NSW GOVERNMENT | Education Public Schools

Human Impacts Depth Study

Introduced Species – A study of the fox and its impact on Australia.

Student Name: _____

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Health and Safety Issues

As you are working out in the field you need to be aware that:

- Ground material is often covered in moss and can be very slippery.
- Vines and dense undergrowth can trip.
- Fallen trees can be rotten and weak.
- Some animals can deliver painful or venomous bites.
- On slopes, rocks can be easily dislodged.
- Edges of wetlands can be quite deep and muddy.

Inquiry Question

How do introduced species affect the Australian environment and ecosystems?

Students:

- develops and evaluates questions and hypotheses for scientific investigation EES11/12-1
- designs and evaluates investigations in order to obtain primary and secondary data and information EES11/12-2
- conducts investigations to collect valid and reliable primary and secondary data and information EES11/12-3
- describes human impact on the Earth in relation to hydrological processes, geological processes and biological changes EES11-11

Student Tasks

Student tasks:

- Create a specific inquiry question relating to the impact of foxes on the Australian environment
- Predict/hypothesise the outcome of a field study based on researching the impact of fox populations on native fauna
- Complete a firsthand investigation as part of a field trip to collect primary and secondary data.
- Process and analyse the data to help solve the problem presented by the inquiry question.
- Communicate scientific findings using a medium of your choice.

BEFORE EXCURSION: Complete your pre-excursion research in a separate book/document by addressing the following questions.

Visit http://brewongleeec.com/student-learning/secondary/stage-6/module-4-human-impacts/

Human Impacts:
- Provided examples of two introduced species and their impact on the Australian environment.
- Create an abbreviated list of terms important to your research and define them using the definition of terms list provided on our website.
- Describe the 4 main processes that can influence population density in any species.
- Outline some sampling methods ecologists use to estimate population density in both plants and animal populations.

Red fox (Vulpes vulpes)

We are interested in the impact that the Red Fox has on other species in an ecological community. Complete some research into Red Foxes and their prey to answer the following: (helpful links provided on our website)
- Distribution, diet, habitat, breeding, threats, ecological niche
- Describe known facts about the impacts of foxes on the Australian environment (include impacts on animals/vegetation/weeds).
- Research the vegetation associations and discuss how sampling vegetation will be important to your research (consider the habitats of prey and competitors).

The Study Site
- Describe the major land use patterns around Brewongle EEC at Sackville North (utilise the Google Map on our website or site like Six Maps).
- The study site is '*remnant bushland*' – what does this mean and what might be the implications for native flora and fauna?
- What is a '*vegetation corridor*' and why are they important for native wildlife and introduced predators?
- Is Brewongle EEC linked to other remnant bushland areas by a vegetation corridor?
- Identify some factors that would influence the distribution and abundance of foxes around Brewongle EEC and Sackville North:

The Field study/excursion

Overall inquiry question "How do introduced species affect the Australian environment and ecosystems?"

- Create your own inquiry question specific to the proposed excursion to Brewongle EEC and how introduced species affect ecosystems within the Australian environment.
- What type of data do you need to collect and what first hand investigation methods could you use in the field to answer this question? (Hint think about ecosystem relationships – Abiotic/biotic/vegetation/animals/humans)
- Hypothesise an outcome of your investigation based on your prior research.
- We have provided a scaffold and various activities that will help you collect primary data during your excursion on both vegetation and the target species.

Survey Recording Form

Abiotic Components - Physical & Chemical Characteristics Along the Transect

		Method	1	2	3	4	Mean	Range
Soil	Temperature	Remove the cover from the thermometer and place probe in soil.						
	Colour	Rub fore fingers on ground & colour in the worksheet section						
	pH	Step 1-Place soil on white tray with spoon						
		Step 2-Place 2-3 drops of universal indicator over the sample						
		Step 3-Sprinkle barium sulphate on sample						
		Step 4-Use colour chart to assess pH level						
	Texture	See notes on pink laminated sheet						
	Leaf Litter Depth	Place trowel into leaf litter. Take measurement from centre of trowel						
Air	Temperature	Use the temperature meter						
	% Moisture	Use hygrometer.						
		Step 1-Read dry bulb temperature						
		Step 2-Read wet bulb temperature						
		Step 3-Calculate difference between wet & dry bulb temperatures						
		Use chart in centre to assess relative humidity						
	Light Intensity	Use lux meter. 1 lux = light of one candle per square meter.						
		Turn on to x100 & take a reading from waist height (add two zeros to your reading)						
Geography	Slope	Use clinometer. (blue colour) (in degrees)						
	Aspect	Use compass. Step 1-Assess where north is						
		Step 2-Assess direction of transect line						
	Elevation	Will be given to you						
	Lithology	Assess the rock type observed						

Survey Recording Form

Abiotic Results – interpretation sheet

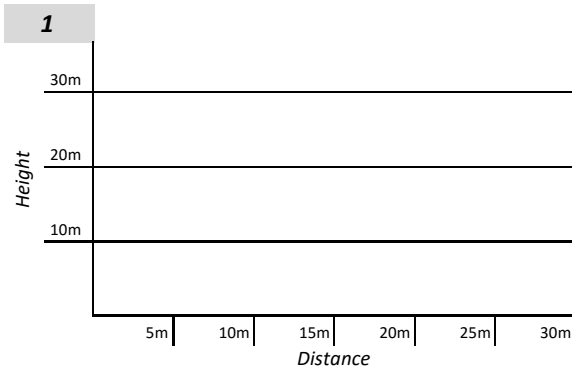<table>
<tr><td rowspan="4">Soil</td><td>Temperature</td><td colspan="5">What would soil temperature influence?</td></tr>
<tr><td>pH</td><td>1 – 5.5 = unhealthy</td><td>5.5 – 8 = healthy</td><td>8 – 12 = unhealthy</td><td>*H=Healthy U=Unhealthy*</td><td></td></tr>
<tr><td>Texture</td><td colspan="5">How would the texture influence vegetation?</td></tr>
<tr><td>Leaf Litter Depth</td><td><1cm = unhealthy</td><td>2 – 3cm = adequate</td><td>3cm & above = healthy</td><td>*H=Healthy U=Unhealthy*</td><td></td></tr>
<tr><td rowspan="3">Air</td><td>Temperature</td><td colspan="5">How does your result compare to the average for Sackville North for this time of year?</td></tr>
<tr><td>Light Intensity</td><td colspan="5">*<100 lux = very dark day   Full daylight = ~10,000 lux   Bright sunlight = ~100,000 lux*

What factors contribute to a variation in lux readings?</td></tr>
<tr><td>% Moisture</td><td colspan="5">How would the humidity infuence vegetation?</td></tr>
<tr><td rowspan="4">Geography</td><td>Slope</td><td colspan="5">How would the slope influence vegetation?</td></tr>
<tr><td>Aspect</td><td colspan="5">How would the aspect of the slope change the type of vegetation?</td></tr>
<tr><td>Elevation</td><td colspan="5">Would the vegetation change as you move between the gully and ridge? Explain differences.</td></tr>
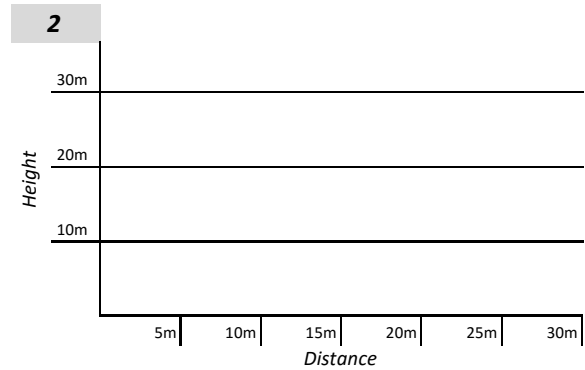<tr><td>Lithology</td><td colspan="5">Why are we interested in the type of rock observed?</td></tr>
</table>

Survey Recording Form

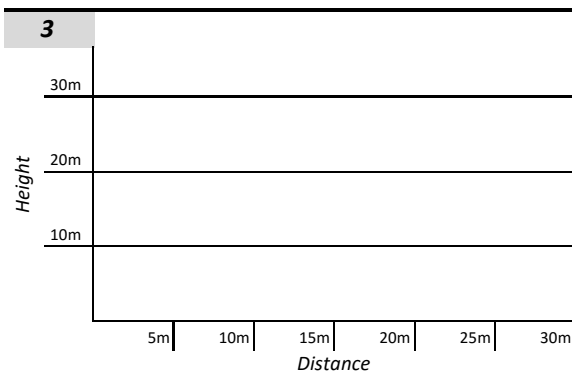## Vegetation - Type and Height

Distribution of a species describes where it is found. A transect can be used to measure distribution. Follow your 30m transect and record tree species and tree height on the table below. Draw a line for each tree with a symbol at the top that represents the species. Utilise the field guide iBook provided to identify tree species and vegetation sheets to identify structure
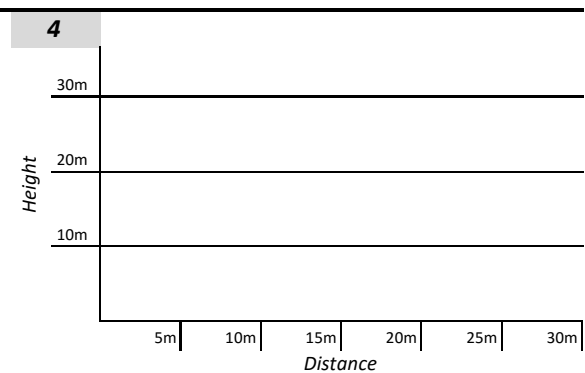
1

Height

30m

20m

10m

5m 10m 15m 20m 25m 30m

Distance

Highest Tree Height _____

Canopy Cover _____

Vegetation Structure _____

2

Height

30m

20m

10m

5m 10m 15m 20m 25m 30m

Distance

Highest Tree Height _____

Canopy Cover _____

Vegetation Structure _____

3

Height

30m

20m

10m

5m 10m 15m 20m 25m 30m

Distance

Highest Tree Height _____

Canopy Cover _____

Vegetation Structure _____

4

Height

30m

20m

10m

5m 10m 15m 20m 25m 30m

Distance

Highest Tree Height _____

Canopy Cover _____

Vegetation Structure _____

TREE SPECIES KEY

Example

Height

30m

20m

10m

5m 10m 15m 20m 25m 30m

Distance
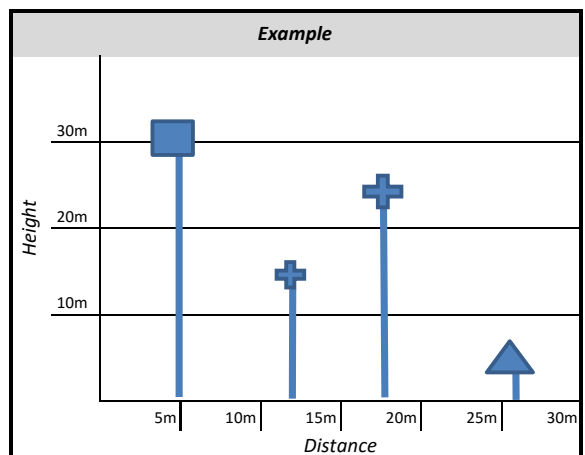
What layer of vegetation (if any) is missing? _____

HABITAT ASSESSMENT

Habitat Element							1	2	3	4	Mean	Range
TREES	**Trees**	1- 3 large trees (> 6m) **1**		More than 5 large trees **2**								
	One or more trees native to Australia	**2**										
	A variety of 4 or more plant species	**2**										
	Healthy Tree Canopy /Plant Foliage	Healthy **2**	Moderately Healthy **1**	Defoliation Evident **0**	Evidence of Dieback **0**							
SHRUBS	**Shrubs**	None **0**	Some **1**	Many **2**								
	Native Shrubs	None **0**	Some **1**	Most **2**								
GROUND COVERS	**Ground Cover**	None **0**	Some **1**	Most **2**								
	Native Grasses or Spreading Plants	**2**										
SHELTER	**Hollows**	Butt Hollows **1**	Limb Hollows **1**	Fallen Log Hollows **1**								
	Rocks & Crevices	None **0**	Some **1**	Most **2**								
	Leaf Litter	None **0**	Some **1**	Most **2**								
	Loose Bark (attached or shed)	None **0**	Some **1**	Most **2**								
	Logs & Fallen Branches	None **0**	Some **1**	Most **2**								
WATER	**Pond/Water**	Yes **1**	No **0**									
FOOD	**Plants with Fruits / Seeds**	None **0**	Some **1**	Most **2**								
HABITAT SPACE	**Plants of Different Ages**	None **0**	Some **1**	Most **2**								
SURROUNDING LANDSCAPE	**Joined or Located to Other Gardens / Bush by Gardens / Bush**	Yes **1**	No **0**									

A LOW SCORE WILL INDICATE THE ZONE IS POOR HABITAT. This may be because it has been disturbed or requires additional habitat parameters to better support the amazing variety of living things.

TOTAL SCORE / 33

A quoll requires a minimum score of 20 to survive

INTERPRETING THE HABITAT ASSESSMENT

AREA - the higher the score the better. Larger animals and those higher up the food chain require more territory/range in which to support themselves. Wildlife corridors play an important role in sustaining and conserving plant and animal species.

TREES - provide nesting sites and food for nectar and fruit eaters.

HEALTHY TREE CANOPY – a healthy canopy will indicate the site is relatively free of human disturbances (eg; erosion, compaction) or natural disturbances (storm damage, major presence of mistletoe)

SHRUBS – dense native shrubs allow small native animals and birds to shelter and to hide from predators such as feral cats.

HERBS & GROUND COVERS – provide the food for finches, lyrebirds, lizards, frogs and wallabies, and also provide habitats for small mammals, insects and spiders.

NATIVE PLANTS – native plants are adapted to the Australian environment. They require less watering, little or no fertiliser and provide the right food at the right time for the native animals that have evolved with them.

HOLLOWS – are important homes for native wildlife. It can take over a hundred years for hollows to develop in forests. Hollows also provide nesting sites for birds, possums and bats.

ROCKS & CREVICES – provide habitat for many animals to live and feed and for certain species of plants to grow – they are valuable habitat. Bush rock collection has had a significant impact on our wildlife and degraded many areas.

LEAF LITTER – provides habitat for smaller animals like lizards, geckos, frogs and invertebrates. Leaf litter, when broken down, provides humus – a rich source of nutrients for trees and shrubs.

LOOSE BARK – provides habitat for invertebrates, spiders and lizards.

LOGS OR FALLEN BRANCHES – 20% of native mammals need logs to nest in. They provide habitat for invertebrates and reptiles. When they decay they provide nutrients for the ecosystem.

POND / WATER – provides homes for frogs, native fish, dragonfly nymphs and other invertebrates. Also drinking water for birds and animals.

PLANTS WITH FRUIT / SEEDS – an important source of food for birds, bats, possums and invertebrates.

PLANTS OF DIFFERENT AGES – indicates that an area has more habitat spaces for a variety of plants and animals.

JOINED OR LOCATED TO OTHER GARDENS / BUSH – a variety of vegetation, vegetation density and landscapes will allow a greater range of animal species to find food and nesting sites.

References –   Rumbulara EEC   CRAM Project – CMA,Windsor

Nest Box Camera Survey

List any wildlife or evidence of wildlife that you found.

Box	Species	How many?	behaviour/comments

Camera Trap Results

List any wildlife or evidence of wildlife that you found after reviewing camera trap footage.

Camera	Species	How many?	behaviour/comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

General Observations

List any wildlife or evidence of wildlife that you find. (Live or dead animals/birds/scats/diggings/tracks)

Human Impacts on a Vegetation Community

There are many ways in which a vegetation community can be disturbed and each disturbance can have a varying degree of impact.

Observe the vegetation community around you to complete the following checklist.

1. Has the soil been disturbed by;

	None (o)	minor (1)	major (2)
erosion (sheet, rill, gully)	☐	☐	☐
mining of soil, clay or sand	☐	☐	☐
dumping of rubbish/garden waste	☐	☐	☐
bushrock collection	☐	☐	☐
access roads, paths or tracks	☐	☐	☐

2. Has the vegetation been disturbed by;

	None (o)	minor (1)	major (2)
weed invasion	☐	☐	☐
logging	☐	☐	☐
past clearing	☐	☐	☐
off road vehicle use	☐	☐	☐
nutrient/sewage seepage from adjacent farmland	☐	☐	☐

3. Is the site;

	No (0)	Yes (2)
adjacent to an urban area	☐	☐
adjacent to recreational facilities	☐	☐
showing evidence of feral animals	☐	☐

Score:

Poor	=	21 - 30
Average	=	11 - 20
Good	=	0 - 10

Recorded score:

NB: the spotted-tailed quoll requires a score of 0-10 to survive.

Observe as many alterations to the vegetation community at the study site.

Alteration	Environmental Impact

Post Visit task 1 - Processing the Data

It is important to collect a full data set by sharing primary data with your fellow students. Ensure that your tables have all data to enable you to calculate means and ranges.

Represent your data in your separate document using an appropriate graphical form (not all data can be represented in a graph) or using some of the options below.

  o Using ICT software, use a **topographic map** or **satellite image** as a base map, locate Brewongle and identify locations of nest boxes, camera traps and survey areas.
  o Collate data from your field study into a **table/or graph** to summarise your findings.
  o Create **flowcharts** to demonstrate your understanding of the ways abiotic data is linked to biotic and relationships between the target species.
  o Assemble and annotate **photographs** to provide a visual representation of the site. Analyse and label interconnections.
  o Develop **consequences charts** to explain human impacts and relationships between foxes and their prey (positive and negative). Show the impacts on Google Tour Builder.
  o Summarise each section of data and note any areas of concern or possible issues for the target species (ie is there habitat elements missing, abiotic concerns, vegetation structure missing etc?)

Post Visit task 2 - Analysing the Data

This is where you **evaluate** and **relate** your findings to your **inquiry question**. Remember to relate to your **data and prior research**. Answer the following in your data analysis – this also called a 'Discussion".

- Utilise links on our website to see historical biodiversity data on the **Atlas of Living Australia** website
- How does the **abiotic** data effect the **biotic** data? Ie how does the soil, air and geography influence vegetation and can you then relate to fox populations?
- Are there sufficient habitat elements for foxes and their prey?
- Have you found any direct evidence of fox populations at the field research site?
- Is there **structural diversity** evident in the vegetation that may support a wide range of food for the fox?
- Are there many **habitat space**s for small mammals and birds that constitute fox prey?
- Is there potentially an active red fox population at the research site?
- If an active population, how would you determine the size of that population at the research site?(What further testing could be down and how?)
- If you found no evidence of foxes discuss the reasons for this? (Lack of habitat? Competition? Control programs? Human impacts?)
- Do not limit yourself to these questions, if you can think of further discussion include it in you analysis

Post Visit task 3 – Problem Solving

Use some of the documents provided on our website listed under Fox Control to help you.

- Investigate fox control mitigation measures and document.
- Investigate and document the economic costs of fox predation and cost of implementing control and mitigation measures.
- Predict some consequences for native animal and fox populations in Australia due to predation, control and mitigation measures.
- Outline your recommendations to control fox populations and improve habitat for native fauna at the research study site.
- Are there any arguments against fox control?
- How can we as a nation, reduce the extinction rates of our native animals?
- Why is it important (or not important) to ensure that native animals survive in the Australian landscape? Use evidence to support your argument and consider the views of Aboriginal and Torres Strait Islander Peoples.

Post Visit task 4 – Communicating

Choose one of the following options to communicate your depth study findings.

- Work in small groups to develop a 5-6 minute documentary on the results of your field study. Include all your research, findings and recommendations. Please share with us at Brewongle EEC
- Write a scientific report to communicating your findings
- Choose an appropriate ICT visual communication form to present your findings (eg Powerpoint, Prezi, Google Slide)