Tocal site visit

Field work book

connect • grow • learn
DPI in SCHOOLS

NSW GOVERNMENT
Department of Primary Industries

Tocal COLLEGE
RTO 91166

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Note to teachers:

Tocal staff will address the information or facilitate activities that will assist student in completing this work book while you are on site at Tocal. If students would like to investigate further or would like more details we have included a QR code for the Tocal Virtual Farm which can be accessed from the NSW DPI Schools Program web page (https://www.tocal.nsw.edu.au/farm-and-facilities/tocal-farms/virtual-farm)

If you would like students to complete this work book please bring copies with you. Alternatively there are a number of apps available where worksheets can be created and completed on digital devices.

Welcome to Tocal

PROPERTY

Tocal is 2200 hectares. The property contains a range of natural ecosystems, from rainforest remnants and wetlands to dry sclerophyll forests.

RAINFALL

Mean = 972 mm, Median = 749 mm.

SOILS

Soils form a complex pattern across the property. This can be simplified by looking at the soil landscapes, that is the uplands or hills with erosional soil landscapes, the floodplain with alluvial (made up of materials left by rivers) soil landscapes, the midslopes with colluvial (loose earth accumulated at the base of a hill usually moved by gravity) soil landscapes and the vestigal soil landscapes that remain as evidence of volcanic activity. Each of the soils represents different production and management opportunities.

BEEF

Beef cattle are run over an area of 1790 hectares, made up of prime pasture, medium pasture and poor pasture land as well as bushland.

The average herd size is 1100 head – ranging between 800 and 1400 depending on the time of the year and seasonal conditions. The breeding herd averages 300 Brangus, 103 Shorthorn, 102 Angus, 60 Charolais cows and 12 Brangus, 5 Shorthorn, 9 Angus, 3 Charolais bulls. Our main market is the sale of weaners on local stores market – around 450 head per year.

DAIRY

The Dairy covers an area of 260 hectares. The herd is 580 head (mainly Holstein Friesian) of which approximately 305 are milked twice daily. Our average weekly production is 53,000 litres/week. We supply to Norco Cooperative. Milk is transported to Raleigh near Coffs Harbour for processing.

The pasture on the dairy is Kikuyu based, oversown in early autumn with ryegrass, white cover and red clover with some chicory and plantain and fertilised with N+P+K regularly as well as selective use of nitrogen and poultry litter. Some paddocks are limed.

EGGS

Free-range eggs are produced under contract to Pace Farms on an area of 86 hectares. The hens are housed in five sheds covering an area of 8,762m2. The sheds have the capacity to house 90,000 hens and we currently run Isa Brown hens. The hens have access to 11 hectares for free ranging.

SHEEP

Tocal runs a self-replacing Dohne flock of 300 ewes on an area of 113 hectares. This is a demonstration flock used for student training. The flock produces over 1 tonne of wool per year as well as prime lambs. The sheep are guarded by a Maremma dog named Duneedoo.

HORSES

Australian Stock Horses are bred at Tocal for student training and stock work. At any one stage Tocal will have over one hundred horses on the property from young foals, yearlings, breakers, work plant horses and broodmares. Foaling begins around August and the foals are weaned and handled at 5 months.

Property description

Property Name	
Location	
Managers	

Give a brief property history (see the History of Tocal).

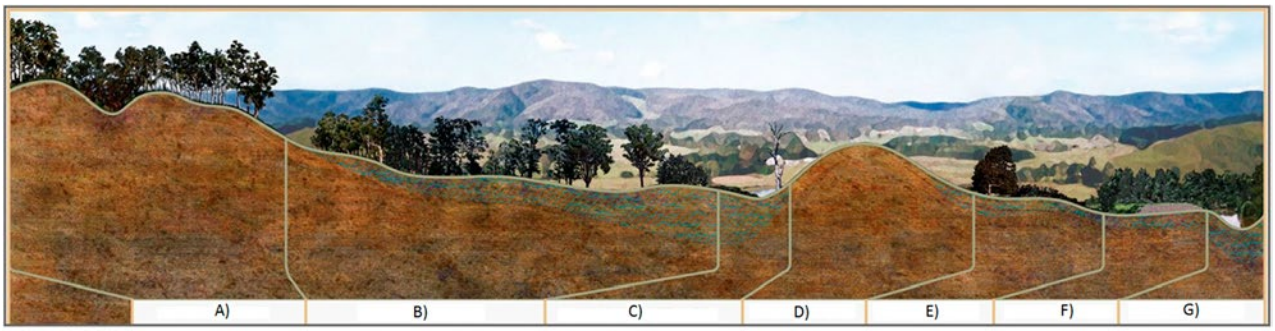
_____

_____

_____

_____

Physical and biological resources on the farm



Topographic landscapes on Tocal

Label the topographic landscapes of Tocal in the transect A)-G).

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

Landuse

A. _____

B. _____

C. _____

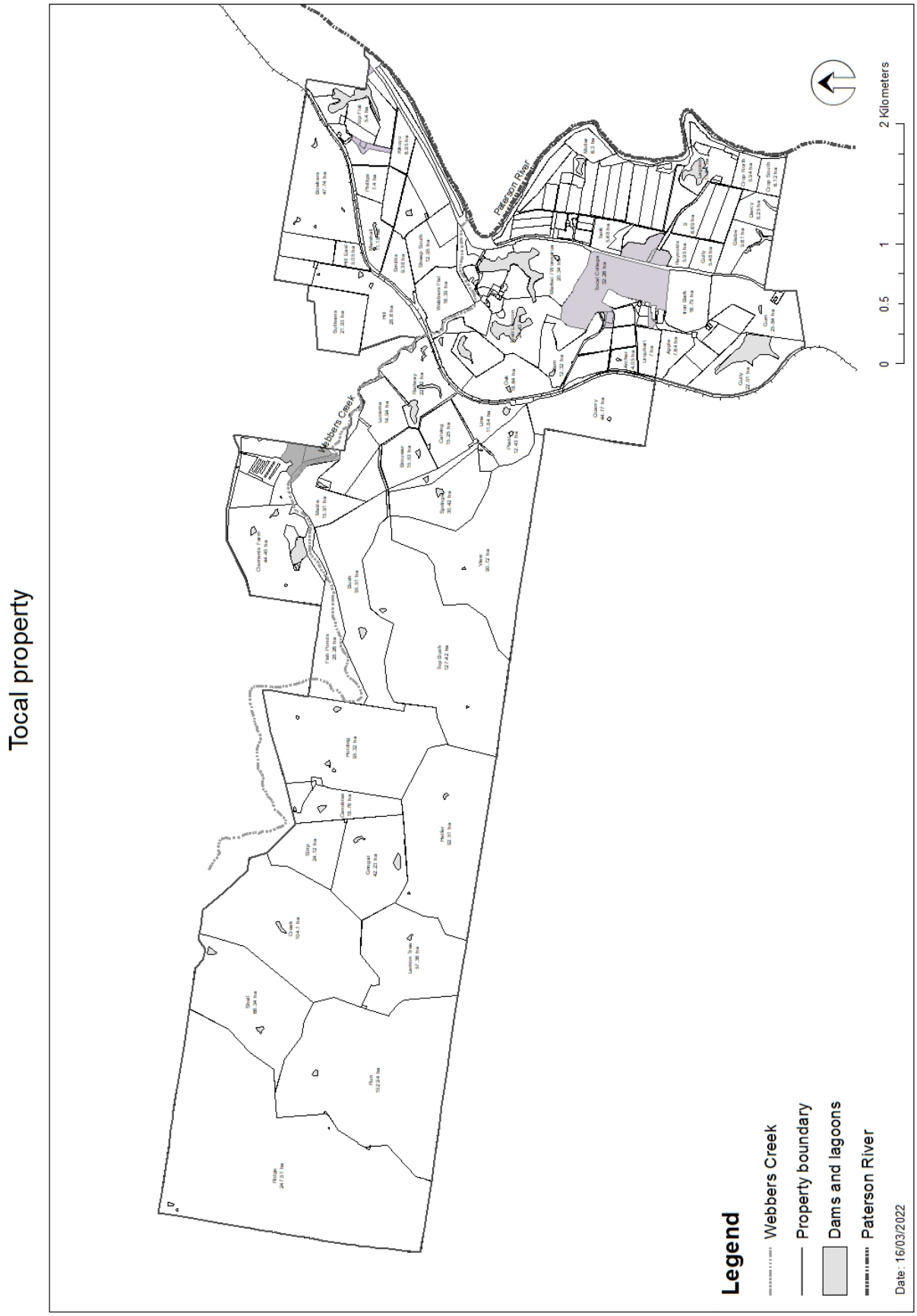
D. _____

E. _____

F. _____

G. _____

Indicate on the map where the different farm enterprises are run. Include a key.



Enterprises

	Size	Production	Pasture/vegetation	Water	Infrastructure	Staff
Beef						
Dairy						
Eggs						
Sheep						
Horses						

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

Evidence of erosion? ☐ Yes ☐ No

Paddock water

Type: ☐ Dam ☐ River ☐ Groundwater ☐ Trough

Use: _____

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

Evidence of erosion? ☐ Yes ☐ No

Paddock water

Type: ☐ Dam ☐ River ☐ Groundwater ☐ Trough

Use: _____

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

Evidence of erosion? ☐ Yes ☐ No

Paddock water

Type: ☐ Dam ☐ River ☐ Groundwater ☐ Trough

Use: _____

Soils

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 6 to 7
Ground cover	Less than 50%	50-75%	More than 75%
Infiltration	More than 7 minutes	3 to 7 minutes	Less than 3 minutes
Compaction	Wire probe will not penetrate	Wire probe penetrates to less than 20cm	Wire probe easily penetrates to 20cm

Colour of surface layer: _____ subsoil: _____

Texture of subsoil: _____ subsoil: _____

Notes: _____

_____

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 6 to 7
Ground cover	Less than 50%	50-75%	More than 75%
Infiltration	More than 7 minutes	3 to 7 minutes	Less than 3 minutes
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Texture of subsoil: _____ subsoil: _____

Notes: _____

_____

Site: _____

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Colour of surface layer: _____ subsoil: _____

Texture of subsoil: _____ subsoil: _____

Notes: _____

_____

Vegetation and biodiversity

What is biodiversity and why is it important?

_____

_____

_____

Outline the effect the following factors have on vegetation

Soils

_____

_____

Water

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_____

Weather and Climate

_____

_____

Topography

_____

_____

Infrastructure

_____

_____

Vegetation

_____

_____

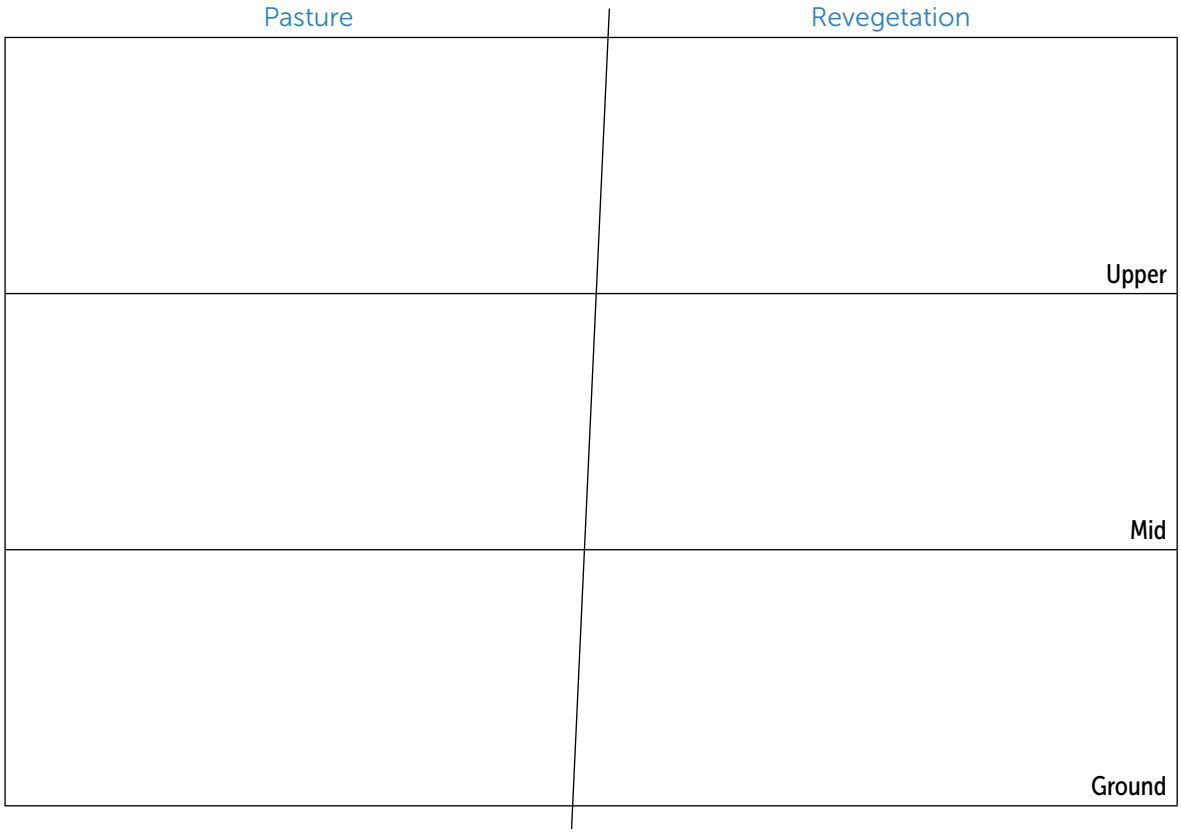
Pests and disease

_____

_____

Site sketch

Draw a comparison between a pasture site and a revegetation site.



Notes: _____

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Water quality

Site name: _____ Date and Time _____

Last rainfall: ☐ within 24 hrs ☐ 1-7 days ☐ more than 7 days

Type of rainfall: ☐ light ☐ medium ☐ heavy

Test results:

Air temperature	
Water temperature	

	Poor	Good	Ideal	Good	Poor
pH	<6	6-7	7	7-8	>8

	Poor	Fair	Good	Very good
Salinity (µS/cm)	>800	400 - 800	<400	
Turbidity (NTU)	>30	15-30		≤10
Available phosphate (mg/L)	≥0.45	0.15 - <.045	0.06 - <0.15	<0.06

Comments and Observations:

_____

_____

_____

Site sketch

Annotate your sketch with notes about features that help us maintain water quality

Technology

Device / innovation: _____

How does it make farming more efficient and/or sustainable?

_____

_____

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Device / innovation: _____

How does it make farming more efficient and/or sustainable?

_____

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_____

Device / innovation: _____

How does it make farming more efficient and/or sustainable?

_____

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_____

Device / innovation: _____

How does it make farming more efficient and/or sustainable?

_____

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Work health and safety

Note some examaples of WHS that you noticed on your visit today.

_____ _____

_____ _____

_____ _____

Reflection:

What surprised you today and why?

_____

_____

_____

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_____

What's the most important thing you learned today and why do you think so?

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What do you want/need to learn more about and how will you do it?

_____

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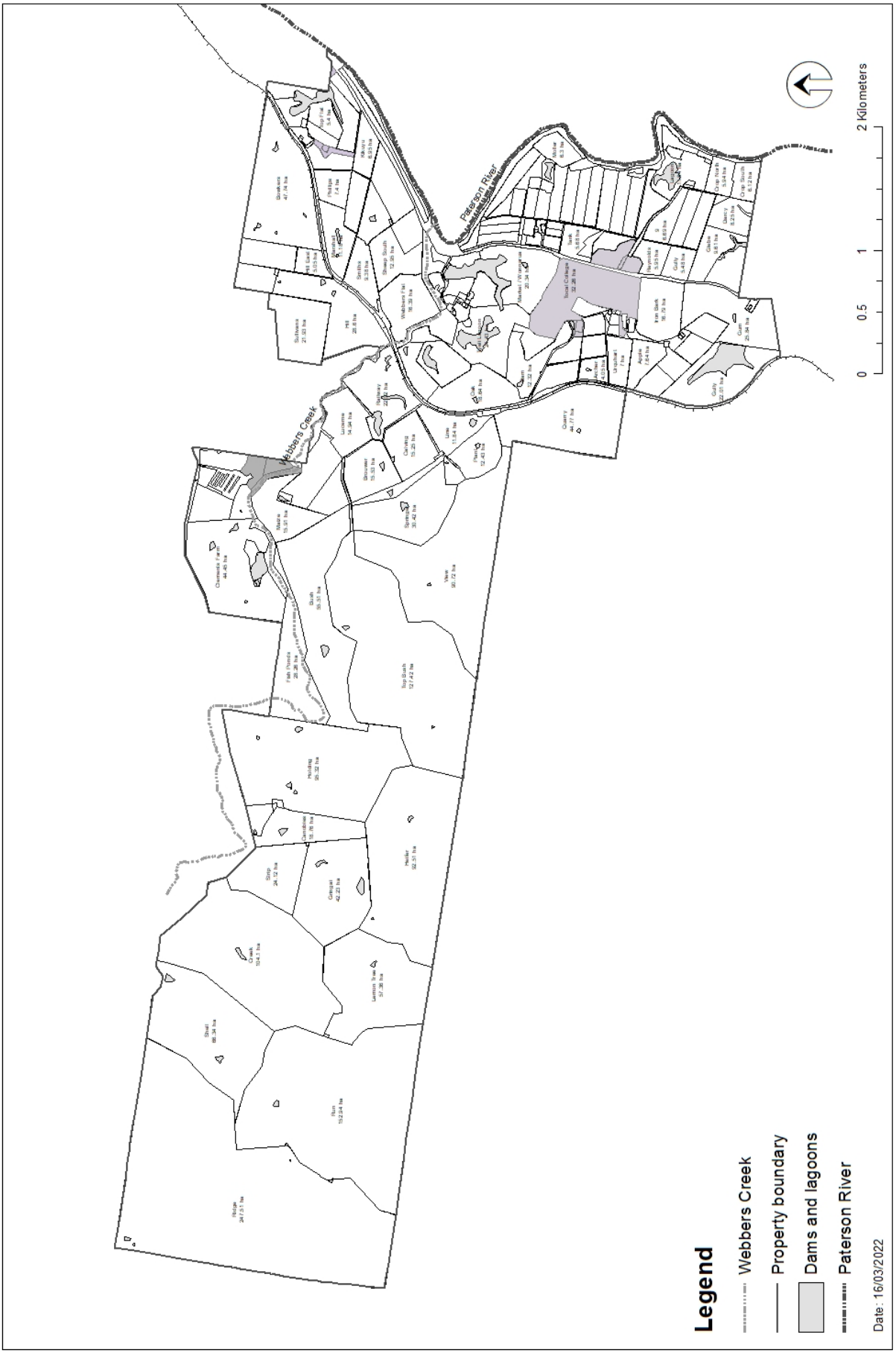
Tocal property



Thank you for visiting Tocal today.

www.tocal.nsw.edu.au

Tocal site visit Field work book-

ANSWER GUIDE

Property description

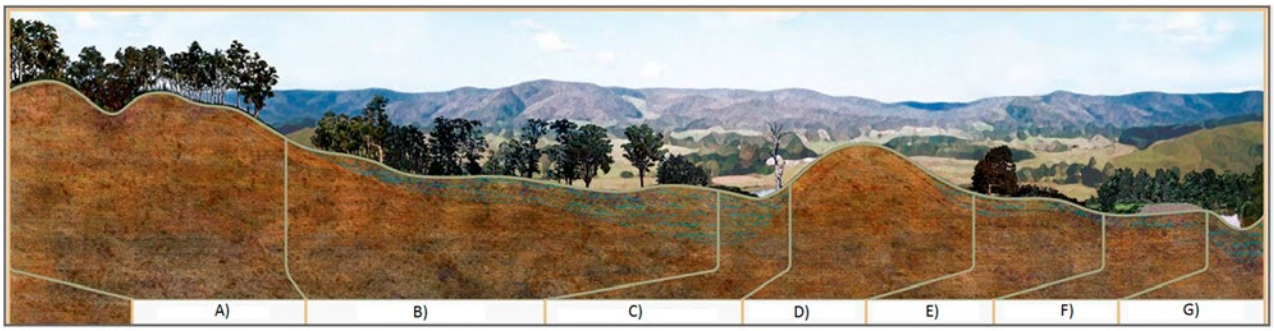
Property Name	Tocal College Farm
Location	Located in the lower Paterson Valley of the New South Wales Hunter Valley. Located mostly within the Webbers Creek sub catchment.
Managers	NSW DPI and the CB Alexander Foundation

Give a brief property history (see the History of Tocal)

- Tocal has a long and proud history, which has seen it established as one of the foremost agricultural institutions in Australia.
- Tocal is on lands formerly inhabited by the Gringai clan of the Wonnarua people. The name 'Tocal' is a Koori word meaning 'plenty'.
- In 1822 James Webber took up the property as one of the first land grants in the Paterson Valley. Webber was an innovator, growing tobacco, hops, grapes, beef and dairy cattle, horses and merino sheep.
- In 1834 Webber sold Tocal to Caleb Wilson and his son, Felix. Felix built the Homestead in 1841.
- Charles Reynolds leased the property in 1844. During the next 82 years, Charles, and subsequently his widow Frances, his son Frank and grandson Darcie, ran Tocal as one of the most important Hereford, Devon and Thoroughbred studs in the country. Frank Reynolds purchased Tocal from the Wilson family in 1907.
- In 1926, Tocal was purchased from the Reynolds family by Jane Alexander. The Alexander family at Tocal consisted of Jane (known as Jean), Isabella, Robert, and Charles.
- When Charles Alexander died in 1947, he left a very large estate and a particularly detailed and complex will. His intention was that his estate be used to help orphan and destitute children by training them for agricultural careers.
- In 1963, the Presbyterian Church was awarded Alexander's Estate under a proposal designed by Edward Alan Hunt, law agent for the Church.
- In 1965, the first fifteen students were enrolled, and Sir Robert Menzies opened the CB Alexander Presbyterian Agricultural College.
- The Church managed the College until 1970 when it was transferred to the State as the CB Alexander Agricultural College, Tocal. This coincided with the passing of the CB Alexander Foundation Act, 1969.
- The Tocal property has increased through various land purchases since the College commenced - Athcourt Farm, Glendarra, Bona Vista, Dunning's Hill, Clements Farm and Numeralla. It is now 2,200 hectares.
- NSW Department of Primary Industries runs the College, assisted in many different ways by the CB Alexander Foundation, Friends of Tocal,Tocal Students Association, Tocal Alumni (encompassing the former ex-students association), Tocal Field Days Association, and the Tocal College Advisory Council.

Physical and biological resources on the farm

Label the topographic landscapes of Tocal in the transect A)-G)

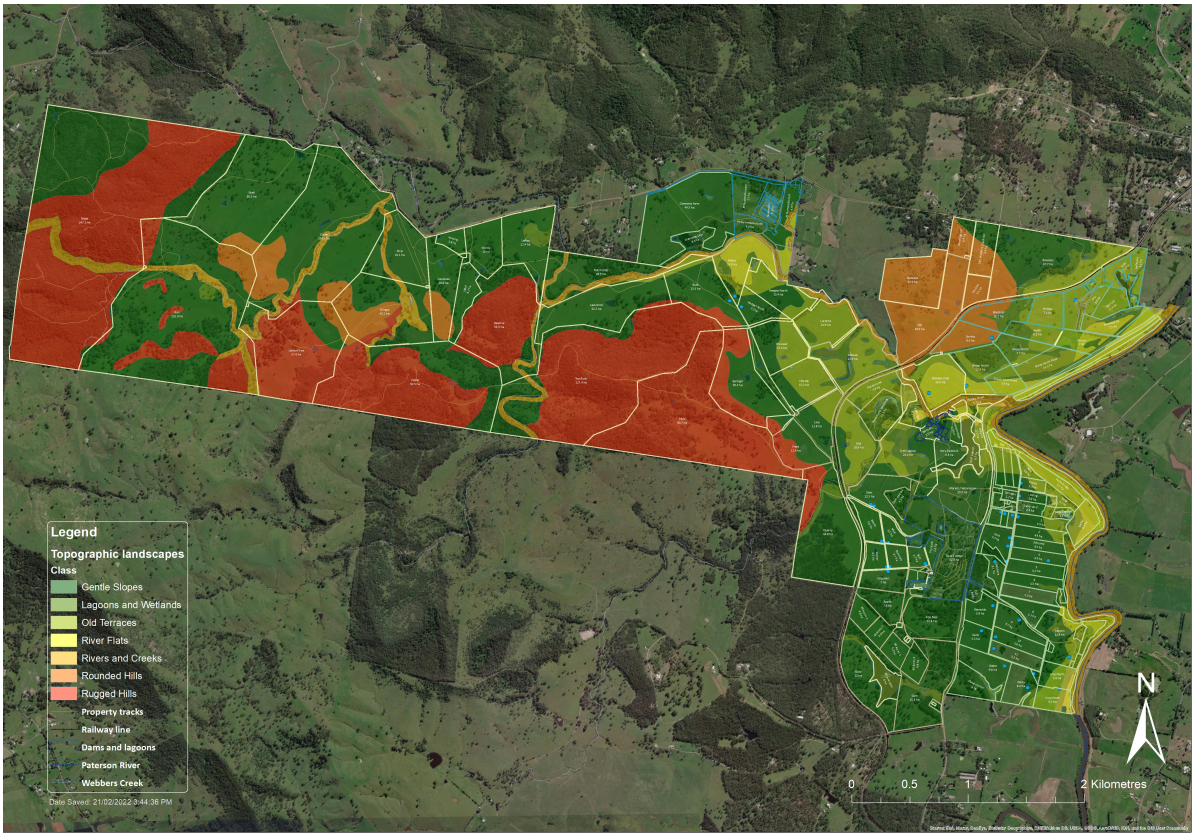


Topographic landscapes on Tocal

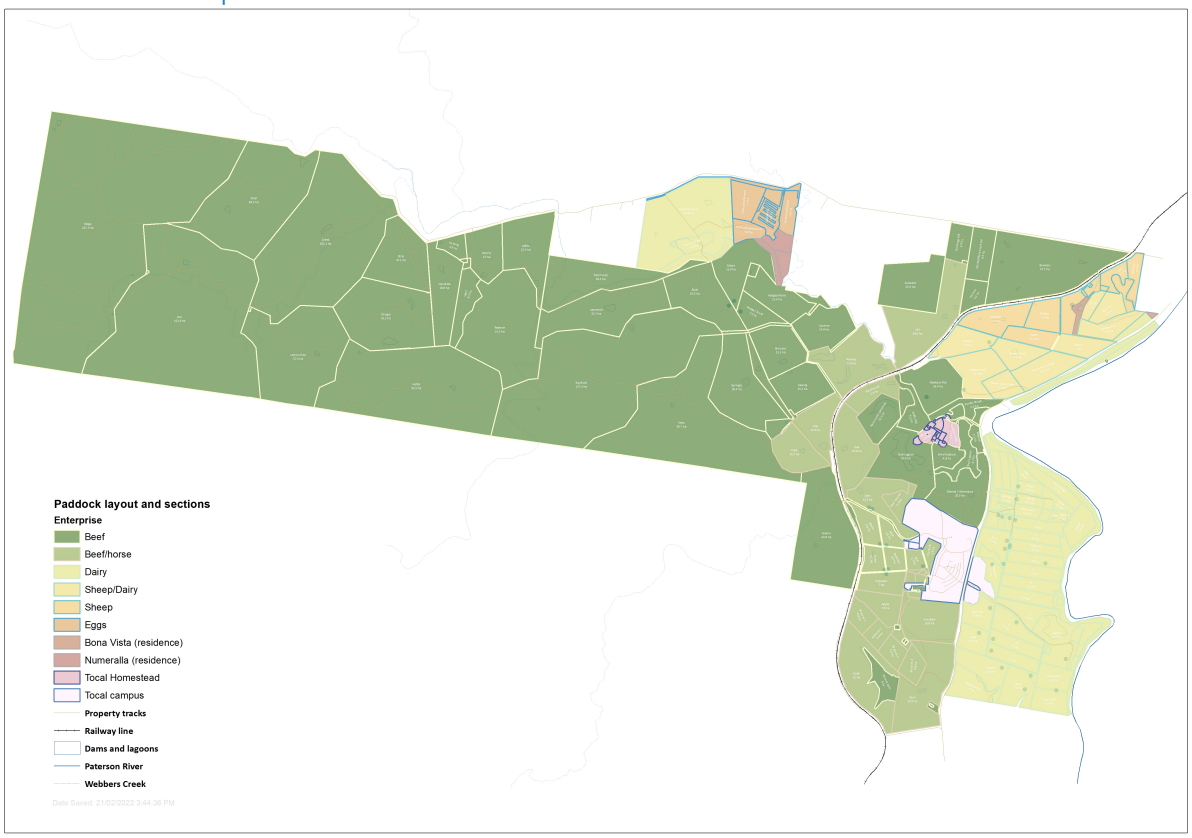
	Landuse:
A. Rugged hills	Light grazing
B. Gentle slopes	Intensive grazing
C. Lagoons and wetlands	Progressive exlusion of grazing
D. Rounded hills	Grazing
E. Old terraces	Grazing
F. River flats	Cropping and/or intensive grazing
G. River and creeks	exclusion of stock and rehabilitation with native species

Indicate on the map where the different farm enterprises are run and the topographic landscapes. Include a key.

Tocal topographic landscapes



Tocal enterprises



Enterprises

	Size	Production	Pasture/vegetation	Water	Infrastructure	Staff
Beef	1790 Ha ~550 breeding cows 800-1400 head, seasonal	Cows: 300 Brangus, 103 Shorthorn, 102 Angus, 60 Charolais Bulls: 12 Brangus, 5 Shorthorn, 9 Angus, 3 Charolais 450 yearlings sold on local stores market	300-500 round bales per year	46 dams and lagoons troughs in strategic locations	130 km fencing yards and handling facilities	3 full-time 12 casual
Dairy	260 Ha 80 Ha under irrigation ~580 head. (~305 milked twice daily)	Mostly Holstein 53,000 litres per week	kikuyu-based pasture, with seasonal planting and strategic fertiliser application	troughs provide stock water. Pastures are irrigated.	Fencing for pasture management. Dairy with 15 per side parallel parlour	3 full-time 2 casual
Eggs	86 Ha 5 sheds with capacity for 90,000	85,000 eggs per day. Under contract to Pace Farms	chickens are fed in sheds with pellets provided by Pace and have access to open areas for foraging	water available on demand in sheds	5 sheds (8762 m^2). 11 Ha free-range area	2 full-time 1 mainteneance 5-7 casual
Sheep	113 Ha ~380 Dohne sheep	1 tonne wool/year guarded by Maremma dog	as for beef	as for beef	as for beef	1 teaching staff 1 staff from beef section
Horses	~100 horses on Tocal. Australian Stock Horses. Horse sales is in November	average sale price in 2017 was $10,000	as for beef	as for beef	as for beef	2 teaching staff 1 staff from beef section

Site observations (results vary)

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

Evidence of erosion? ☐ Yes ☐ No

Paddock water

Type: ☐ Dam ☐ River ☐ Groundwater ☐ Trough

Use: _____

Soils (results vary)

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 6 to 7
Ground cover	Less than 50%	50-75%	More than 75%
Infiltration	More than 7 minutes	3 to 7 minutes	Less than 3 minutes
Compaction	Wire probe will not penetrate	Wire probe penetrates to less than 20cm	Wire probe easily penetrates to 20cm

Colour of surface layer: _____ subsoil: _____

Texture of subsoil: _____ subsoil: _____

Notes: _____

_____

Vegetation and biodiversity

What is biodiversity and why is it important?

Biodiversity is having a large variety of organisms present on an ecosystem including, plants animals and microorganisms. Protecting and increasing biodiversity is in everybody's best interests. Maintaining a wide range of native plants and animals in an agricultural environment maintains the health of an ecosystem meaning it is more resistant to invasion by pests and diseases. A healthier ecosystem is stronger and more productive.

Remnant vegetation or bushland is essential for biodiversity. It can include all types of native vegetation communities including forests, woodland, native grasslands and rainforest. It provides shelter for stock and crops and a habitat for native and non-native species.

List the impacts that the following factors have on production and sustainability:

Soils
Soils provide a medium, nutrients, gases and water essential for plant growth. The quality of the soil and its associated physical and chemical characteristics have a direct effect on the type and intensity of agriculture that can be carried out in a given area. Soil can be improved to some extent and can also be degraded if not well managed.

Water
Water quality and quantity have a direct effect on production. Water is essential for all plants and animal production. If a reliable natural water source is available agricultural production can be optimised for example through irrigation and provision of stock water in troughs. Water quality is difficult to improve on small scale- it is a catchment management focus. However management should minimise or eliminate water degradation.

Quantity can be managed by optimising water collection and storage through dams, tanks and effective water usage for irrigation.

Weather and Climate
Weather and climate have a direct effect on the intensity and types of agricultural production. Australia's agriculture is divided into farming zones (temperate, tropical, sub-tropical, arid and semi-arid). Each zone has characteristic enterprise types which can be successfully carried out dependant on major factors: temperature extremes and amount and seasonality of reliable effective rainfall.

Short term effect of weather can be managed to some extent as long as longer term climate predictions indicate the suitability of agricultural enterprises. For example the impacts of drought on the diary can be managed by irrigation or providing supplementary feed as long as the operation is in an area that usually received adequate rain for dairy production.

Topography
Topography influences factors such as soil type distribution, soil physical and chemical properties, water movement into the soil and protection to crops and animals from weather. Topography on large scale is difficult to manipulate. To manage topography farming should be carried out according to the lands capability.

Infrastructure
The types of infrastructure on farm will be directly linked to the types of enterprises that are carried out on the farm. Well-designed infrastructure raises farm productivity and lowers operational costs. Problems can be overcome through the maintenance, improvement or addition of farm infrastructure specifically designed for the enterprise needs.

Vegetation
Effective management of vegetation is essential for biodiversity, farming systems and supporting agricultural productivity. Vegetation can have economic value, ecological value and native vegetation has cultural and heritage value. Impacts of vegetation include:

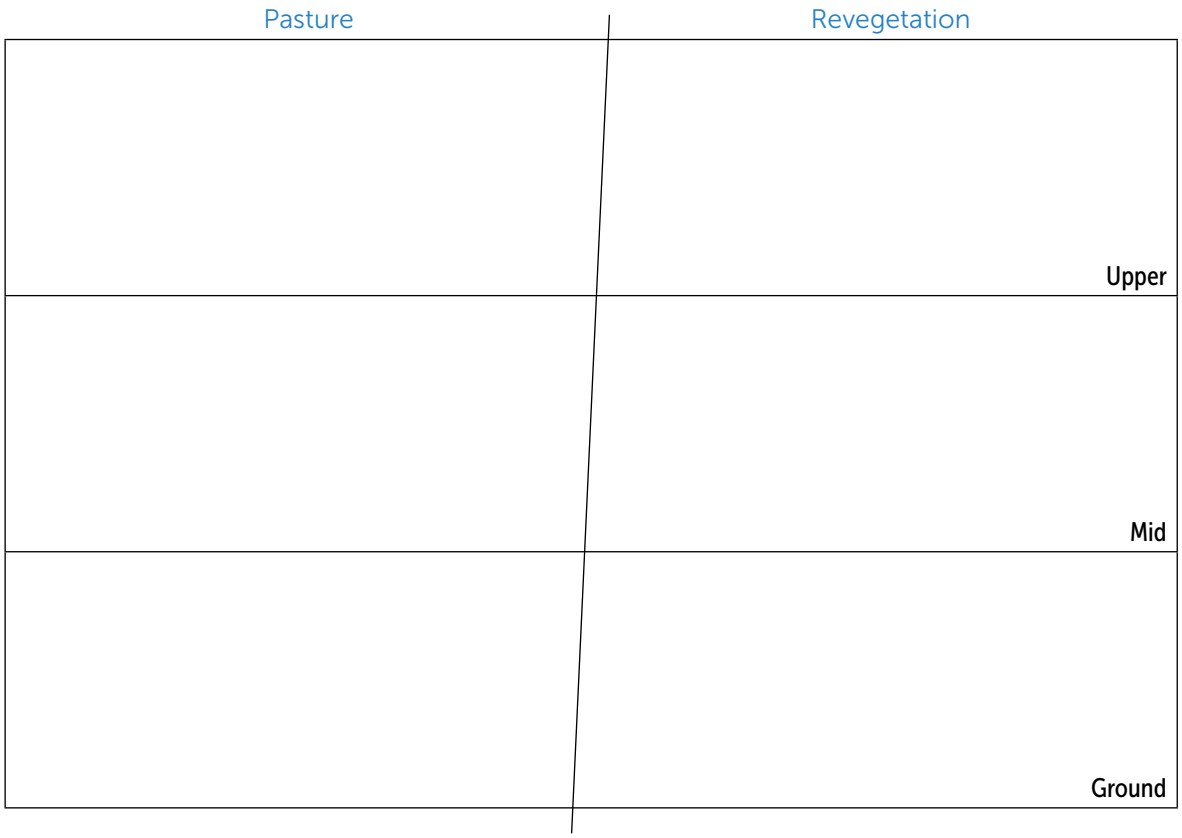
- Provision of direct economic source,
- Vegetation provides wind breaks and protection for plants and animals
- Increase water conservation
- Control and reversing resources degradation issues such as rising water tables, erosion, water quality and trees are carbon sinks assisting with carbon sequestration
- Provision of habitats for native and non-native wildlife
- Assist in pest and disease control. For example insectivores consuming pests.

Pest and disease
Pests and disease have a negative economic impact on production through competition for resources as well as directly impacting plant and animal growth and development. They affect production by reducing the marketability, quality and quantity of products. Problems associated with pest and disease can be managed through control or preventative strategies dependant on the target pest or disease.

Site sketch

Draw a comparison between a pasture site and a revegetation site.

Illustrations should indicate increased species numbers and presence of different vegetation layers in natural sites.



Notes: _____

_____

_____

Water quality (results vary)

Site name: _____ Date and Time _____

Last rainfall: ☐ within 24 hrs ☐ 1-7 days ☐ more than 7 days

Type of rainfall: ☐ light ☐ medium ☐ heavy

Test results:

Air temperature	
Water temperature	

	Poor	Good	Ideal	Good	Poor
pH	<6	6-7	7	7-8	>8

	Poor	Fair	Good	Very good
Salinity (µS/cm)	>800	400 - 800		<400
Turbidity (NTU)	>30	15-30		≤10
Available phosphate (mg/L)	≥0.45	0.15 - <.045	0.06 - <0.15	<0.06

Comments and Observations:

_____

_____

_____

Site sketch

Annotate your sketch with notes about features that help us maintain water quality