Warrumbungle National Park

Environmental Education Centre

Module 4: Ecosystem Dynamics Depth Study 2018

Population Dynamics – a study of the effect of different species on each other in a community

Student Name: _____ Date: _____

White Gum Lookout – Warrumbungle National Park (April 2017)

Warrumbungle National Park

P.O. Box 280, Coonabarabran, NSW

www.wnpeec.nsw.edu.au

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Environmental and Zoo Education Centres

NSW Government Education Public Schools

Health and Safety Issues

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

- Ground material is often covered in loose material and can be very slippery.
- Vines and dense undergrowth can lead to a tripping hazard.
- 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.
- Branches of all sizes fall from trees.

Inquiry Question:

"What effect can one species have on the other species in a community?"

Students:

● *investigate and determine relationships between biotic and abiotic factors in an ecosystem, including: (ACSBL019)*

– the impact of abiotic factors (ACSBL021, ACSBL022, ACSBL025)

– the impact of biotic factors, including predation, competition and symbiotic relationships (ACSBL024)

– the ecological niches occupied by species (ACSBL023)

– predicting consequences for populations in ecosystems due to predation, competition, symbiosis and disease (ACSBL019, ACSBL020)

– measuring populations of organisms using sampling techniques (ACSBL003, ACSBL015)

Student Tasks

- To create a specific inquiry question relating to the inter-relationship of the Eastern Grey Kangaroo and Blue Heliotrope (major agricultural weed and introduced species) and the possible introduction of dingoes to the area.
- Predict/hypothesise an outcome of your field study based on your research of Eastern Grey Kangaroo/Blue Heliotrope/Dingo population dynamics.
- 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 your inquiry question.
- Communicate your scientific findings using a video production.

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Before the excursion: Visit http://www.wnpeec.nsw.edu.au

Complete your pre-excursion research in this booklet by addressing the following questions:

Pre-Excursion Work

1. Terminology – define these important terms

term	definition	term	definition
ecosystem		metamorphic	
biodiversity		niche	
conservation		terrestrial	
transect		species	
quadrat		population	
abiotic		community	
biotic		woodland	
distribution		tree	
abundance		shrub	
igneous		forb	
sedimentary		grass	
monoculture		predator	
commensalism		parasitism	
mutalism		competition	
weed		alluvial	
Trophic Cascade			

2. Describe the four (4) main processes that can influence population density of a species

I. _____

_____

_____

_____

II. _____

_____

_____

III. _____

_____

_____

_____

IV. _____

_____

_____

_____

3. **Outline two sampling methods ecologists use to estimate population density in both plants and animal populations.**

I. _____

_____

II. _____

_____

4. **Camera Traps**

A non-intrusive biological sampling method that has become very popular in recent years due to the development of technology is camera traps. The WNPEEC has placed a camera trap in each of the study site locations to collect data. This imagery is located at https://drive.google.com/open?id=1kYCAVt7odTMiLtE84T3wD62bpiPloDZ3
Using this imagery data complete the following tables.

Table 1. White Gum Lookout Camera Trap

Animal	Tally

Table 2. Camp Blackman Camera Trap

Animal	Tally

By looking at the data tabled above can this accurately depict the species present in these ecosystems?

Why/ why not?

_____

_____

_____

_____

_____

5. The Species in focus

Eastern Grey Kangaroo (Macropus giganteus), Blue Heliotrope (Heliotropium amplexicaule) and Dingo (Canis lupus dingo)

We are interested in the relationship between these three species in an ecological community. Complete some research into each species to answer the following: (helpful links provided on our website)

i. <u>Eastern Grey Kangaroo</u> - distribution, diet, habitat, breeding, threats, ecological niche

_____

_____

_____

_____

_____

_____

_____

ii. <u>Blue Heliotrope</u> – origins, distribution, mechanism of spread, physical appearance, habitat, toxicity, impact on animals, competition with other flora

iii. <u>Dingo</u> - distribution, diet, habitat, breeding, threats, ecological niche

iv. **Research any known facts about the inter-relationships between the Eastern Grey Kangaroo, Blue Heliotrope and Dingo populations.**

6. How the Wolves Changed the Yellow Stone Ecosystem

a. **Watch the How Wolves Change Rivers**

b. **Where in the food chain does a trophic cascade begin?**
   i. Bottom
   ii. Top
   iii. Middle
   iv. Scientist are not sure

c. **Which organisms were introduced in Yellowstone National Park in the United States that caused a trophic cascade?**
   i. Elk
   ii. Grizzly Bears
   iii. Beavers
   iv. Wolves

d. **Deer multiplied in the park, what was the result?**
   i. Lots of human-deer interaction
   ii. A population crash
   iii. An increase in the number of wolves
   iv. Overgrazing of the vegetation

e. As a result of the introduction of the wolves, which of the following happened?

i. Tree height increased
ii. Valleys and gorges regenerated
iii. Aspen, cottonwood and willow tree abundance increased
iv. All of the above

f. Along with the wolves, which organisms listed below is an ecosystem engineer?

i. Migratory birds
ii. Song birds
iii. Deer
iv. Beavers

g. List the organisms that thrived as a result of the beaver arrival.

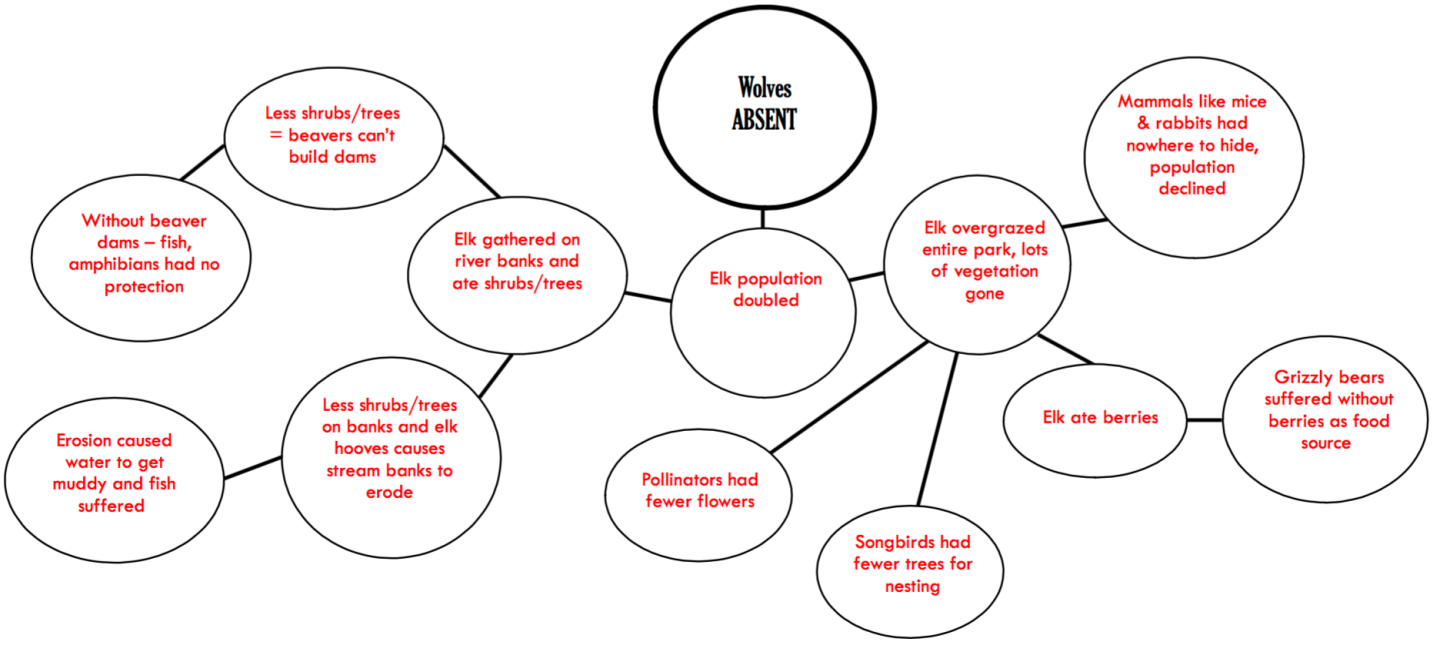
_____

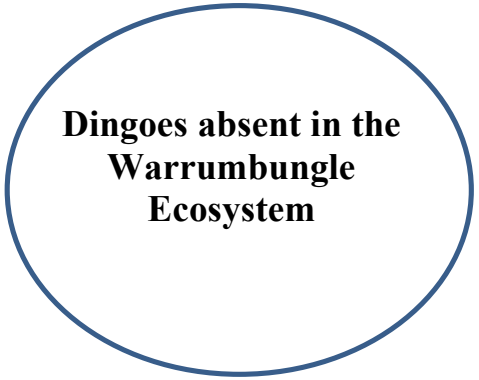
_____

_____

_____

h. From the film a bubble map below shows all of the things that happened in the Yellowstone ecosystem in the absence of wolves. On the next page construct a bubble map that represents the Warrumbungle ecosystem in the absence of Dingoes.




Dingoes absent in the
Warrumbungle
Ecosystem

The Study Site –

1. **Watch this clip on the study sites HERE!**

2. **Sketch a map to show the location of the Warrumbungle National Park in relation to NSW**

3. **Research the major land use patterns around Warrumbungle National Park**

4. **The study sites are 'dry sclerophyll' – what does this mean and what might be the implications for native flora and fauna?**

5. **Identify some factors that would influence the distribution and abundance of Eastern Grey Kangaroos, Blue Helitrope and Dingoes around the Warrumbungle National Park.**

- _____
- _____
- _____
- _____
- _____

6.

Outline the recent history of the area.	

7. **Impact of Abiotic Factors**

Using secondary sources <u>identify</u> four (4) abiotic factors that could be measured at the WNPEEC study sites, and <u>explain</u> how they might impact on the fauna and flora.

Identify	Explain

The Field study/excursion

Overall inquiry question "What effect can one species have on the other species in a community?"

1. **Create your own inquiry question specific to the proposed excursion to WNPEEC and the target species.**

   _____

   _____

2. **What type of data will you need to collect and what first hand investigation methods could you use in the field to answer this question?**

   _____

   _____

   _____

   _____

3. **Now that you have examined some secondary research, develop a hypothesis that you are going to investigate while at the WNPEEC.**

   _____

   _____

Purpose of the investigations

White Gum Lookout and Blackman's Camp provide sites within the Warrumbungle National Park that will offer a good comparison between two natural woodland ecosystems. We will analyse primary data to investigate one of our goals – to identify and measure various abiotic and biotic factors that have created niche environments allowing certain organisms to thrive in these ecosystems. Our second goal is to investigate the intricacies of ecosystem dynamics by analysing the relationships between organisms and how ecosystem health is related to balanced ratios between organisms. We will also use secondary data to investigate how humans have impacted on the ecological history of the Warrumbungle area.

STUDENTS MUST HAVE:	Minimal Impact: Sites must be left how they found it or better.	Students are responsible for the equipment
A full water bottle, a hat, sturdy shoes. Hard hat will be supplied by WNPEEC.	If scientists don't do this, when another scientist attempts to replicate their study the results will vary.	Students must return the equipment in a clean and well packed order. Take note of how the kit is packed.

Excursion Investigation

Inquiry Question

What effect can one species have on the other species in a community?

Transect Study: Examining the impact of biotic factors within the ecosystem

Lay the **30 metre transect** in a north-south direction in each of the investigation sites. Make sure it as flat on the ground as possible.

We are going to collect information using a sampling technique called a Quadrat Study to compare between the two sites. To undertake the **quadrant study** complete the following steps:

1. Standing at the **0 metre mark** on your transect, face east with the quadrat in your hand. Gently toss the quadrat towards the **east**. Where the quadrat lands, **record data** required in the following table. **NOTE**: If quadrat is not flat on the ground, rethrow.

2. Return to the transect and stand at the **3 metre mark** facing west. Gently toss the quadrat towards the **west**. Record data in abundance e.g. If 5 scats were in a quadrat, record 5.

3. **Continue alternating direction** in this fashion until you have collected data within 11 random quadrats required by the table, finishing at the 30 metre mark.

Table 1. White Gum Lookout Carpark – Grassy White Box Site

evidence of living things	0	3	6	9	12	15	18	21	24	27	30
scats											
tracks											
fur											
feather											
bone											
insect											
Blue Heliotrope											

Table 2. WNPEEC - Camp Blackman

evidence of living things	0	3	6	9	12	15	18	21	24	27	30
scats											
tracks											
fur											
feather											
bone											
insect											
Blue Heliotrope											

Biotic Transect Study continued

The layers in a **eucalypt woodland** are:

- the **ground covers** which consist of **grasses** and **forbs**. Grasses can grow quite high while, forbs are herbaceous flowering plants growing no higher than 50cm.
- the **shrub layer** or **understorey**. This layer consists of **flowering plants** with woody stems growing between 0 - 8 metres high.
- the **canopy layer**. This layer is the **tree layer** and includes trees 5 metres or higher.

Along each 5 metre length and within 10 cm either side, note how many trees, shrubs, forbs, and grasses fall in the transect bounds and also how many different species of those organisms there are. Remember a transect is a slice through the biosphere so we are not just looking on the ground but through the three-dimensional space held by the 30 metres x 20cm x infinity invisible rectangular prism. If a tree falls into several sections of the transect count it only once and then only in the transect section where the trunk is found to be perpendicular.

Table 3. Site 1. White Gum Lookout Carpark – Grassy White Box Site

Record the data collected from your **transect** in the table below. Only count living organisms.

Site 1	TREES			SHRUBS		FORBS		GRASSES	
	# of plants	# of species	height of trees	# of plants	# of species	# of plants	# of species	# of plants	# of species
0 – 5 m									
5 – 10 m									
10-15 m									
15-20 m									
20-25 m									
25-30 m									

Table 4. Site 2. WNPEEC - Camp Blackman

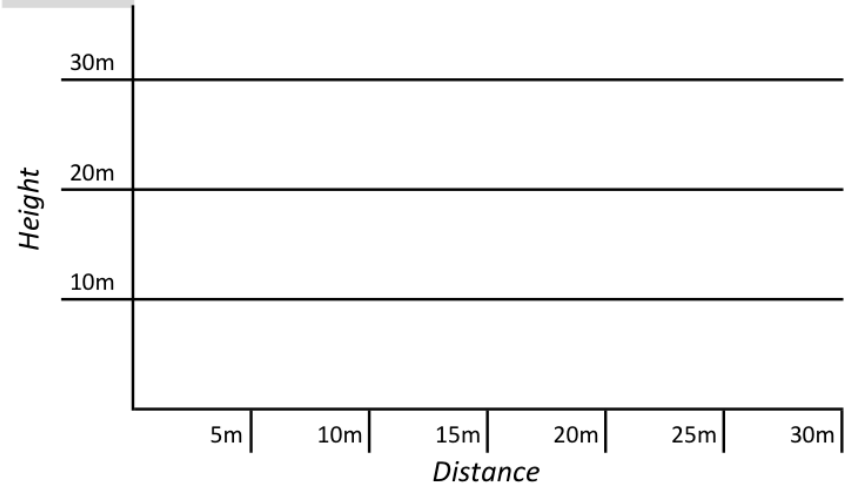
Record the data collected from your **transect** in the table below. Only count living organisms.

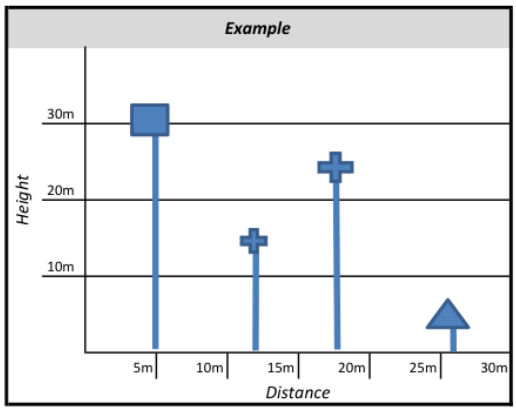
Site 1	TREES			SHRUBS		FORBS		GRASSES	
	# of plants	# of species	height of trees	# of plants	# of species	# of plants	# of species	# of plants	# of species
0 – 5m									
5 – 10 m									
10-15m									
15-20m									
20-25m									
25-30m									

Transect Distribution Diagram - Vegetation type, abundance and height

Distribution of a species determines where it is found. A transect can be used to measure distribution. Using the 30m transect record vegetation species, type and height for each location on the graph below. Draw a line or shade for each vegetation type with a key that represents that species. Utilise the field guide IBook provided to identify vegetation species.

1

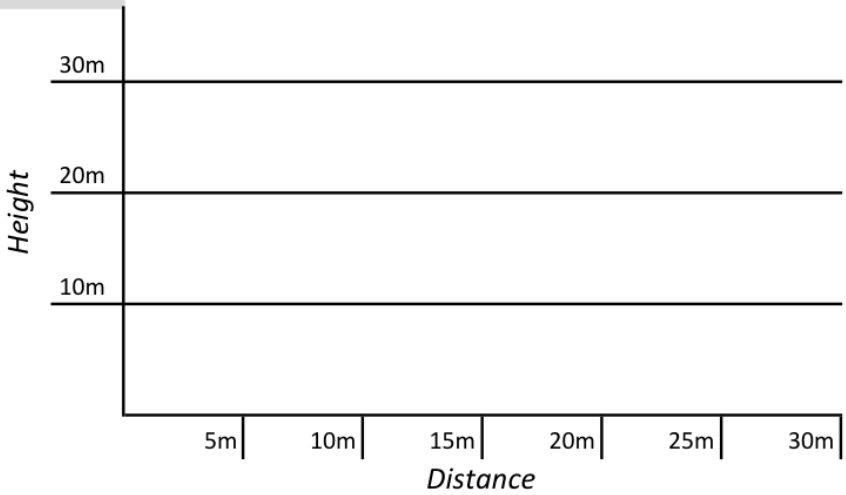




Highest Tree Height _____

Canopy Cover _____

2



TREE SPECIES KEY

Highest Tree Height _____

Canopy Cover _____

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Measuring the Abiotic factors

– read and follow instructions to complete Table 5 and 6.

Abiotic Factor	Equipment and instructions
Organic ground cover	Is there any organic ground cover at your sites? Place the quadrat over the site and record and estimate of organic groundcover as a percentage.
Aspect	Use the compass. The aspect is the direction the slope is facing relative to North.
Gradient	Use the clinometer. Find out the height your eyes are at on a team member. Have the other member stand at the higher end along the transect. Aim the clinometer with the trigger pulled at the height of your eyes on your team member. Release the trigger and take the reading on the clinometer. For greater reliability and accuracy, repeat 3 times and take an average.
Air temperature	This can be determined by number of ways: using the field multimeter thermometer, temperature is displayed at the top of the screen for all readings; or, using the anemometer thermometer temperature reading.
Wind speed	Hold the anemometer facing it into the wind for one minute above your head. Record the greatest wind speed in this time period.
Humidity	Using the field multimeter, take the Relative Humidity (%) reading displayed at the top of the screen for all readings.
Light intensity	Using the multimeter's light meter, switch to Lux X 10 mode. Face multimeter sensor towards the ground ensuring no shadow is being made. Place finger on the HOLD button before turning around to take reading. Press HOLD button again to switch off reading.
Altitude	Using the GPS, press power on and leave to find satellites for 5 minutes. Then on the bottom of the home screen there is signal bars. Press on these and it will display altitude.
soil depth	Use the tent peg to see how far you can push it into the soil. If it stops before the full depth of the peg, measure this with the ruler on the compass or transect tape measure.
soil temperature	Place the soil thermometer carefully into the hole in the soil created by the tent peg. Leave for a moment to allow it to adjust to its environment then take reading.
Soil texture	Using a small amount of soil in your palm, wet it to be malleable not soggy. Assess this using the 'determining soil texture' slip in the black folder.
Soil pH	1.Place a small amount of soil in the lid of specimen container. 2. Place three or four drops of Universal indicator on the soil. 3. Sprinkle some barium sulphate (white powder) on the surface of the soil and allow it to absorb and watch for a colour change. Compare colour to the chart in the black folder.
Soil colour	Using a small amount of moist soil on your finger, smear the soil in the provided recording cell.

Table 5. White Gum Lookout Carpark – Grassy White Box Site – Date:_____ Time:_____ Lat./Long.:_____

ABIOTIC FACTOR	0 m interval	15 m interval	30m interval
Organic ground cover (%)			
Aspect			
gradient			
Air temperature ( )			
Wind speed ( )			
Humidity (%)			
Light intensity (Lux*10)			
Altitude (m)			
Soil depth (cm)			
Soil temperature ( )			
Soil texture			
Soil pH			
Soil colour			

Table 6. WNPEEC - Camp Blackman – Date:_____ Time:_____ Lat./Long.:_____

ABIOTIC FACTOR	0 m interval	15 m interval	30m interval
Organic ground cover (%)			
Aspect			
gradient			
Air temperature ( )			
Wind speed ( )			
Humidity (%)			
Light intensity (Lux*10)			
Altitude (m)			
Soil depth (cm)			
Soil temperature ( )			
Soil Texture			
Soil pH			
Soil Colour			

NOTE:
Ensure you minimise the impact on the sampling site by filling in any holes in the ground you have created and reduce damaging vegetation along the transect. **Place lids on the soil samples** in the specimen jars with the contaminated soil within. It is to be cleaned back at the Environmental Education Centre on your return.

Trophic Interactions in the past, present and possible future Warrumbungle Ecosystem

Below, create a **food web** using the living organisms listed below in a food web arrows point in the direction of the energy transfer.

Grass	**Red Gum**	**Sugar Glider possum**	**Eastern Grey kangaroo**
Ant	**Feral Goats**	**Echidna**	**Dingo**
Rabbits	**Mistletoe**	**Blue Heliotrope**	**Red Necked Wallaby**
Powerful Owl	**Native bee**	**Mistletoe bird**	**Goanna**

Tertiary

Secondary Consumers

Primary Consumers

Producers

What has happened to this food web since the Dingo has been excluded?

Assessing the validity and reliability of first-hand data

Validity	**The extent to which the processes and resultant data measure was intended.**
Reliability	**The degree with which repeated observations and/or measurements taken under identical methodologies achieved the same results.**
Accuracy	**The degree to which a measured value represents the true value of the factor that is being measured.**

Use available **evidence** to discuss the **reliability and validity of the data** collected in your field work investigation.

If a future investigation was to take place, what recommendations would you make so that the scientists could increase the reliability and accuracy of the data collected?

HIGHER SCHOOL CERTIFICATE ASSESSMENT SCHEDULE -EXAMPLE

Subject: Biology **Course**: Year 11 **Year**: 2018

Components

1. **Students develop Knowledge and understanding of -**
   - Structure and function of organisms
   - Earth's biodiversity and the effect of evolution

2. **Students develop Skills in working Scientifically**

Task No.	Outcomes	Task Title and description	Total Weight	Component Weighting 1	2	Date
1	BIO11-1,2,3,7,8	***Enzyme Practical Task***	30%	10%	20%	Term 1 Week 8
2	BIO11-1,4,5,6,7,10	**Depth Study - WNPEEC Field Study and report/oral presentation**	40%	10%	30%	Term 2 Week 8
3	BIO11-8,9,10,11	**Yearly Examination**	30%	20%	10%	Term 3 Week 8-9
			100%	40%	60%	

Fieldwork Marking Criteria - Teachers

Group #:_____ **Teacher:**_____

Student Name: _____
Criteria:

Working Collaboratively	0 1 2 3 4 5
Using technology/tools	0 1 2 3 4 5
Undertaking investigation safely	0 1 2 3 4 5
Accurately recording	0 1 2 3 4 5
Respecting the environment	0 1 2 3 4 5

Total:____/25

Student Name: _____
Criteria:

Working Collaboratively	0 1 2 3 4 5
Using technology/tools	0 1 2 3 4 5
Undertaking investigation safely	0 1 2 3 4 5
Accurately recording	0 1 2 3 4 5
Respecting the environment	0 1 2 3 4 5

Total:____/25

Student Name: _____
Criteria:

Working Collaboratively	0 1 2 3 4 5
Using technology/tools	0 1 2 3 4 5
Undertaking investigation safely	0 1 2 3 4 5
Accurately recording	0 1 2 3 4 5
Respecting the environment	0 1 2 3 4 5

Total:____/25

Farrer
Science Key Learning Area
Farrer Memorial Agricultural High School
585 CALALA Ln. TAMWORTH NSW 2340
PHONE: 02 6764 8650, FAX: 02 6760 9451

BIOLOGY

Term 2, 2018

Date Issued: Thursday 3rd May Week 1
Date Due: Friday 22nd July Week 8

Weighting for the Preliminary course is 40 %

Components:

1. **Students develop Knowledge and understanding of (10%)**
   - Earth's biodiversity and the effect of evolution

2. **Students develop Skills in working Scientifically (30%)**

Outcomes Assessed

Inquiry Question:

"What effect can one species have on the other species in a community?"

Students:

● *investigate and determine relationships between biotic and abiotic factors in an ecosystem, including: (ACSBL019)*
– the impact of abiotic factors (ACSBL021, ACSBL022, ACSBL025)
– the impact of biotic factors, including predation, competition and symbiotic relationships (ACSBL024)
– the ecological niches occupied by species (ACSBL023)
– predicting consequences for populations in ecosystems due to predation, competition, symbiosis and disease (ACSBL019, ACSBL020)
– measuring populations of organisms using sampling techniques (ACSBL003, ACSBL015)

What you need to do.

- To create a specific inquiry question relating to the inter-relationship of the Eastern Grey Kangaroo and Blue Heliotrope (major agricultural weed and introduced species) and the possible introduction of dingoes to the area.
- Predict/hypothesise an outcome of your field study based on your research of Eastern Grey Kangaroo/Blue Heliotrope/Dingo population dynamics.
- 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 your inquiry question.
- Communicate your scientific findings using a video production.

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Suggested plan of attack

1. Complete the pre-reading and pre-excursion questions supplied.
2. Create a specific inquiry question that you can investigate while on the excursion utilising your skills and knowledge.
3. Utilising technological skills present a captivating report of the findings.
    a. This is based on the first hand and second hand data and research. Selectively choose what data is relevant that may be required to show evidence to support the enquiry question/s.
    b. Refer to Presentation marking rubric below

Presentation Options

☐ Typed ☒ Report ☐ Paper
☐ Neatly hand written ☒ Diagrams ☒ Google Drive upload
☐ Email - if you are using this method to submit your report it needs to be by 3.15pm on the day it is due and I will send you a reply email to let you know I have received it

The minimum standard of submission for this task is 50%.

Keep your rough drafts and research notes so that you can provide evidence of working on the task should you be unable to hand in your final draft (eg technology failure). To support your argument that you have done all your own work and have not plagiarised pieces of the experimental report.

Media Marking Criteria – Students and Teachers (To be used in conjunction with media presentation rubric)

Group #: ____ **Teacher:_____**

Student Name: _____

Criteria:

Knowledge and Understanding	0 1 2 3 4 5 →
Data collection and analysis	0 1 2 3 4 5 →
Inquiry question addressed	0 1 2 3 4 5 →
Presentation	0 1 2 3 4 5 →
Creativity	0 1 2 3 4 5 →

Total:____/25

Student Name: _____

Criteria:

Knowledge and Understanding	0 1 2 3 4 5 →
Data collection and analysis	0 1 2 3 4 5 →
Inquiry question addressed	0 1 2 3 4 5 →
Presentation	0 1 2 3 4 5 →
Creativity	0 1 2 3 4 5 →

Total:____/25

Student Name: _____

Criteria:

Knowledge and Understanding	0 1 2 3 4 5 →
Data collection and analysis	0 1 2 3 4 5 →
Inquiry question addressed	0 1 2 3 4 5 →
Presentation	0 1 2 3 4 5 →
Creativity	0 1 2 3 4 5 →

Total:____/25

Documentary/Media presentation **Student: _____** **Total Mark: _____**

Criteria	5	4	3	2	0-1
Knowledge and Understanding	Excellent identification, explanation and description of the WNP uniqueness including Excellent understating of the W.N.P Abiotic & Biotic factors, Geology, flora and fauna, introduced species, location and history.	Thorough identification, explanation and description of the WNP uniqueness including thorough understating of the W.N.P Abiotic & Biotic factors, Geology, flora and fauna, introduced species, location and history.	Sound identification, explanation and description of the WNP uniqueness including sound understating of the W.N.P Abiotic & Biotic factors, Geology, flora and fauna, introduced species, location and history.	Basic identification, explanation and description of the WNP uniqueness including basic understating of the W.N.P Abiotic & Biotic factors, Geology, flora and fauna, introduced species, location and history.	Elementary reference to the WNP uniqueness.
Data collection and analysis	Excellent collation of research, comprehensive understanding of pre-reading exhibited. Analysis of research provided in conjunction with the on-site first-hand investigation data. Student thoroughly utilises analysed data in graphs and/or tables to support their investigation.	Thorough collation of research, thorough understanding of pre-reading exhibited. Links developed between research provided and first-hand investigation data. Student utilises analysed data in graphs and/or tables to support their investigation.	Sound representation of research, a sound understanding of pre-reading exhibited. Links shown between research provided and on site first-hand investigation data. Student shows data in graphs and/or tables but draws a vague link supporting their investigation.	Basic representation of research and a basic understanding of pre-reading exhibited. Mentions a minor link between research and on site first-hand investigation data. Student shows data in graphs and/or tables but does not link to support their investigation.	Elementary reference to research and data collected with minor/no link to made between research items.
Inquiry question addressed	Effectively and concisely answers the inquiry question by evaluating analysed first-hand data and secondary resources. Student provides a recommendation for future research and direction for the WNP.	Answers the inquiry question by utilising analysed first-hand data and secondary resources. Student provides a recommendation for future research and direction for the WNP.	Answers the inquiry question by explaining analysed first-hand data and secondary resources. Student provides a brief recommendation for future research and direction for the WNP.	Basic answer to the inquiry question with brief links to the data collated. Student provides little or no recommendation for future research and direction for the WNP.	Elementary reference to the inquiry question with no reference to data collected.
Presentation	Effectively communicates complex ideas and information to the audience such as but not limited to; eye contact, gestures and movement, clear speech, varied tone and in a timely manner.	Clearly communicates complex ideas and information to the audience such as but not limited to; eye contact, gestures and movement, clear speech, varied tone and in a timely manner.	Sound communication of relevant ideas and information to the audience such as but not limited to; eye contact, gestures and movement, clear speech, varied tone and in a timely manner.	Basic communication of ideas and information to the audience such as but not limited to; eye contact, gestures and movement, clear speech, varied tone and in a timely manner.	Elementary skill in recounting and communicating ideas and information to the audience with guidance.
Creativity	Creatively uses techniques and originality to present in an innovative but scientific way.	Creatively uses techniques and originality to present ideas.	Creatively uses techniques and in an appropriate and typical way.	Presents in an appropriate manner.	Presents with guidance or presents in an inappropriate manner an unoriginal product.

Useful links

Blue Heliotrope

- NSW Government Department of Primary Industries – WeedWise
  http://weeds.dpi.nsw.gov.au/Weeds/Details/19

- Herbiguide
  http://herbiguide.com.au/Descriptions/hg_Blue_Heliotrope.htm

Eastern Grey Kangaroo

- Australian Museum
  https://australianmuseum.net.au/eastern-grey-kangaroo

Dingo

- Australian Museum
  https://australianmuseum.net.au/dingo

Warrumbungle National Park

- http://www.nationalparks.nsw.gov.au/visit-a-park/parks/warrumbungle-national-park

Trophic Interactions

- How Wolves Change Rivers