PROPERTY PLANNING FIELD DAY

FOR HIGH SCHOOLS

NAME:

NSW GOVERNMENT

26 MAY 2022

TOCAL COLLEGE, PATERSON

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DPI in SCHOOLS

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Note:

Tocal staff will address the information or facilitate activities that will assist student in completing this workbook 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://ww.tocal.nsw.edu.au/ farm-and-facilities/tocal-farms/virtual-farm)

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

The Property Planning Field Day and this workbook are a collaborative project of NSW Local Land Services and NSW Department of Primary Industries, including the Northern Tablelands Property Planning competition.

Welcome to Tocal

PROPERTY PLANNING

Planning is an important part of the success of any business. In farming a good plan provides for long term profitability as well as sustaining the natural resources of the area. The current goals and management strategies for Tocal, as well as more detail about the following factors, are detailed on the Tocal Virtual Farm.

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.

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.

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.

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).

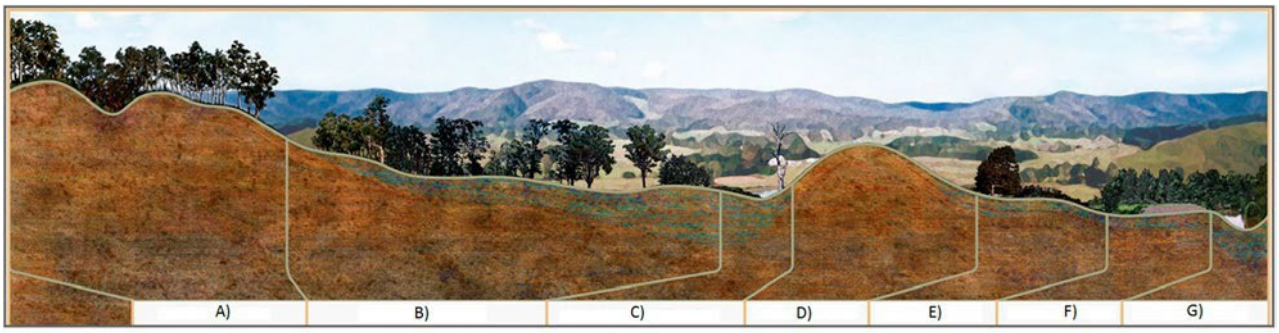
_____

_____

_____

_____

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. _____

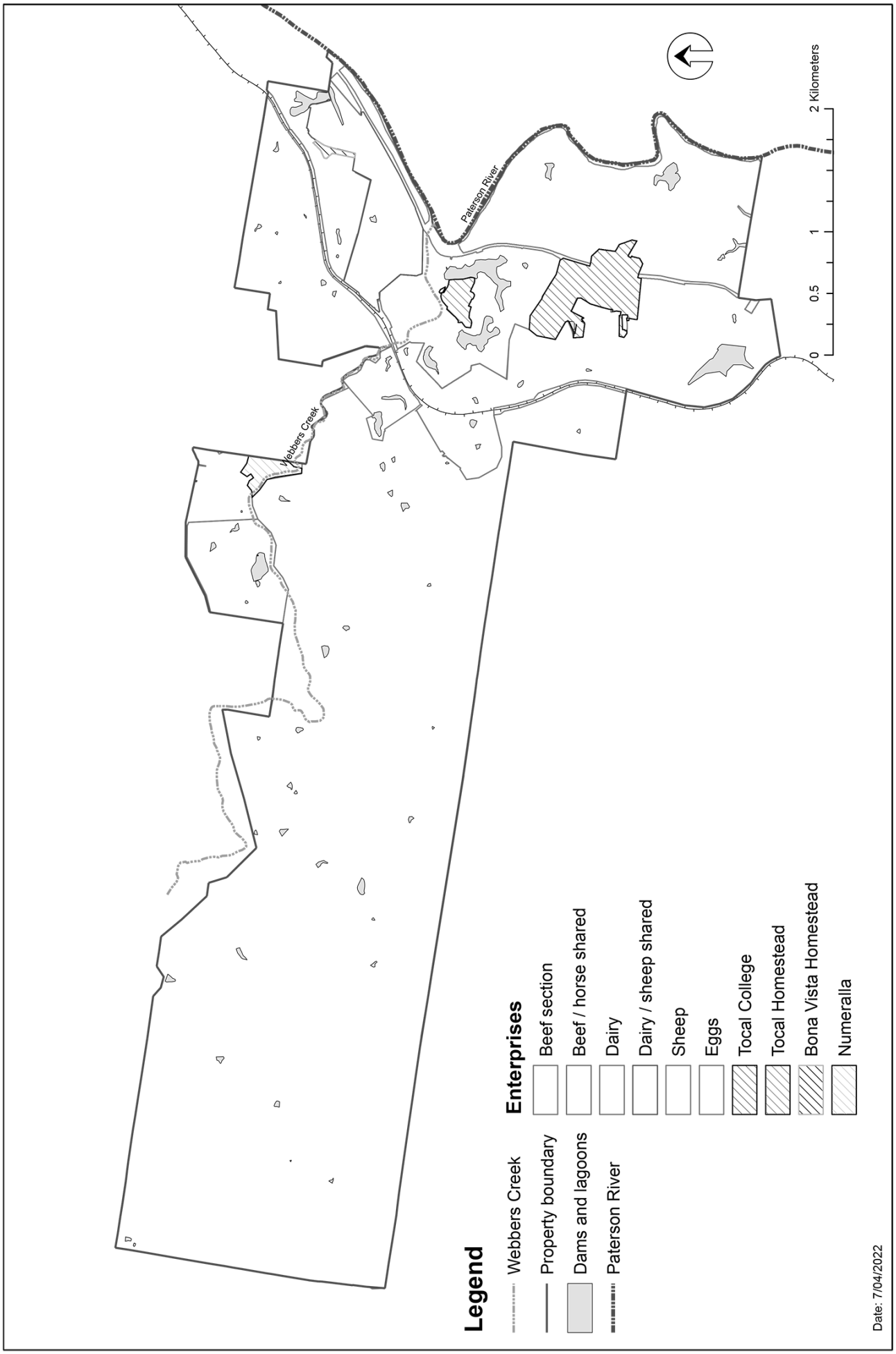
D. _____

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						

Property tour

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

Paddock water

Type: ☐ Dam ☐ River ☐ Groundwater ☐ Trough

Use: _____

Site/paddock name: _____

Date: _____ Paddock size: _____

Current land use: _____

Topography: _____

Land capability: _____

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

Soil is one of the most important natural resources to any land manager as it is the foundation upon which plant and animal production depends. It is important to know the type and condition of the soils present on the property so you can decide the most suitable land-use.

Is there any variation in soil across the property? Explain

.....

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.....

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 5.5 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 5.5 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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Colour of surface layer: _____ subsoil: _____

Texture of subsoil: _____ subsoil: _____

Notes: _____

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 5.5 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: _____

_____

What would be the limitations and opportunities for land use on the different soil types across this property?

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Water quality

Water is vital for sustaining life - our lives as well as the lives of the plants and animals with whom we share the Earth and on which we depend for survival. So the role of water in agriculture cannot be overstated.

Access to water on Tocal made this a useful site for the Wonnarua and Worimi Aboriginal people of whom there is evidence of long-term use. This also ensured the success of European style agriculture since the arrival of James Webber in 1822.

Date: _____

Last rainfall: ☐ within 24 hours ☐ 1-7 days ☐ > 7 days

Rainfall description: ☐ light ☐ medium ☐ heavy

Site1: _____

Test	Units	Results	Results according to the ANZECC guidelines *(tick the box)*	
pH	pH units		<6	☐ POOR
			7	☐ IDEAL
			6 - 8	☐ GOOD
			>8	☐ POOR
Salinity	*u*S/cm		< 400 *u*S/cm	☐ VERY GOOD
			400-800 *u*S/cm	☐ FAIR
			> 800 *u*S/cm	☐ POOR
Turbidity	NTU		≤ 10 NTU	☐ VERY GOOD
			15 – 30 NTU	☐ FAIR
			>30 NTU	☐ POOR
Available Phosphate	mg/L		<0.06	☐ VERY GOOD
			0.06 – 0.15	☐ FAIR
			>0.15	☐ POOR

Site 2: _____

Test	Units	Results	Results according to the ANZECC guidelines *(tick the box)*	
pH	pH units		<6	☐ POOR
			7	☐ IDEAL
			6 - 8	☐ GOOD
			>8	☐ POOR
Salinity	*u*S/cm		< 400 *u*S/cm	☐ VERY GOOD
			400-800 *u*S/cm	☐ FAIR
			> 800 *u*S/cm	☐ POOR
Turbidity	NTU		≤ 10 NTU	☐ VERY GOOD
			15 – 30 NTU	☐ FAIR
			>30 NTU	☐ POOR
Available Phosphate	mg/L		<0.06	☐ VERY GOOD
			0.06 – 0.15	☐ FAIR
			>0.15	☐ POOR

Comments and Observations:

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.....

Site sketch

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

Vegetation and biodiversity

Pastures on Tocal are composed of a range of different plant species. Some plant species can be difficult to identify in their vegetative growth stage. Plants in the reproductive stage (flowering or seed head) make positive identification much easier. Today (autumn) it will be the summer growing species in the reproductive growth stage while winter species will be in the vegetative stage (perennials) or about to germinate/seedling stage (annuals).

Why is it important to know the difference between native and introduced pastures?

.....

.....

List two roles that legumes play in the paddock:

.....

.....

Besides quantity, the quality of a pasture is also very important. Why is quality important?

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.....

What are the indicators of a good pasture? What could be improved?

.....

.....

Looking at this pasture are there any improvements that can be made?

.....

.....

Name some benefits of maintaining high levels of pasture and ground cover.

.....

.....

Assess the ground cover of the pasture by performing 4 random quadrat assessments.

Quadrat	Ground cover (%)
1	
2	
3	
4	
Average	

It is recommended that a minimum of 80 - 100% groundcover is achieved for most or all of the time to prevent degradation such as erosion. How desirable do you think the current level of ground cover is?

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What is biodiversity and why is it important?

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Outline the effect the following factors have on vegetation

Soils

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Water

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Weather and Climate

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Topography

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Infrastructure

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Pests and disease

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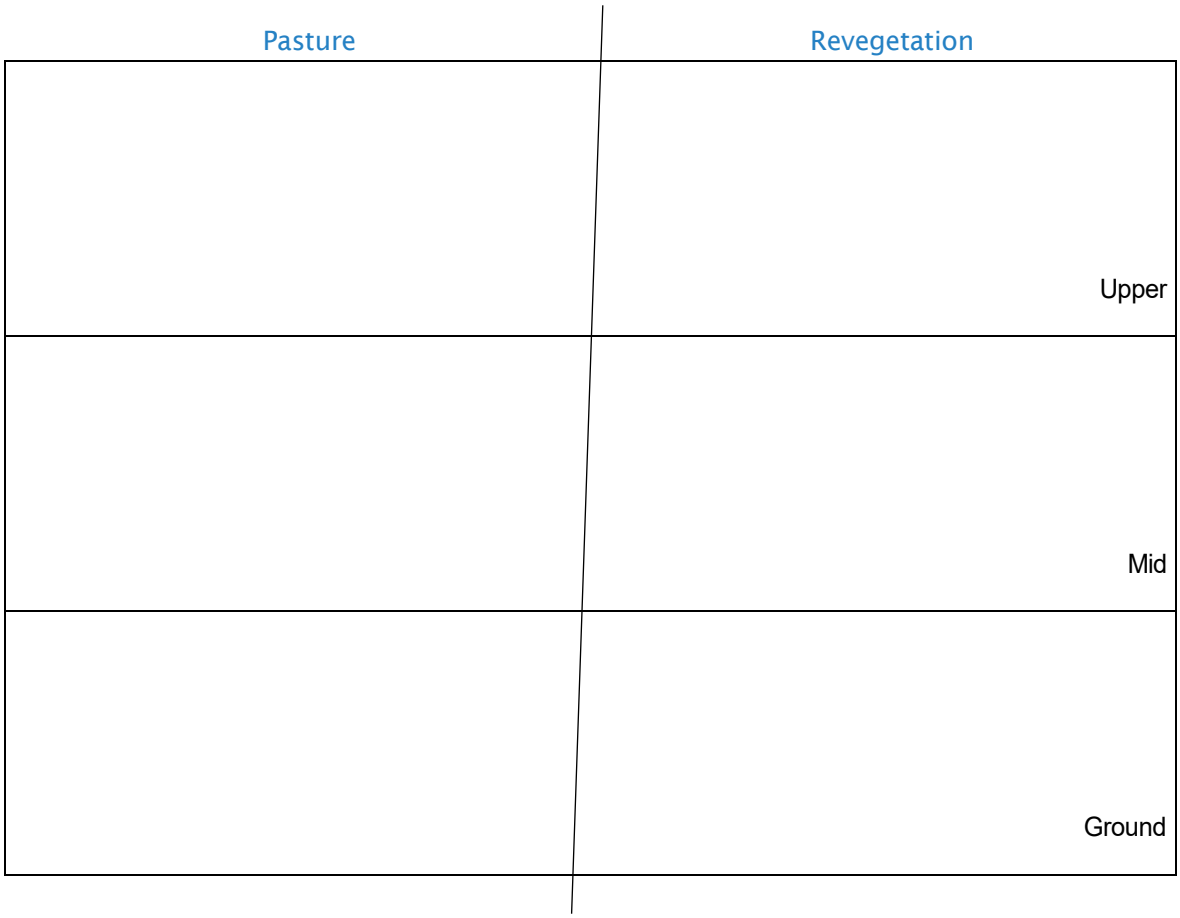
Site sketch

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



Livestock

What are the main livestock enterprises on Tocal?

_____ _____

_____ _____

_____ _____

What makes ruminant livestock different from other food producing animals?

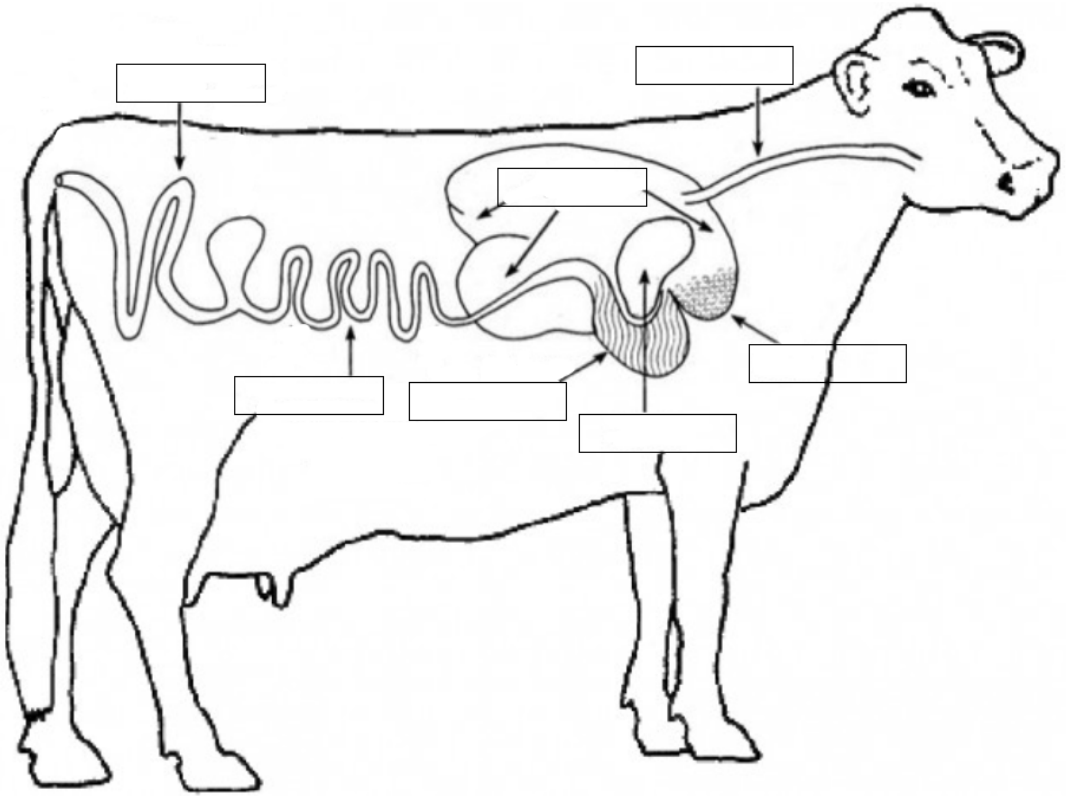
_____

_____

_____

Correctly label the components of the ruminant's digestive system using the following;

- Large intestine
- Omasum
- Oesophagus
- Rumen
- Abomasum
- Small intestine
- Reticulum



Can you think of some biosecurity risks to consider when running livestock on farm?

What are the advantages of running a number of livestock enterprises on Tocal.

Pest Animals

Name priority pest species in the Hunter:

_____

_____

_____

_____

Name some 'alert species' that we don't currently have in the Hunter but could become a threat if introduced:

_____

_____

_____

Australian private and public landowners and managers spend considerable time and money addressing the impacts of pest animals. For example, it has been estimated that negative impacts of pest animals in Australia valued at $797 million per year.

What negative impacts could pest animals have on agricultural production at Tocal?

.....

.....

List control methods that could be used to control the priority pest species you have listed above

_____

_____

_____

Describe how one of these is implemented

_____

_____

Technology

Describe three pieces of technology that make agriculture on Tocal more sustainable.

Device / innovation: _____

_____

_____

_____

Device / innovation: _____

_____

_____

_____

Device / innovation: _____

_____

_____

_____

Work health and safety

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

_____ _____

_____ _____

_____ _____

_____ _____

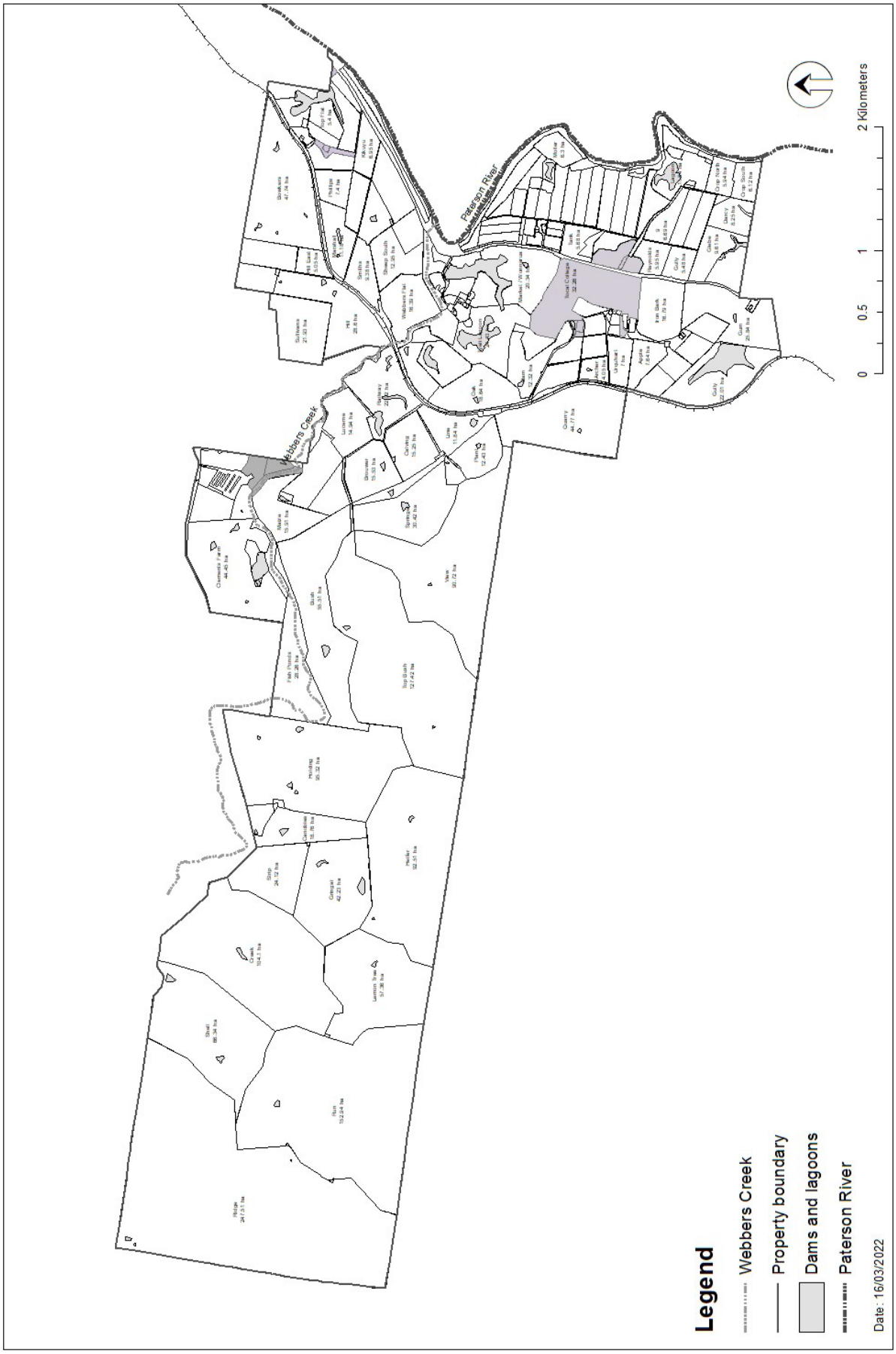
Reflection:

What surprised you today and why?

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

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

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.

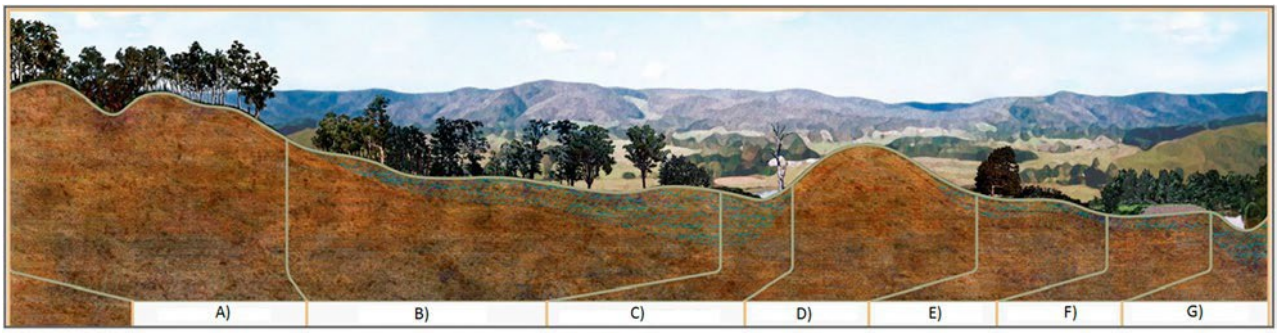
In 1963, the Presbyterian Church was awarded Alexander's Estate under a proposal designed by Edward Alan Hunt, law agent for the Church.

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.

Physical and biological resources on the farm

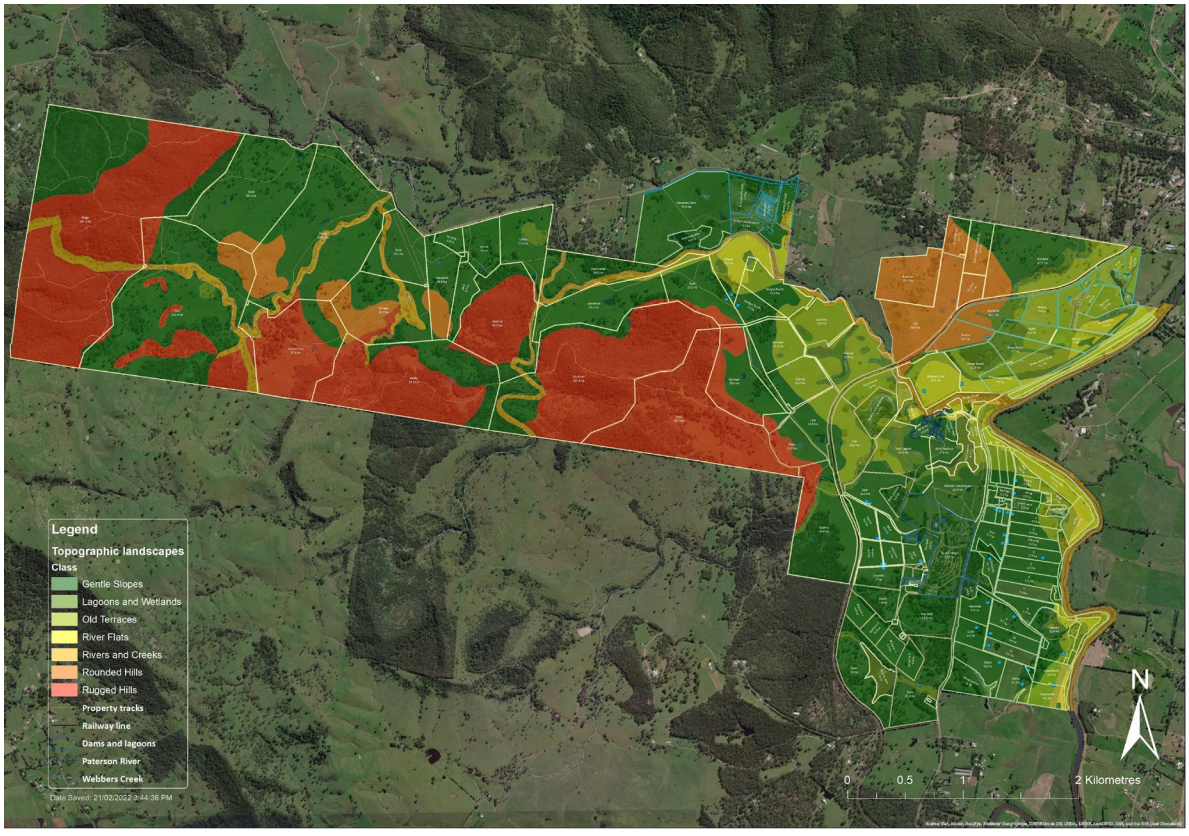


Topographic landscapes on Tocal

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

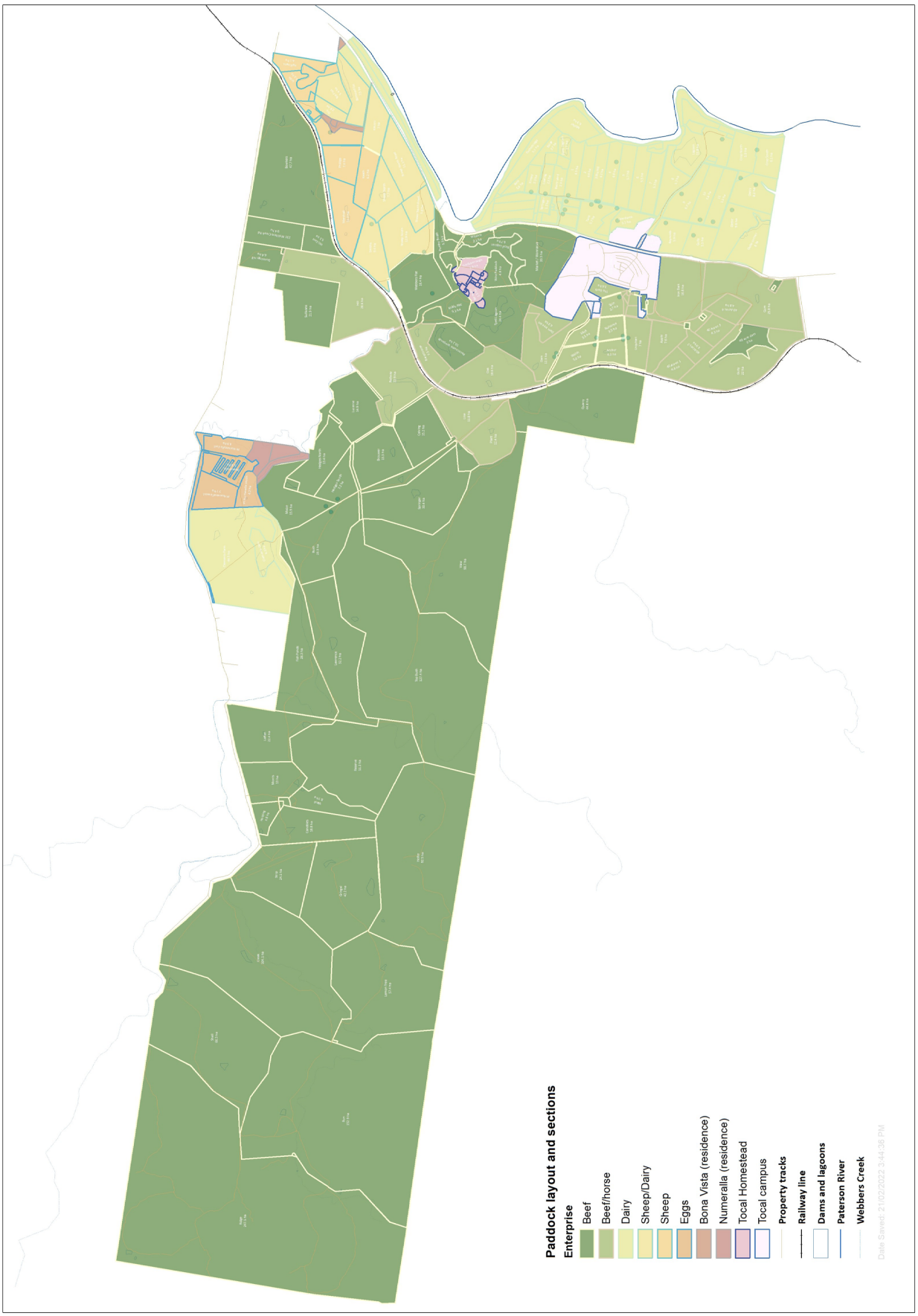
A. Rugged hills	Light grazing
B. Gentle slopes	Intensive grazing
C. Lagoons and wetlands	Progressive exlusion of grazing
D. Rounded hills	Grazing
E. Old terraces	Grazing
F. River flats	Cropping and/or intensive grazing
G. River and creeks	exclusion of stock and rehabilitation with native species

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)

Soils vary significantly across the property because soils are the result of a number of factors that interact over thousands of years. Understanding the different soils on your property assists farmers in making sustainable and profitable management decisions.

Site: _____

	Poor	Fair	Good
pH	pH 5 or lower	pH 5.5	pH 5.5 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: _____

_____

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	Units	Results	Results according to the ANZECC guidelines *(tick the box)*	
pH	pH units		<6	☐ POOR
			7 6 - 8	☐ IDEAL ☐ GOOD
			>8	☐ POOR
Salinity	*u*S/cm		< 400 *u*S/cm	☐ VERY GOOD
			400-800 *u*S/cm	☐ FAIR
			> 800 *u*S/cm	☐ POOR
Turbidity	NTU		≤ 10 NTU	☐ VERY GOOD
			15 – 30 NTU	☐ FAIR
			>30 NTU	☐ POOR
Available Phosphate	mg/L		<0.06	☐ VERY GOOD
			0.06 – 0.15	☐ FAIR
			>0.15	☐ POOR

Comments and Observations:

_____

_____

_____

Site sketch

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

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:

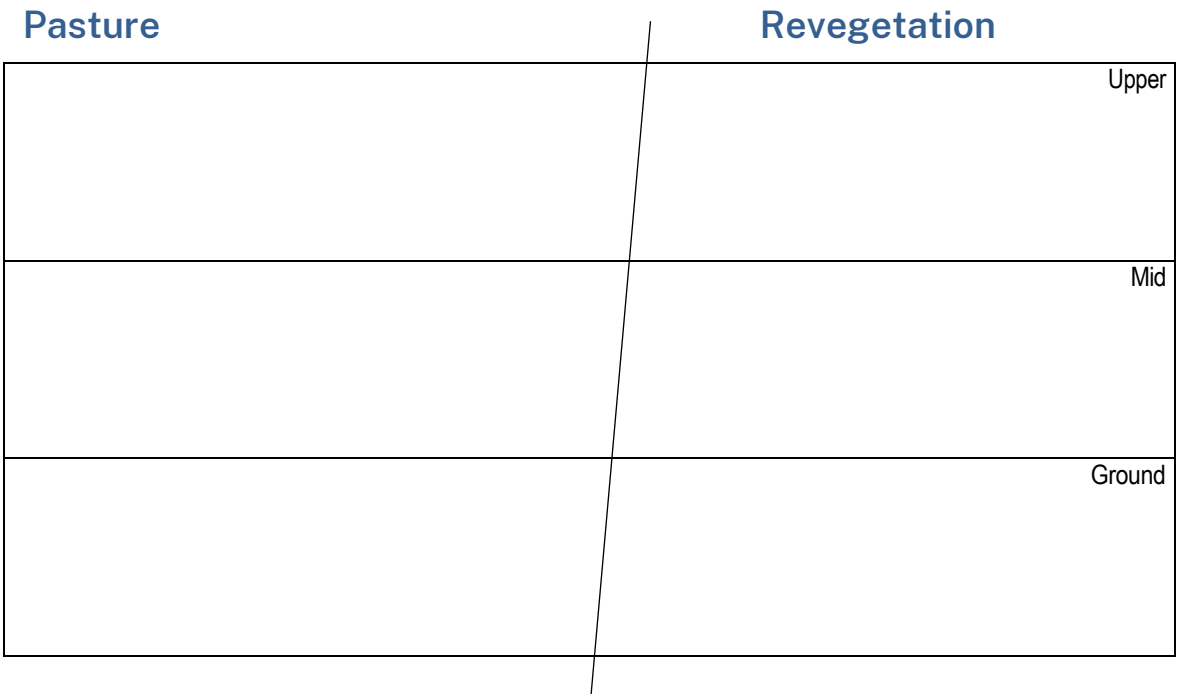
Soils Soils provide a medium, nutrients, gases and water essential for plant growth. The quality of the soil and its associated physical and chemical characteristics have a direct effect on the type and intensity of agriculture that can be carried out in a given area. Soil can be improved to some extent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

Vegetation	**Weather and Climate (cont)** 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.
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	

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.



Livestock

What are the main livestock enterprises on Tocal?

Beef _____ Dairy _____

Eggs(chickens) _____ Horses _____

Sheep _____ Bees _____

What makes ruminant livestock different from other food producing animals?

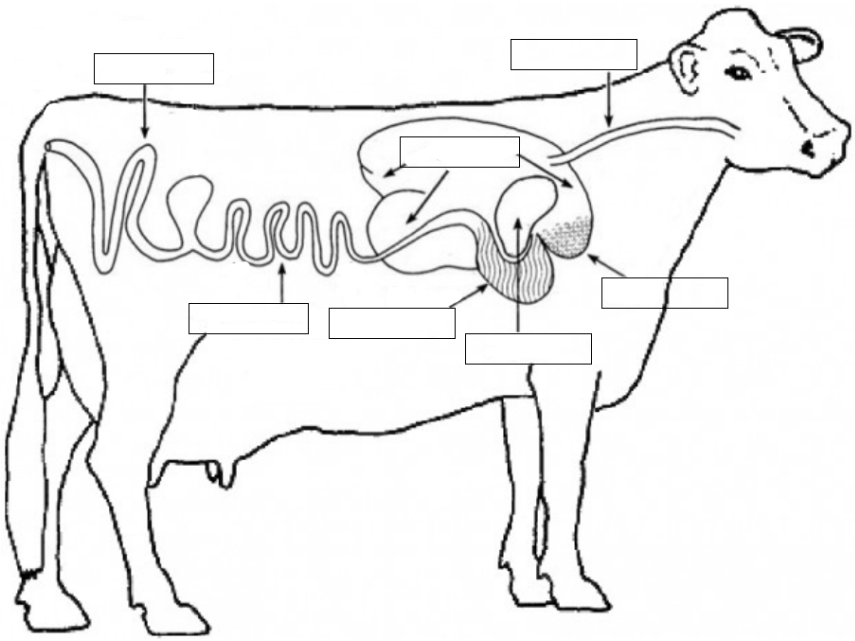
_____

_____

_____

Correctly label the components of the ruminant's digestive system using the following;

- Large intestine
- Omasum
- Oesophagus
- Rumen
- Abomasum
- Small intestine
- Reticulum



Can you think of some biosecurity risks to consider when running livestock on farm?

_____

_____

_____

What are the advantages of running a number of livestock enterprises on Tocal.

_____

_____

_____

What are the advantages of running a number of livestock enterprises on Tocal.

Running several livestock enterprises allows Tocal to balance the risks associated with all farming activities. Weather, market access, pests and diseases amongst other variables can impact a farms ability to return a profits. Offsetting risks with a number of enterprises can provide a buffer against the impact of some of those risks. Although not significant on most farms, on Tocal the range of enterprises provides for a range of training contexts.

Pest Animals

Name priority pest species in the Hunter:

_____

_____

_____

_____

Name some 'alert species' that we don't currently have in the Hunter but could become a threat if introduced:

_____

_____

_____

Australian private and public landowners and managers spend considerable time and money addressing the impacts of pest animals. For example, it has been estimated that negative impacts of pest animals in Australia valued at $797 million per year.

What negative impacts could pest animals have on agricultural production at Tocal?

.....

.....

.....

List control methods that could be used to control the priority pest species you have listed above

_____

_____

_____

Describe how one of these is implemented

_____

Technology

Describe three pieces of technology that make agriculture on Tocal more sustainable.

Device / innovation: **Cow collars** on the dairy allow farm staff to monitor the health and reproductive status of cows remotely and more efficiently.

Device / innovation: **Air temperature and humidity sensors in the chicken sheds** provide farm staff with information to help them make decisions about ventilation and to ensure the comfort of the chickens.

Device / innovation: **Autoesteer equipment and variable rate spreaders on tractors** enables accurate and efficient planting and fertilising of fodder crops.

Other equipment may also be mentioned.