percentage ranges refer to the amount of sky that is covered by cloud, estimated through observation.

Table 8 – describing cloud cover

Cloud cover description	Percentage cloud cover
Clear	0% – 5%
Partly cloudy	5% – 50%

Cloud cover description	Percentage cloud cover
Mostly cloudy	50% – 95%
Overcast	95% – 100%

Visual opacity refers to the density of the cloud. A dense cloud will be difficult to see through.

Table 9 – visual opacity of clouds

Visual opacity	Description
Opaque	Difficult to see through
Translucent	Light passes through only diffusely
Transparent	Can see through

Estimating canopy cover

Use the following steps to estimate the canopy cover.

1. Place a canopy cover chart on a board with a mirror.
2. Hold the board underneath the canopy.
3. Look at the reflection of the canopy in the mirror and identify the image on the chart that it most closely matches.

If more than half (> 50%) your view is covered by branches, leaves or other vegetation then the canopy is described as 'closed'. This means you can see more vegetation than sky. Rainforests usually have a closed canopy.

If less than half (< 50%) your view is covered by branches, leaves or other vegetation then the canopy is described as 'open'. This means you see more sky than vegetation. Dry sclerophyll forests usually have an open canopy.

The amount of canopy cover is important. Land clearing reduces the amount of canopy cover, exposing the smaller trees and shrubs below to more sunlight than they are naturally adapted to. Heavy rain, which would normally fall on the canopy, hits the soil harder resulting in erosion.

Additional geographical representations

Additional geographical representations are used to display, visualise, analyse and communicate geographical data and information. Additional geographical representations take many forms and include digital and non-digital media. Table 10 summarises the stage appropriate additional geographical representations as outlined in the Geography 7–10 Syllabus.

Table 10 – additional geographical representations Geography 7–10

Stage 4	Stage 5
• 3D models and globes • illustrations • multimedia • tactile graphics and models • posters and collages • soundscapes • Aboriginal and Torres Strait Islander Peoples' Knowledge Systems (such as Cultural mapping and Oral Histories) • paintings and artworks • diagrams, infographics • mind maps • cartoons • flowcharts • sketches such as field sketches • line drawings and photo sketches	• 3D models and globes • illustrations • multimedia • tactile graphics and models • paintings and artworks • diagrams • infographics • mind maps • cartoons • flowcharts, transects • Aboriginal and Torres Strait Islander Peoples' Knowledge Systems (such as Cultural mapping and Oral Histories) • sketches such as field sketches • line drawings and photo sketches • digital tools such as apps and web tools

Stage 4	Stage 5
• digital tools such as apps and web tools • photographs classified by location	• photographs classified by location and angle

Creating a field or photo sketch

Note: teachers may like to access Field sketches (4:50), Geography 7–10 – field sketches, Types of photos (3:21) and Geography 7–10 – guide to using photographs in geography for lesson strategies and templates that support teaching field or photo sketching.

Field sketches are a way of recording visual data when visiting a fieldwork site. They may be annotated to improve the detail recorded.

To complete a field sketch, you will need:

- a pencil
- blank paper
- an eraser
- a ruler (optional)
- a black pen (optional).

Before starting your field sketch:

- Select the view relevant to your fieldwork and a good place to stand or sit. You will need a hard surface to draw on such as a book or clipboard.
- Write down details such as date, time, location, direction.
- Using a ruler, divide your blank page into 9 parts so your sketch is more manageable. You also need a border.

Use the following steps to draw a field sketch.

1. Start by simply sketching the skyline in the background – this is the area furthest away from you.
2. Draw simple lines showing the foreground – this is the area closest to you.
3. Draw simple lines showing the main geological or structural features.
4. Fill in the middle ground. You can leave out most minor features, but some can be included for perspective or scale.
5. Draw simple outlines of other important features or sites relevant to your fieldwork site.
6. Annotate your sketch, including details that might not be obvious in the main sketch or in a photograph.
7. Develop a key if required and indicate the north point.
8. Some of the most important features can be traced over in pen to accentuate them.

You may want to practise your sketching techniques using photographs before going out into the field. This would then be called a ‘photo sketch’.

Taking photographs

Note: teachers might like to access Types of photos (3:21) and Geography 7–10 – guide to using photographs in geography for more advice and lesson activities relating to engaging with Additional geographical representations.

Photographs are a way of recording data during fieldwork. They may be useful in recording changes over time as the images provide a detailed, high-quality record of a specific place and time. The best type of camera you have is the one you carry with you all the time; this is likely to be a mobile phone. Taking photographs with a phone allows you to add your photographs to Google Maps.

Less commonly used now are digital SLR cameras which can be used to obtain high-quality images; used in conjunction with tripods the digital camera can provide very clear records. Digital cameras differ in some ways, but all have similar features and functionality.

Drones are very popular and useful for taking aerial photographs. These require accessibility permissions in some locations.

When organising your photographs you may consider setting up a table like the one below, so you do not forget the details.

Table 11 – photograph record table

Photo number	Location (AR/GR)	Name/brief description	Time	Facing – direction
IMG 123	GR 123456	Smith Park	12:35pm	NW

Benefits of taking photographs include a capacity to:

- show a sequence of activities
- assist in describing the fieldwork site
- match features in real life to a topographic map
- visually record changes at the site over time
- present information orally or in a fieldwork report
- store photographs electronically.

Maps

Maps are used to locate, visualise, represent, display and record spatial data. Maps take many forms and include digital and non-digital media. Examples include, but are not limited to:

- pictorial maps
- large-scale and small-scale maps
- relief maps
- choropleth maps
- flowline maps
- cadastral maps
- isoline maps
- land use maps
- physical maps
- political maps
- précis maps
- cultural mapping
- road maps
- thematic maps
- tactile maps
- topographic maps
- special-purpose maps.

Maps are to be integrated into Stage 4 as appropriate: large-scale maps and small-scale maps, relief maps, special-purpose maps, physical maps, political maps, sketch maps, précis maps, topographic maps and thematic maps, such as choropleth maps, isoline maps, cartogram maps, dot maps, flowline maps, weather maps or synoptic charts. Table 12 summarises the use and application of stage appropriate maps as outlined in the Geography 7–10 Syllabus.

Table 12 – maps Stage 4 geography

Stage 4
• Identify key features on a map using cartographic conventions • Identify physical and human features on a map • Identify spatial patterns using a range of maps • Use a range of large-scale and small-scale maps • Determine direction using a 16-point compass • Locate features on a map using latitude and longitude coordinates in degrees • Locate features on a map using area and grid references • Measure distances on a map using a linear scale • Identify contour lines • Determine altitude of a location using contour lines • Calculate the local relief between 2 points using spot heights and contour lines • Recognise the steepness of a slope using shading, spot heights, colour or contour lines • Determine values represented on choropleth maps and thematic maps • Interpret weather maps to gather information about wind direction and speed, pressure patterns, fronts and rainfall

Maps are to be integrated into Stage 5 as appropriate: large-scale maps and small-scale maps; relief maps, special-purpose maps, physical maps, political maps, sketch maps, précis maps, topographic maps, land use maps and thematic maps, such as choropleth maps, isoline maps, cartogram maps, dot maps, flowline maps, weather maps or synoptic charts, graduated or proportional symbol maps. Table 13 summarises the use and application of stage appropriate maps as outlined in the Geography 7–10 Syllabus.

Table 13 – maps Stage 5 geography

Stage 5
• Identify key features on a range of maps using cartographic conventions • Identify relationships between physical and human features using a range of maps • Identify and interpret spatial patterns using a range of maps • Distinguish between large-scale maps and small-scale maps • Determine direction using a 16-point compass • Locate features on a map using latitude and longitude coordinates in degrees and minutes • Locate features on a map using area and grid references • Measure distances on a map using a ratio scale • Identify and interpret contour lines • Determine the altitude of a location using contour lines • Calculate the local relief between 2 points using spot heights and contour lines • Identify the aspect of a slope using contour lines • Calculate the gradient of a slope as a ratio • Calculate area on a map using a ratio scale • Construct a cross-section from a topographic map • Measure bearings on a map • Determine the density of a specific feature on a map • Construct and interpret choropleth maps and thematic maps • Analyse weather maps, including wind speed and direction, pressure patterns, fronts and rainfall, to determine weather conditions and patterns and make simple weather

Stage 5
predictions

Using a map

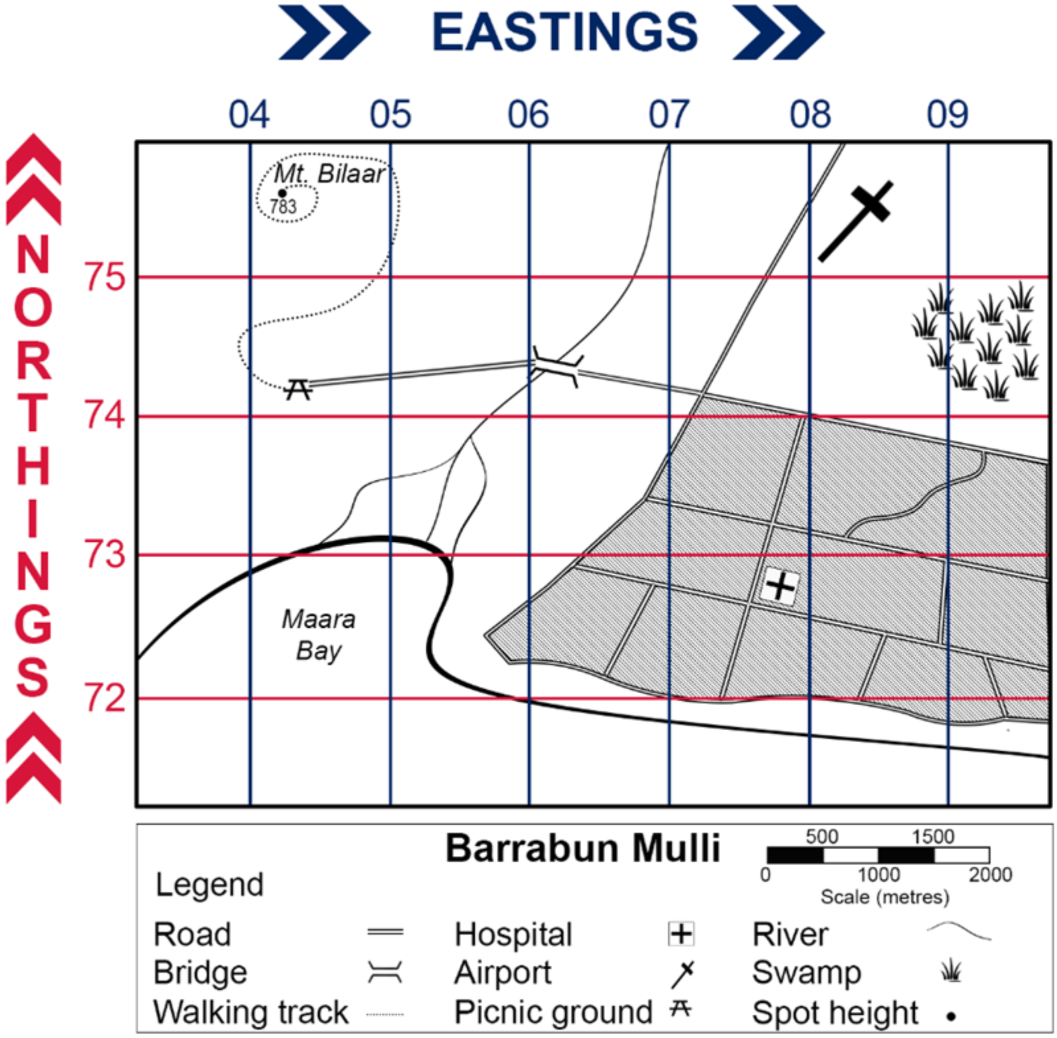
Note: teachers might like to access Area and distance (3:22) and Geography 7–10 – mapping – area and distance for more teaching advice and strategies for mapping.

Maps can show a range of human and natural features. You can match the physical features you see in the field with the features identified on the map to determine your location, for example using road intersections, creeks, park boundaries, buildings, ridges and hilltops.

You can record your location by using:

- area references: this is usually a 4-digit number that provides the location of an area referring to a grid square on the map
- grid references: this is usually a 6-digit number that breaks up the grid square further and can provide a more precise point.

Figure 1 – eastings and northings on a map



Bundjalung language used with permission of NSW AECG.

When taking measurements for fieldwork you should always record the location (such as an area or grid reference) and time. Such information could help explain why you obtain certain results, for example tidal movements and how far upstream you are may affect pH levels. Photograph locations should also be recorded (latitude and longitude), to allow accurate comparison of the site at later visits.

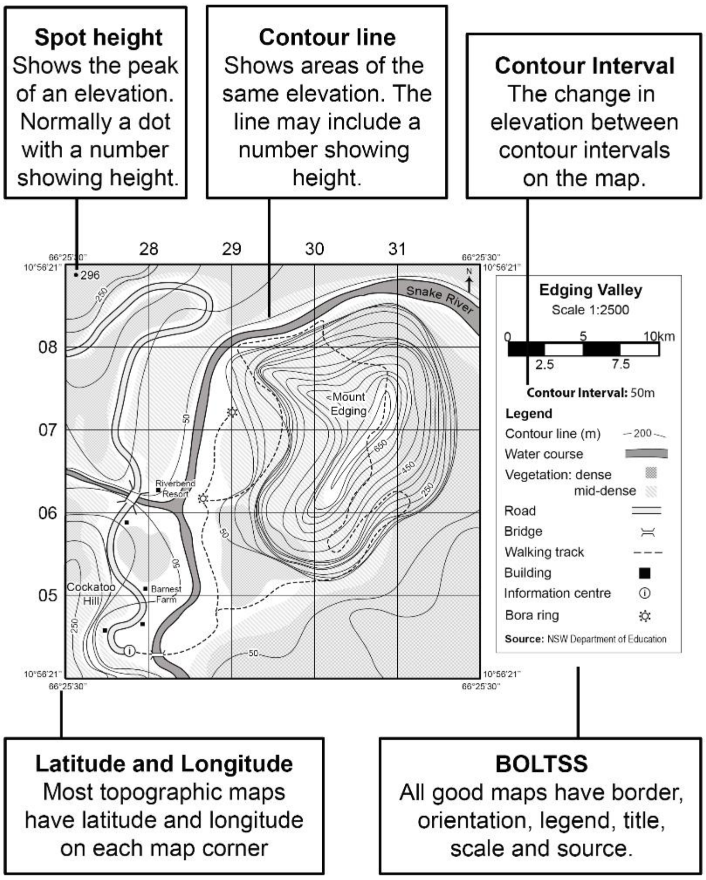
Once you have determined the location you can then see what features surround you, what you need to do or where you need to go next and the best way of getting there.

Using a map to identify landforms

Topographic maps have lines called contour lines. These join points of equal height above sea level. The further apart the lines are, the gentler the slope. The difference in height between each contour line is called the contour interval. The patterns created by contour lines make some landforms easily identifiable because each landform feature has quite a distinctive look.

You need to be familiar with a few key contour patterns such as hills, valleys, saddles, streams and cliffs so you can interpret a topographic map.

Figure 2 – annotated topographic map



Fieldwork examples and LISC

Learning intentions (LI) are statements that describe what students should know, understand and be able to do by the end of a task. Success criteria (SC) are linked to learning intentions and describe what success looks like. What a good one looks like (WAGOLL) is used to show students a clear example of high-quality work. They:

- assist educators to articulate the purpose of a learning task and make judgements about the quality of student learning
- help students to focus on the task or activity taking place, what they are learning and also self-reflect
- may be used for the whole class or differentiated for individuals or smaller groups within the class.

Teachers will need to apply appropriate learning intentions and success criteria to chosen fieldwork examples. Teachers may like to access Learning intentions and success criteria (PDF 251 KB) and Five elements of effective assessment practice for further information on developing and delivering learning intentions and success criteria.

The following examples provide a comprehensive list of fieldwork examples that can be applied to Geography 7–10. Each outlines suggested focus areas to align the fieldwork and there are a variety of examples provided here to give teachers the ability to adjust for the context of their school and class.

Urban rivers

Note: select appropriately accessible sites along an urban river to conduct the following activities. Where appropriate, apply the department’s Excursions policy along with the school policy when planning and delivering an excursion.

Syllabus content

Water in the world

Hydrological and atmospheric hazards

- Investigation of ONE hydrological or atmospheric hazard that has occurred this century, including impacts, responses and management

Learning intentions

Students learn about:

- urban river flooding and its impacts on communities, the environment and infrastructure
- urban river flooding incidents by effectively selecting and applying fieldwork methods and geographical tools to acquire, analyse and present geographical information.

Success criteria

Students will be able to:

- explain management and protection strategies employed in response to the hazard
- apply skills of field observation, field sketches and transects to record and interpret information related to urban river flooding
- use topographic maps to develop a cross-section that accurately illustrates an urban river in their local environment
- understand and identify the impacts, responses and management strategies associated with urban flooding.

Objective

Investigate aspects of flood defences in the local catchment.

Equipment

Equipment required:

- clipboard
- data collection handout
- [Geography 7–10 – field sketches](#).

Urban rivers pre-fieldwork activities

Prior to site visit consider implementing the following into lessons:

- watch the path of a raindrop from anywhere in the world – River-runner
- instructions on how to measure river channel width and practise using equipment required
- view the 3 transect locations online via Google Earth or similar
- use topographic maps, Cross sections and transects (2:53) and Geography 7–10 – guide to teaching mapping – cross-sections to construct cross-sections of the 3 river transects selected for fieldwork
- revisit the processes involved in drawing a field sketch using Field sketches (4:50) and Geography 7–10 – field sketches.
- pose or discuss a hypothesis for the fieldwork
- invite a guest speaker in to discuss flood management along your urban river.

Urban rivers fieldwork

Note: select 3 accessible sites along an urban river to conduct the following activities.

Select 3 different sites on an urban river for students to conduct a transect observation. Along each transect complete the following:

- measure the width of the river channel
- complete a field sketch noting specifically any flood defences used along the transect
- record any evidence of flood activity (flood markers, debris on the bank, water damage, water heights on permanent structures).

Urban rivers post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- comparing transects and field sketches for the 3 sites observed

- researching effectiveness of the observed flood defences
- reflecting on research methods used and provide feedback for ways the research approach could be refined
- reflecting on any hypothesis presented and explaining how the research proved or disproved the hypothesis
- making recommendations for future flood defences.

River erosion

Note: select appropriately accessible sites along a river to conduct the following activities. Where appropriate, apply the department's Excursions policy along with the school policy when planning and delivering an excursion.

Syllabus content

Environmental change and management

Environmental change

- Biophysical processes that change Earth's environments

Learning intentions

Students learn about:

- the biophysical processes of erosion, deposition and transportation that contribute to transformation of rivers
- the role of fieldwork and geographical tools to support an investigation of river erosion, effectively selecting and applying geographical tools to acquire, analyse and present geographical information related to the impact of biophysical processes on river systems.

Success criteria

Students will be able to:

- use field observations and geographical tools to analyse the processes and interactions that transform people, places and environments
- demonstrate the use of field observation, field sketches and transects to illustrate their understanding of the biophysical processes of erosion, deposition and transportation, identifying key features such as erosion patterns and human intervention

- analyse and present relevant data, such as river width, sediment type and water velocity using graphs and cross-sectional profiles to visualise patterns of erosion within a river system
- conduct a literature review to inform and support their analysis of field data to build an understanding of the biophysical processes of erosion, deposition and transportation.

Objective

Investigate the causes and extent of erosion along a local river or creek.

Equipment

Equipment required:

- tape measure
- camera
- field sketch template Geography 7–10 – field sketches.
- vegetation chart.

River erosion pre-fieldwork activities

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities:

- conduct a literature review using existing studies of river erosion, sediment transport and impact of human activities
- research instructions on how to measure river channel width, collect sediment samples and record river velocity, and practise using equipment required
- view the river online via Google Earth or similar
- use topographic maps, Cross sections and transects (2:53) and Geography 7–10 – guide to teaching mapping – cross-sections to construct a cross-section of the site selected for fieldwork

- revisit the processes involved in drawing a field sketch using Field sketches (4:50) and Geography 7–10 – field sketches
- pose or discuss a hypothesis for the fieldwork
- invite a guest speaker in to discuss river erosion.

River erosion fieldwork

Note: select 3 accessible sites along an urban river to conduct the following activities.

Have students engage in the following fieldwork activities:

- measure the width of the river channel at multiple points
- take sediment samples from the riverbed and banks
- photograph areas showing evidence of erosion
- complete a field sketch noting areas of erosion and any human interventions such as riprap and gabions
- record water velocity and discharge rates
- note vegetation type and coverage along the banks.

River erosion post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- entering measurements of river width, water velocity and discharge rates into a spreadsheet
- cataloguing sediment samples by location and type
- creating graphs such as histograms or scatter plots to visualise data on river width, sediment types and water velocity
- developing cross-sectional profiles of the river at different points to illustrate erosion patterns

- integrating field sketches and photographs into a GIS platform to create detailed maps highlighting erosion-prone areas
- making inferences about the vegetation type and cover at each site and the impact this may have on field observations and results.

Noxious weeds and riparian zones

Note: Save our catchment virtual excursion outlines the following fieldwork in detail. This virtual excursion investigates the noxious weed infestations of the Cat's Claw Creeper in the upper Clarence River catchment. The fieldwork can be adjusted to suit other noxious weed investigations along rivers and creeks. Where appropriate, apply the department's Excursions policy along with the school policy when planning and delivering an excursion.

Syllabus content

Environmental change and management

Environmental case study

- Causes, extent and consequences of the environmental change affecting the selected environment

Learning intentions

Students learn about:

- the diverse features and characteristics of riparian zones
- the role of fieldwork and geographical tools to support an investigation of riparian zones.

Success criteria

Students will be able to:

- explain the causes, extent and consequences of environmental change due to the presence of noxious weeds in these critical ecosystems
- effectively select and apply geographical tools to acquire, analyse and present geographical information related to the impact of noxious weeds
- use field observation, field sketches and belt transects to identify and illustrate the impact of noxious weeds on riparian ecosystems, focusing on changes in plant density and ecosystem health to demonstrate an understanding of environmental change

- analyse and visualise data related to noxious weed distribution using column graphs and calculating percentage cover along belt transects to illustrate patterns of environmental change
- develop a written text (public service announcement) to communicate their knowledge and understanding of environmental change in riparian zones.

Objective

Investigate the invasion of a noxious weed along a local river, creek or stream.

Equipment

Equipment required:

- tape measure
- camera
- field sketch template Geography 7–10 – field sketches
- vegetation chart or plant identification guide
- 1 m × 1 m grid quadrant
- field estimation percentage cover sheets.

Noxious weeds and riparian zones pre-fieldwork activities

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities:

- familiarisation with vegetation chart or plant identification guide
- familiarisation with noxious weeds through secondary research
- view the river online via Google Earth or similar
- demonstration of and practise conducting a belt transect.

Noxious weeds and riparian zones fieldwork

Note: select 3 accessible sites along a riparian zone to conduct the following activities. Episode 9 Save our catchment (4:59) provides a detailed explanation of how to conduct a simple belt transect. Common graphs (2:57) may prove helpful here.

Have students engage in the following fieldwork activities:

- conduct a simple belt transect along 10 metres at 3 different sites in the riparian zone
- conduct a relative density survey at 3 different sites in the riparian zone.

Noxious weeds and riparian zones post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- analysing data from a belt transect by adding up the percentage cover per metre along each 10 metre belt transect then divide the total by 10 to calculate the average
- illustrating percentage cover along a belt transect for the 3 different sites in a column graph
- engaging in a series of discussion questions
  - Is there a difference in abundance between the 3 sites?
  - Is there a significant difference in noxious weed distribution between the 3 sites?
  - Can you pose any hypothesis that could explain differences between the 3 sites?
- inviting guest speakers who have different perspectives on the noxious weed issue in your riparian zone
- developing a PSA – Public Service Announcement for the noxious weed issue explored in the fieldwork
- writing a plan for catchment management that uses data collected in fieldwork to illustrate purpose and necessity of the plan.

Wetlands

Note: teachers may like to consider a field excursion to one of the NSW Australian wetland education centres – Bicentennial Park Education Centre, Botany Bay Environmental Education Centre, Coastal Environment Centre, Hunter Wetlands Centre, Wetlands Environmental Education Centre, Manly Environment Centre, The Aquatic Environment Education Centre at Wonga Wetlands, or Window on the Wetlands Centre.

Syllabus content

Water in the world

Water resources and their value

- Hydrological processes that move water through a catchment area
- Factors influencing water flows and the availability of water resources in different places

Learning intentions

Students learn about:

- the global variations in the distribution, quantity and quality of water resources through a study of wetlands
- ways to access wetland health and sustainability.

Success criteria

Students will be able to:

- effectively select and apply geographical tools such as water bug identification and turbidity testing to acquire, analyse and present geographical information
- explain the processes and interactions that change these unique environments
- use field observation, water bug identification and turbidity tubes, assessing water quality and biodiversity to develop an understanding of the health of a local wetland

- analyse and interpret data collected in the field and demonstrate the use of data collected in the field to draw conclusions about wetland health and sustainability, making recommendations for wetland management and conservation
- communicate findings through a range of presentation tools, using field data to support their recommendations for wetland protection.

Objective

Investigate the role and importance of wetlands as a natural environment.

Equipment

Equipment required:

- plastic tubs
- nets
- clear glass tubes
- turbidity tube
- water bugs identification sheet
- water bugs identification data sheet.

Wetlands pre-fieldwork activities

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities that are provided at Wetlands and food webs and River detectives.

Wetlands fieldwork

Note: teachers might like to use the River Detectives Site Selection Checklist to choose an appropriate site for fieldwork.

Have students engage in the following fieldwork activities:

- engage with online maps to familiarise themselves with the wetland
- use online maps, topographic maps or field observations to draw a land use map for the wetland and immediate surrounding environment
- conduct bird observations at different times of day
- collect waterbugs and record on data collection sheets
- use the waterbugs data collection sheet to calculate the health of the wetland water
- undertake water quality testing such as turbidity and salinity and observation of rubbish or litter.

Wetlands post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- developing a public service announcement (PSA) to raise awareness for the health of the wetland
- devising an action plan for protecting the wetland
- developing a presentation that can be shared with the local council that highlights the fieldwork methods and results.

Urban heat islands

Note: this resource addresses one part of the Changing places focus area – Urban planning for sustainability.

Syllabus content

Changing places

Urban planning for sustainability

- Diverse strategies for the effective management of sustainable urban places

Learning intentions

Students learn about:

- the change to climate in urban spaces as a direct result of human change to the natural environment
- the diverse strategies that can be applied to manage and sustain urban temperature
- the importance of effectively selecting and applying geographical tools when investigating urban planning and sustainability to acquire, analyse and present geographical information.

Success criteria

Students will be able to:

- use field observations, thermometer or temperature guns to measure and interpret temperature variations, developing an understanding of the concept of urban heat islands and the impact of infrastructure on climate
- analyse the processes and interactions that transform people, places and environments
- create bar graphs from field data to illustrate temperature variations and draw conclusions about the cause and effect of urban heat islands

- develop a proposal to manage urban heat islands, explaining the issue, potential strategies and a cost-benefit analysis of solutions presented.

Objective

Investigate the variation in temperature in schools potentially identifying heat islands onsite.

Equipment

Equipment required:

- thermometer
- temperature gun
- record sheet.

Pre-fieldwork activities

Note: prior to a site visit complete the following suggested learning activities.

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities provided in Geography 7–10: Changing places learning sequence.

Fieldwork

Note: where schools don't have portable buildings, an area of the school that is hotter than other parts may be selected. Students should work in small groups for each part of this activity.

Have students engage in the following fieldwork activities:

- As schools grow, many more portable buildings are appearing and can be warmer than other places around schools. Work in groups to conduct a geographical inquiry into the spaces around portable buildings to answer questions including, but not limited to:
  - Is it hotter around portable buildings?

  - Why is it hotter around portable buildings?
  - What strategies can be implemented at a school level to manage this issue?
- Conduct fieldwork to measure, collect and record the temperature at 5 places around the school. Examples of locations may include:
  - on bitumen near portable buildings
  - on an oval
  - in the hallway
  - outside a permanent building
  - under the shade of a tree.

Post-fieldwork activities

Have students reflect on observations and recordings made in the field by doing the following.

- Graph your results in a bar chart with temperature in degrees Celsius on the vertical axis and location on the horizontal axis. Discuss the results as a class.
- Work in groups to brainstorm possible strategies to reduce the temperature around the portable buildings. Choose the best strategy and complete an annotated map of the school to help explain the solution.
- Prepare a presentation (multimodal) for the school principal to propose a solution to this problem. Your presentation should include
  - an explanation of why heat islands are a problem (as illustrated by your temperature measurements)
  - your proposal to implement at the school, including estimated costs and benefits of this solution.

Coastal dunes investigation

Syllabus content

Environmental change and management

Environmental change

- Biophysical processes that change Earth’s environments

Learning intentions

Students learn about:

- the biophysical processes associated with coastal dunes
- the importance of effectively selecting and applying geographical tools when investigating the biophysical processes associated with coastal dunes to acquire, analyse and present geographical information
- the impact of human activities and management strategies on coastal dunes, exploring both modern conservation efforts and traditional custodianship practices.

Success criteria

Students will be able to:

- analyse the interactions and transformations within this environment that impact people, places and environments
- demonstrate the use of a large variety of fieldwork instruments to collect and accurately record data on coastal dunes
- apply a large variety of fieldwork methods to collect and record data in the field to support an explanation of the processes associated with coastal dunes formation, change and management.

Objective

Use a variety of fieldwork techniques to investigate and understand the dynamics and processes of coastal dunes, including their formation, structure, ecological significance and the impacts of human activities.

Equipment

Equipment required:

- anemometer
- barometer
- Bureau of Meteorology (BOM) website access (for precipitation data)
- camera
- clinometer or clinometer app (optional)
- clipboard
- compass
- data sheets
- drawing paper or field sketchbook
- erosion pins or markers
- field notebook and pens
- geological hammer (optional)
- grain size card
- gloves (for beach clean-up)
- hand lens (optional but beneficial)
- hygrometer
- notebook and pens

- oranges (for longshore drift study)
- pH meter or pH test strips
- plant identification booklet or app
- protractor
- range poles
- rock identification guide (optional)
- salinity meter or test kit
- soil moisture sensor
- stopwatch or watch with a second hand
- tape measure
- thermometer
- trash bags (for beach clean-up)
- turbidity tube or meter.

Coastal dunes pre-fieldwork activities

Have students prepare for the fieldwork by conducting the following activities:

- research the traditional custodianship of the dunes
- access local council website to research information about the local beach, including biodiversity, current issues and management strategies
- explore the dune system using spatial technology tools such as National Geographic Mapmaker 4.0 and Google Earth
- use National Geographic Mapmaker 4.0 to create a topographic map and a sketch map of the study site
- make a shortlist of places suitable for conducting fieldwork activities

- if possible, determine the bearing of the planned transect
- access historical photos of the coastal dunes that can be used to compare the site to present day
- note taking on the basics of primary, secondary and tertiary dunes
- note taking on the basics of primary, secondary and tertiary vegetation, as well as the concepts of pioneering and succession
- note taking on destructive and constructive waves, as well as key terms like swash, longshore drift, and prevailing winds.

Surveying the dunes fieldwork activity

Note: Rob Brander Emery Survey (10:15) explains how and why to complete a beach profile using the Emery method. This method requires only 2 range poles and a tape measure and is outlined below. Another method which uses a clinometer could also be considered. Ideally transects are recorded at different parts of the beach to compare differences.

Two range poles and a tape measure are required for this activity. Choose a starting point (temporary benchmark) and mark it with elevation and horizontal distance of zero.

- choose a place to record the first measurement
  - place one pole at the benchmark
  - partner takes the second pole and tape measure, walking to a point with a noticeable slope
- measure horizontal distance
  - measure and record the horizontal distance between the poles, for example, 5 metres
- measure elevation change
  - align the top of the pole at the benchmark with the horizon
  - partner holds the distant pole vertically

- sight the top of the distant pole at the horizon, align your finger on your pole, and record the elevation change, for example, 30 cm down
- leapfrog method
  - leave the distant pole in place
  - move the nearby pole further along the beach and repeat measurements
  - continue leapfrogging to capture the beach profile
- handling elevation increases
  - if the beach slopes upwards, align specific lines on the poles with the horizon
  - measure the difference between these points and record the elevation change
- steep slope measurements
  - use shorter increments on steep slopes to maintain accuracy
  - ensure horizon visibility and accurate measurements
- offshore measurements
  - perform surveys at low tide to extend measurements
  - use shorter increments in water to maintain accuracy
- recording data
  - record each horizontal distance and elevation change
  - plot data points on a graph (horizontal distance on x-axis, elevation on y-axis)
  - connect points to visualise the beach profile.

Sand dune sediment grain analysis fieldwork activity

Note: UNSW Mean Grain Size (1:45) explains how and why to collect sand grain particle size. The instructions below are outlined in this video. Another method uses sand sieves. This equipment can be expensive and more time consuming but is more accurate. Local Environmental and zoo education centres often have this equipment and are worth connecting with if required.

A grain size card is required for this activity and a hand lens is optional but beneficial.

- Choose sampling location
  - for a single sample, take sand from between the high tide mark and the low tide mark
- Collect sand
  - scoop a small amount of sand from the chosen location
- Determine mean grain size
  - place a representative pinch of sand on the grain size card
  - compare the sand to the card to find the closest match
  - use the hand lens if needed for better accuracy
  - identify and note the mean grain size, for example, medium sand, coarse sand
- Determine sediment sorting
  - flip the card to the sorting side
  - place another pinch of sand on the card
  - use the hand lens to assess sorting
  - identify and note the sorting, for example, well sorted, poorly sorted.

Observing abiotic conditions of coastal dunes

Students record the date, time, latitude and longitude of the fieldwork. Students also record information about the tide.

Table 14 – coastal dune data record sheet

Weather element	Unit of measurement	Instrument used	Reading
Temperature	Degrees Celsius (°C)	Thermometer	
Precipitation in previous 24 hours	Millimetres (mm)	BOM website	
Wind speed	Kilometres per hour (km/h)	Anemometer	
Wind direction	Degrees	Compass	
Cloud cover	Low/medium/high	Observations	
Relative humidity	Percentage (%)	Hygrometer	
Air pressure	Hectopascals (hPa)	Barometer	
Soil moisture	Volumetric water content (%)	Soil moisture sensor	
Soil pH	pH units	pH meter or kit	
Soil colour or sample	Colour	Observations	
Nutrients present in soil	Low/medium/high	Observations	

Field sketch of coastal dunes

Choose a suitable location for your group of students to draw a field sketch of the dune system they are studying. A slightly elevated position such as a headland would be ideal. Provide students with the list below as prompts for elements to include and label in the field sketch:

- ocean
- fences
- sand
- swash zone
- surf zone
- berm (if applicable)
- incipient dune (if applicable)
- primary dunes
- primary vegetation
- secondary dunes
- secondary vegetation
- hind dunes
- tertiary vegetation
- erosion and/or blowouts (if applicable)
- grass (turfed area)
- carparks
- any other natural features
- any other human environment features.

Observing longshore drift

The longshore drift study aims to determine if longshore drift is consistent in direction and speed along a beach when measured at 15-metre intervals. The study also investigates:

- if the drift varies at different distances from the shore
- analyses data graphically
- estimates the positions of rip currents and their effects
- observes changes in drift before and after high and low tides.

You will need:

- a straight stretch of beach
- two oranges
- data sheet (Table 15), pencil and a hard surface to write on
- watch with a second hand.

Mark 5 stations, 15 metres apart, along the beach and assign roles. One partner throws the orange far, the other throws it close.

- Signal Start
  - wait for the prearranged signal (for example, a whistle)
  - at the second signal, throw the oranges into the sea
- Track oranges
  - follow the oranges and note any deviations; if an orange washes ashore, throw it back in
- Record data
  - mark the orange’s position on the sand after 1, 2, 3, 4 and 5 minutes
- Data analysis:

- create a data table and write a short report based on your observations.

Table 15 – longshore drift data record sheet 1

Short throw – minutes	Short throw – drift direction	Short throw – distance	Long throw – minutes	Long throw – drift direction	Long throw – distance

Make observations in the field and complete Table 16.

Table 16 – longshore drift data record sheet 2

Category	Data records
Fieldwork site	
Date and time	
Team station	
Orange throw	
Wind speed and direction	
Surf conditions	
Rip present	

Other coastal fieldwork activities

Biodiversity survey

Students can identify and catalogue the different types of plants and animals found along a transect between the swash and the back of the dune system. Most dune systems start with primary vegetation such as spinifex grasses. Biodiversity and height usually increase as you move back from the beach. Local council websites will be a good starting point for preparing for this activity. Teachers could provide students with a plant identification booklet to help identify plants on the day. Alternatively, students could sketch or photograph the plants, or use a smart app to identify plant species.

Water quality testing:

- Conduct tests to measure pH, salinity, temperature, turbidity, and presence of pollutants or nutrients in seawater.

Beach clean-up and waste audit:

- Collect and categorise litter found on the beach. Analyse the types of waste and discuss sources and impacts on the environment.

Coastal erosion study:

- Measure and analyse rates of erosion at different points along the beach using markers or erosion pins.

Wave measurement:

- Measure wave height, frequency and direction. Discuss how these factors influence coastal processes and beach morphology.

Geological survey:

- Identify and record the types of rocks and geological features present at the beach. Discuss their origins and how they influence coastal processes. Some beaches are more suitable for this activity. Long Reef Beach on Sydney's Northern Beaches for example has some very interesting geological evidence to examine.

Plant and animal adaptations:

- Observe and document the adaptations of beach flora and fauna to their environment, such as salt tolerance in plants or burrowing behaviour in animals.

Historical comparison:

- Use old maps, photographs and records to compare past and present beach conditions. Discuss changes over time and potential reasons for these changes.

Human impact assessment:

- Survey the types and extent of human activities on the beach and their impacts on the natural environment. This can include negative impacts and positive impacts such as management strategies.

Adaptations to life on the rock platform

Note: this activity requires students to familiarise themselves with the rock platform and the organisms that are present. Students fill in a table to compare the adaptations of each of the organisms shown. Teachers will need to provide a comparative study outside of Australia to achieve the content points outlined under Syllabus content for this fieldwork activity.

Syllabus content

Environmental change and management

Environmental change

- Biophysical processes that change Earth’s environments

Environmental case study

Investigation of ONE type of environment for a comparative study between Australia and at least ONE other country

- Biophysical processes and interactions of the selected environment
- Causes, extent and consequences of the environmental change affecting the selected environment
- Environmental management strategies to enhance sustainability in the selected environment

Learning intentions

Students learn about:

- biophysical processes operating on rock platforms, including wave action, tides and temperature variations
- adaptations of organisms living in rock platform ecosystems and how these adaptations allow them to survive in varying abiotic conditions

- the importance of effectively selecting and applying geographical tools when investigating the biophysical processes associated with rock platforms to acquire, analyse and present geographical information.

Success criteria

Students will be able to:

- analyse the causes, extent and consequence of environmental change and management
- identify the unique biodiversity and sensitivity of rock platform ecosystems, comparing the physical and behavioural adaptations of organisms to the unique challenges of the rock platform environment
- use field observation and instruments such as tide charts, digital thermometers, alcohol thermometers, refractometers, tape measure and ruler to measure abiotic factors and analyse how these affect biodiversity and species distribution
- explain the causes and consequences of environmental changes on rock platforms, evaluating management strategies that enhance sustainability in these ecosystems.

Objective

Investigate environmental factors which impact organisms that live in rockpools.

Equipment

Equipment required:

- tide chart
- digital thermometers
- alcohol thermometers
- refractometers
- tape measure and ruler.

Pre–fieldwork activities

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities:

- watch Rock Platform Ecology Bateau Bay (5:22) and Investigating Rocky Shores- Zones and Common Species (8:30)
- research common species found on rock platforms
- research human impacts on rock platforms and categorise into possible, probable and likely.

Fieldwork

Note: the rock pool fieldwork requires some very specialised geographical instruments. Local environmental and zoo education centres may be able to assist with a loan of specialised equipment.

Have students engage in the following fieldwork activities:

- measure abiotic factors affecting organisms living in rock pools in different sub-habitats
  - wave action
  - tides – identify high and low tide boundaries
  - rock surface temperature using digital thermometer
  - water temperature using alcohol thermometers
  - salinity using refractometer
  - depth using a tape measure
  - record notes on species adaptations such as shape, ways they attach to the rock and forms of protection.

Post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- constructing a food web
- analysing data collected
  - Did the sub-habitats have equal species richness?
  - Could you see a relationship between abiotic factors and species?
  - Could a lack of expertise in animal identification have an impact on results?
  - Were the results consistent between groups?
  - Were some animals found in only one sub-habitat? What explanation could there be for this?
  - Were some animals found in more than one sub-habitat? What explanation could there be for this?
- contacting your local council and requesting access to local water quality data collected by local council over the last 12–18 months
- conducting a class discussion answering ‘How might climate change impact the study site?’

Going up the mountain

Note: this fieldwork exercise could be adapted to suit any local mountain, hill or geomorphic feature that has a considerable variation in elevation. Where appropriate, apply the department's Excursions policy along with the school policy when planning and delivering an excursion.

Syllabus content

Landscapes and landforms

Dynamic landscapes and landforms

- Location and features of a variety of landscapes and landforms
- Geomorphic processes of tectonic activity, weathering, erosion and deposition that create and shape landscapes and landforms
- Human impacts that modify landscapes and landforms

The value and protection of landscapes and landforms

- Environmental, economic, recreational and cultural value of landscapes and landforms
- Protection of landscapes and landforms on various scales
- Knowledges and Practices used by Aboriginal Peoples to manage and care for Country

Learning intentions

Students learn about:

- the unique physical features and characteristics of mountains and the associated geomorphic activity that has shaped the dynamic landform
- variations in physical features and biodiversity along a mountain's elevation, understanding how altitude affects vegetations, climate and landforms

- the importance of effectively selecting and applying geographical tools when investigating the biophysical and geomorphic change that occurs due to altitude ascent to acquire, analyse and present geographical information.
- environmental, economic, recreational and cultural perspectives related to the value of mountains, including how human activities impact and influence management of these landscapes.

Success criteria

Students will be able to:

- describe the formation and influences of physical process and human modifications
- apply topographic maps, compasses and plant identification charts or apps in the field to analyse elevation, biodiversity and landforms at different altitudes
- collect data on abiotic factors such as temperature, wind speed and soil moisture to draw conclusions regarding the physical and biological features of the mountain landscape
- recognise variations in biodiversity and physical features of mountain environments as they progress in altitude up a mountain
- use data gathered in the field to present a multimodal report that describes variations in biodiversity and physical features within a mountain environment.

Objective

Use a variety of fieldwork techniques to investigate and understand geomorphic processes and biophysical changes occurring at different altitudes on a mountain, including the formation and structure of the landscape, the variation in biodiversity, and the impacts of human activities on the mountain environment.

Equipment

Equipment required:

- clipboard and notebook
- camera

- plant identification chart or app
- topographic map
- compass.

Pre-fieldwork activities

Have students prepare for the fieldwork by conducting some suggested pre-fieldwork learning activities:

- locate the mountain your class will visit on Google Earth or similar
- describe the mountain location using latitude and longitude
- use a topographic map to familiarise yourself with the topography of the mountain noting significant landmarks and features
- invite a local guest speaker to the classroom to answer pre-planned questions composed about the natural and cultural significance of the mountain
- plot the location of the mountain on a map of NSW and identify any local towns or cities
- research the geomorphological formation of the mountain and region
- construct a climatic graph for the region
- watch the relevant geographic tools videos
  - Area and distance (3:21)
  - Area and grid reference (3:32)
  - BOLTSS and scale (4:06)
  - Conducting a field sketch (4:50)
  - Contours, gradient, relief and aspect (3:19)
  - Cross-sections and transects (2:53)
  - Directions and bearings (3:44)

- [Latitude and longitude (4:24)]
- [Topographic maps (3:54)]
- [Types of photos (3:21)]

Fieldwork

Note: teachers would need to provide students with multiple copies of the observation tables below (Tables 17– 20). One of each should be provided for each stop (site) up the mountain.

Have students use a topographic map for your mountain to:

- use a compass to place North on the map
- give the coordinates of significant features such as lookouts, base camp or other local landforms
- identify the name and height of the highest natural geographical feature (metres above sea level)
- identify the altitude difference between 2 or more significant landscape features
- describe the direction of the mountain from your starting point (where your walk up the mountain commences)
- identify any local creeks, rivers or waterbodies on your topographic map
- measure the distance from your starting point to the top of the mountain (you will need to use the scale)

At each stop as you climb the mountain record observations and record into the following tables.

Table 17 – mountain general characteristics

Factors	Notes	Results
Grid reference	6-digit reference	
Slope	Flat <10, Gentle 10–20,	

Factors	Notes	Results
	Medium 20–30, Steep >30	
Aspect	The direction the land is facing	
Landform	Creek, hill, valley	

Table 18 – vegetation description

Factors	Notes	Results
Dominant trees	Discuss with guide, teachers and peers	
Dominant shrubs	Discuss with guide, teachers and peers	
Ground cover	Estimate % cover of plants and leaf litter	
Forest type	Dry sclerophyll, sclerophyll, other	

Table 19 – physical and chemical tests

Factors	Notes	Results
Air temperature	Use field multimeter	
Wind speed	Anemometer	
Humidity (%)	Use field multimeter	
Rock type	Volcanic, sedimentary,	

Factors	Notes	Results
	metamorphic	
Soil moisture	Dry, moist, wet	
Soil texture	Sandy, clay, silty	
Soil colour	Smear some soil onto paper as a record of soil colour	
Soil depth	Use tent peg and compass ruler to determine depth	

Table 20 – observations record

Other observations	Notes

Post-fieldwork activities

Have students reflect on observations and recordings made in the field by:

- answering the following questions
  - Why is there a diversity of landscapes and landforms?
  - What environmental and human processes have formed and transformed landscapes and landforms at the mountain visited?
  - Why do people value and protect landscapes and landforms?
  - In what ways did you observe your mountain being sustainably managed and protected?

- present a multimodal fieldwork report (oral presentation, written report, infographic, podcast, other report negotiated with the teacher).

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