

# Schools Property Planning Competition Manual 2020

Brookfield



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Schools Property Planning Competition Manual 2020

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**More information**

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[www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)

**Acknowledgments**

Meat and Livestock Australia (MLA)

Regional Development Australia, Northern Inland NSW

University of New England

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing April 2020.

However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of Local Land Services or the user's independent adviser.



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NORTHERN INLAND NSW



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## Introduction for Teachers

### Timetable for 2020

Date	Event
<b>Friday 24<sup>th</sup> April 2020</b>	Closing date for school registrations to attend the field day. Resources will be available online by the 24 <sup>th</sup> April <a href="#"><i>Web address will be sent out closer to the date</i></a>
<b>Friday 3<sup>rd</sup> July 2020</b>	The two best entries per school due for marking. Post to: Property Planning Competition Entries, Northern Tablelands LLS, 142 High Street, Tenterfield NSW 2372 or Email to: <a href="mailto:johnelle.stevens@lls.nsw.gov.au">johnelle.stevens@lls.nsw.gov.au</a>
<b>18-20<sup>th</sup> August 2020</b> <b>exact details to be advised</b>	Awards Ceremony: AgQuip Gunnedah 134 Black Jack Rd, Gunnedah NSW 2380

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The Schools Property Planning Competition is designed to give students an opportunity to study a local rural property in detail. The students are required to prepare a plan that provides for long term profitability as well as sustaining the natural resources of the area. The exercise draws together a number of land management themes and gives students the chance to apply their skills and knowledge to a real-life situation.

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### Syllabus Links

The Schools Property Planning Competition has been designed to address numerous outcomes of TAFE Agriculture courses, the School Certificate and HCS Agriculture syllabus, particularly the Farm Case Study unit. Links can also be made to the HSC Geography syllabus and the VET Primary Industries curriculum. Because the activity has been structured to accommodate students studying a range of subjects and abilities, teachers will need to determine the depth of study undertaken. A marking schedule is provided in Appendix 4, which will be used to judge entries submitted.

## Getting Started

Each student and/or group (maximum of four per group) should be given a copy of all the relevant resources. In addition, students should access other resources from libraries, government departments and the internet.

To participate in the Schools Property Planning Competition you need to :

- Download and print the manual, maps, field day workbook, and student entry package and other information that will be provided to you by Northern Tablelands LLS
- Students can submit an individual entry or a group entry with a maximum of four students per group
- Include the student entry package (template shown in Appendix 5 and provided) for each entry with the name of your school, class name and all the contributing students names clearly marked
- Only send the **best two** entries per school to Northern Tablelands Local Land Services. (address is included in the timetable page 3)f.

# Brookfield Farm Case Study

Agriculture students from Northern Tablelands have been invited to use Brookfield for their farm case study.

## What is a Property Plan?

A property plan assists the landholder to develop a productive and profitable farming business through improving the natural resource base on their property (Figure 1). Property planning enables landholders to identify what is holding them back, maintain farm financial viability, enhance their capacity to utilise 'free' natural resources, manage risks proactively, build resilience to withstand climate variability and to develop a framework for fulfilling their farm's potential. It is:

- A written management plan for a farm business which takes a holistic whole farm approach: property layout, land use, land capability, financial planning, risk management and people management
- A tool for farmers to clarify their vision and goals, develop management plans to achieve these goals and take action
- A process that identifies opportunities for business improvement and assists farmers to move towards more sustainable practices through knowledge gained.

## The Property Planning Process

- Develop your vision, values and set goals
- Assess your current situation
- Plan actions to take you from where you are to where you want to be
- Monitor
- Review and replan.

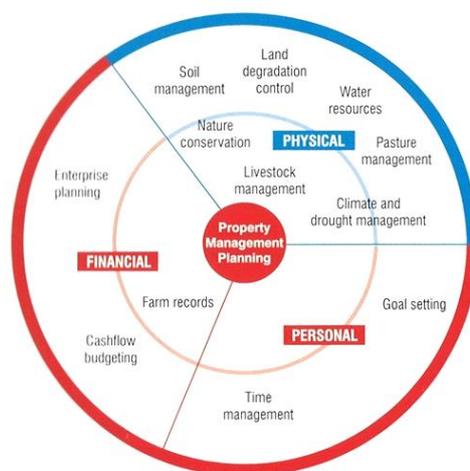


Figure 1: Property Management Planning (Brouwer 2012)

## Your Property Planning Competition Task

Students should use the information provided in this manual and the information collected from further research to develop a property plan. Each student or group of students has been hypothetically contracted by the owners of Brookfield to **make an assessment** of their current farm production system and to **recommend improvements** which will enhance future farm **profitability and sustainability**.

**Your Property Plan report for Brookfield will take into account:**

- The aims of the landholders
- Natural characteristics of the land, water and vegetation
- Minimise land and water degradation by identifying existing and potential problem areas and adapting management accordingly
- Social, legal and economic aspects
- Maximising profitability through appropriate enterprise selection, production systems and marketing options
- Appropriate risk management strategies
- Appropriate monitoring options for recommendations made.

**Property Plan Components**

- Mapped physical property plan with recommendations clearly marked
- A written report explaining these recommendations and addressing the marking criteria.

**WORD LIMIT FOR WRITTEN REPORT IS 3500 WORDS.**

**Essential components of your Property Plan:**

As per the Marking Criteria (Appendix 5):

- Consider land capability in land use and management strategy recommendations
- Address land use issues identified in this manual
- Appropriate enterprise selection and suitability in line with landholder aims, labour requirements, profit, farm design, natural resource base, environmental impact and marketing options
- All recommendations show consideration of land managers' aims and conditions
- Map presentation reflecting the plan
- Report presentation, including structure: introduction, body, conclusion, or follow the student entry package
- Use of resource information provided: manual, maps, field day work book
- Legal considerations accounted for
- Funding considered. Funding options relevant to your recommendations, for example:
  - farm cash flow
  - banks
  - NSW Rural Assistance Authority
  - Northern Tablelands Local Land Services
  - Landcare
- Use of other resources
- Monitoring
- Biosecurity and emergency planning.

**What the judges look for:**

- Presentation
- Precise, clear and brief report
- Quality ideas

- Consistency with landholders' vision
- Consideration of marking criteria and template

***Marks will be deducted for exceeding the word limit of 3500 words.***

## **Report Requirements**

To enter the 2020 Schools Property Planning Competition, each student/group of students will need to submit the following:

1. A physical property plan (map with recommendations clearly marked) (see Map 4, Appendix 1)
2. A written report as per the Student Entry Package (word limit 3,500 words) explaining the recommendations and addressing the marking criteria (Appendix 5).

## Property Information

### About Brookfield

#### **Location**

Brookfield is located at 2570 Guyra-Ebor Road, Guyra NSW 2365. The property is approximately 25 kilometres (km) East of Guyra towards Ebor.

#### **Background and History**

Darryl and Leanne Savage are fifth generation owners of Brookfield, and their four children are sixth generation. Brookfield was a settlement block and there is a long and proud history of taking care of this beloved property and they are all really excited for that to continue long into the future. Leanne's great grandfather was responsible for the clearing of the native vegetation and, as you can see on the map, the ridges were not cleared like other properties in the area. The property was also fenced as close as possible to land type and some paddocks have had improved pastures established in the last 30 years.

#### **Current Farming Operation**

The Savage family are absentee landholders. They live most of the year on their property Teaghlaigh outside Ipswich in South East Queensland, where their children are completing school. Darryl and Leanne took ownership of Brookfield ten years ago however have had it leased to another local cattle producer until the 1<sup>st</sup> of January 2020.

Brookfield was recently in drought receiving below average rainfall, for the last two years, and is stocked with a handful of cows and calves and weaner steers that the Savages have brought down from their Qld farm, which has also been in drought, while both farms have had good rain, they both still have a deficit in soil moisture.

The plan, at this time, is for Brookfield to only run 50 head of cows and calves this year as a drought buffer until they start receiving normal or near normal rainfall events and they have a plan in place to manage Brookfield from interstate. The carrying capacity of Brookfield in a normal to good season is 180-200 head of cows. The Savages are looking to stock conservatively and run only 100 head of cows and calves each year.

The Savages are planning to operate differently from most local producers as they are not going to target the local weaner sales. They are planning to have a self-replacing herd, and fatten cull cattle to 380-400kg on Brookfield to then be transported interstate to Teaghlaigh to finish on irrigated pasture. They will then be sold straight into the local Dinmore meatworks. This will enable them to change their joining period to December/January and have calving in September with a good spring.



*Photo: L. Savage*

While Brookfield has run first cross ewes and merino wethers in the past, the current owners are not including sheep into their enterprise at this time, due to the shearing shed being decommissioned and being absentee landholders.

### Landholders' Aims and Values



*Photo: L. Savage*

The Savages have a very proud history with Brookfield and are working hard to keep it in the family. There is a strong appreciation of their history and the natural resources and environment are of high value. As such, family involvement and succession is important.

“We believe that having the family involved in Brookfield will help to instil the family values and teach business skills, cultivating ideas and providing opportunities for our children and for future generations” said Leanne Savage.

“For example, our four children will all be finished school in the next seven years and we are hoping Brookfield will provide an opportunity for them to manage a rural enterprise and develop their own enterprise/business” said Leanne.

Through the Property Planning Competition, Darryl and Leanne are interested to hear the ideas from the students taking part, as Brookfield is a blank canvas at the moment and there are many opportunities to be explored.

### Landholders' Priorities

- Brookfield needs to make money and stand on its own without input from the Savage's other business. However there is the opportunity to be integrated with their Queensland property.
- Water infrastructure and security is a priority. The dam went dry in the recent drought and the creek went dry around four years ago.
- Technology to monitor the property while the landholders are absent, for example security cameras at the gate that have live feedback, water telemetrics on any new or existing water infrastructure.
- Any improvements, if intensive, need to be able to generate enough income to employ people to oversee or manage. Budgets also need to include contractor rates i.e. a fencing contractor will be required to complete any new fencing, as the savages won't be able to complete this themselves.
- Biosecurity – keeping as weed free as possible. Brookfield has always had a self-replacing herd however, with the recent conditions, the Savages will need to buy in cows to build

their herd again, and this will increase the weed risk. With Chilean Needle Grass not far from the boundary, this is a high priority for the landholders.

## Maps

Students are provided with several maps to assist them to undertake their property mapping (Appendix 1). The maps include:

- Map 1 “Brookfield Farm Infrastructure” which includes all infrastructure and biophysical information (this should be viewed at large A1 size so that the details of the map can be seen clearly. Maps will be posted to each school)
- Map 2 “Brookfield Landscape/Environmental Values” which displays the terrain, water courses, native vegetation plantings and provides a landscape context to the property
- Map 3 “Brookfield Land Capability” which displays land capability classes for the property
- Map 4 “Brookfield Student Map” is a blank map for students to draw their property planning developments onto

These maps should assist students to consider infrastructure requirements, water quality issues, livestock, pasture and grazing management and to assist them to develop a biodiversity plan for the property. Blank maps will also be provided to students in order to assist them to fill in their property plan.



*Photo: J. Stevens*

# Stocktake of Resources

## Climate

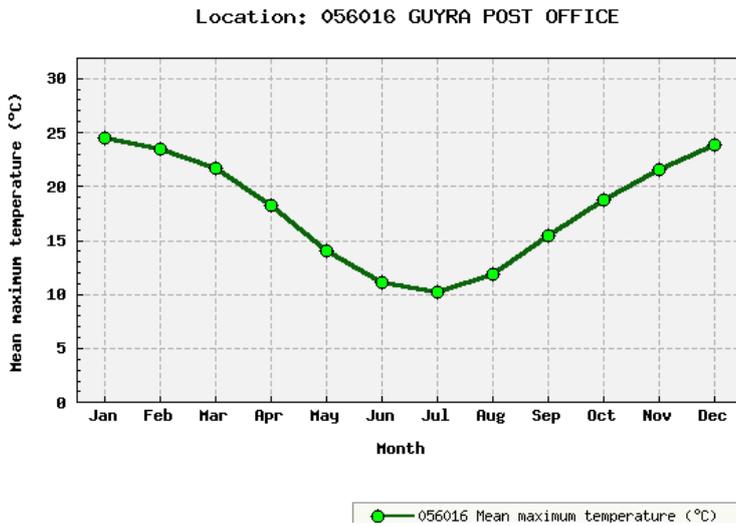


Figure 2: Mean maximum temperature for Brookfield 1970-2019  
(Source: Bureau of Meteorology 2019)

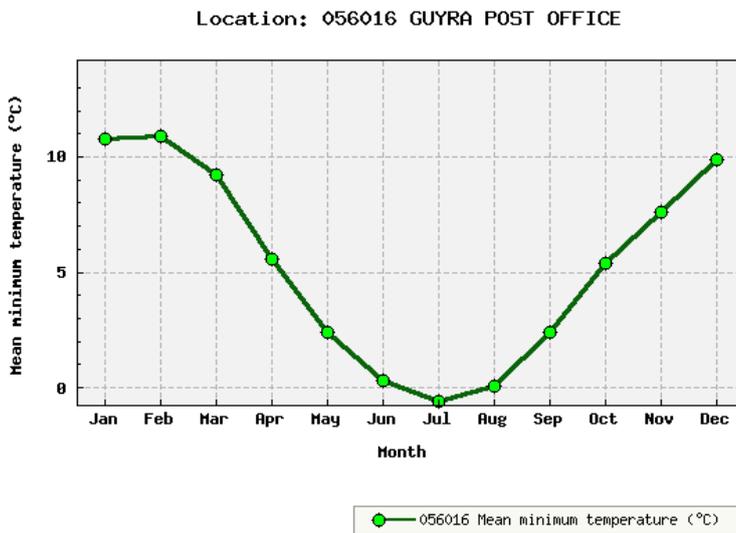


Figure 3: Mean minimum temperature for Brookfield 1970-2019  
(Source: Bureau of Meteorology 2019)

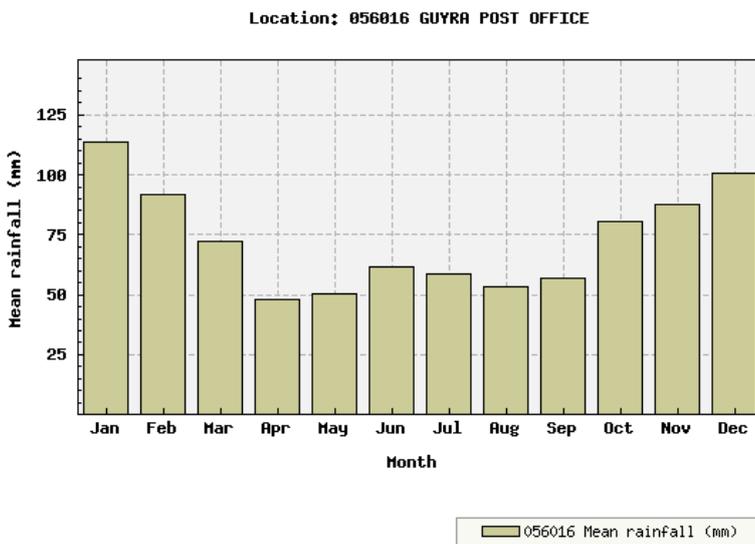


Figure 4: Mean rainfall (mm) for Brookfield 1970-2019  
(Source: Bureau of Meteorology 2019)

More climatic information is available at: [www.bom.gov.au/climate/data/](http://www.bom.gov.au/climate/data/)

### **Key points**

- *Rainfall amount and seasonality determines the growth of pasture and limits the ability to grow crops in an area. It also influences erosion hazard, flooding hazard and groundwater levels.*
- *The amount of rainfall influences stream flow to lower areas and groundwater levels through deep drainage.*
- *Temperature will affect plant growth and stock nutritional needs; management of the property needs to consider how the effects of temperature can be managed.*
- *Wind speed and direction influence water use by crops and pastures, and are important considerations when determining sites for wind breaks or stock shelter areas.*



Photo: B. Rosenberg

### **Contours and Drainage**

Brookfield is located at the top of the Great Dividing Range, towards the top of the Clarence Catchments. A number of smaller watercourses run through the property (see maps for drainage). The map also shows contours, which represent lines of uniform elevation, with a constant interval in height (10m) between them. This means that, where contours are spaced more closely together, the land surface is steeper, so may require conservative management to offset the potential erosion hazard. The contour lines range from 1,220 to 1,290m above sea level (ASL) with some parts of the property being reasonably flat and others having gentle undulations. Salinity is not considered to be an issue on this property as this region is not prone to salinity.

### **Key points**

- *Drainage lines, watercourses and riparian vegetation must be retained and carefully managed. They are especially at risk of erosion if cultivated or overgrazed. Often these areas contain native vegetation and are important for biodiversity.*
- *Streams require flows periodically to maintain riparian vegetation. It is important not to cut off the small flows to streams, riparian areas and aquatic ecosystems in dry periods. Maintaining flow in watercourses and streams is important for environmental reasons, for downstream stock and domestic water supply, and for downstream agriculture and industry.*

## Infrastructure

- Shearing shed (is unusable and has been decommissioned)
- A ten year old set of steel cattle yards, small but functional
- House and house/horse paddocks, currently rented for extra security on the property
- Most internal fencing is old and needs replacing
- A small reticulated watering system, four years old, drawn from unsecure dam
  - one tank
  - five troughs



Photo: L.McDonald

## Key points

- *In the past, Brookfield's infrastructure was designed to suit the enterprise of livestock. Now a lot of the infrastructure is old and needs renewal, this is a good opportunity for the Savages to plan where the best place for new infrastructure is. Some infrastructure (such as dams) are relatively permanent features, whereas electric fences, troughs and gates can be repositioned or constructed elsewhere if this best meets the management needs of the property.*
- *Fencing should be designed to match the enterprise that is operating on the farm. Every time you cross a soil or landscape boundary you are entering a new enterprise/land capacity, with different production potential. One soil and landscape type in each paddock is best for developing meaningful records such as soil test results when trying to identify causes of production loss.*

## Vegetation

Native trees, midstoreys and understoreys are an integral and important part of the landscape and have a major role in catchment

management. In the past, native vegetation across the property would have ranged from Eucalypt open forest or woodland through to native grassland. The current distribution of vegetation on and around the property can be observed on Map 2 (Appendix 1). 'Vegetation Species List' (Appendix 2) contains a species list for trees, shrubs, groundcovers and other plants potentially found on and around Brookfield.

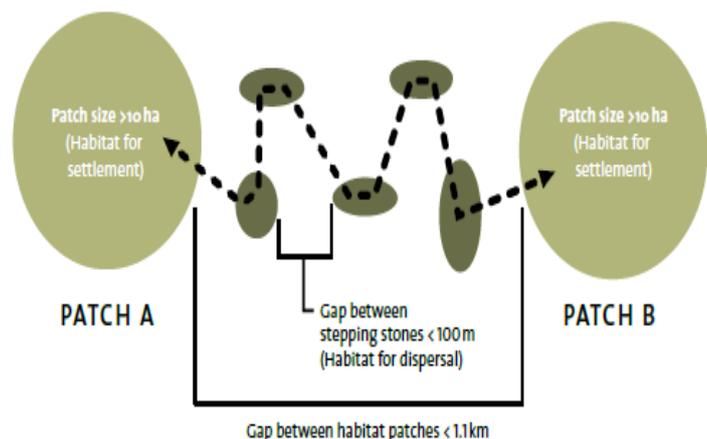


Figure 5: Connectivity between patches of remnant vegetation required for movement of native fauna (from Barrett and Love 2012)

## ***Benefits of Native Vegetation***

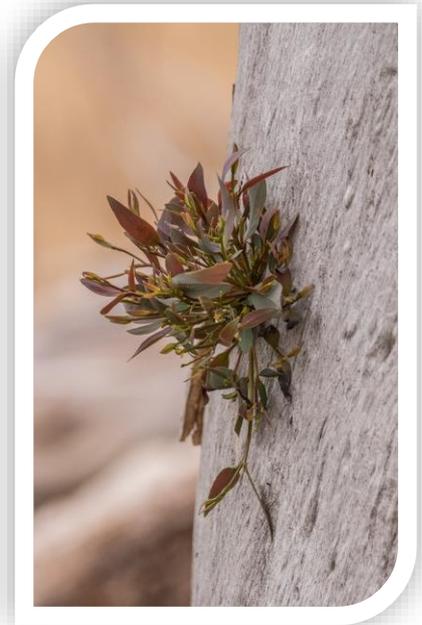
For producers, the benefits of native vegetation include better stock shelter, protection from erosion, improved water quality, increased habitat for wildlife with a corresponding decrease in pest insects, increased property value due to aesthetics, timber sources and many more benefits. An increase in the amount of strategically placed and managed native vegetation can result in an increase in biodiversity (the variety of plants and animals in an area) and a healthier, functioning ecosystem. A healthy ecosystem will then provide ecosystem services to landholders, such as cleaner water for stock, more resilient pastures and biological pest control which will result in higher returns (Miller et al 2013).

## ***Remnant Vegetation***

This area was once covered in native vegetation. Clearing was extensive in the 1900s resulting in the landscape you see today. There is some vegetation which was not cleared and still remains. This is what we call remnant vegetation. Remnant vegetation often occurs along rivers and gullies, in clumps on poorer soil and on ridge tops. Not all remnant vegetation is the same quality – some will be very degraded, other patches may have a lot of diversity and features which make it high quality.

Remnants or fragments of native vegetation are more susceptible to influences from the cleared or developed land that surrounds them. Influences can include uncontrolled grazing, weed invasion, drift from herbicide or fertiliser, increased light, wind and temperature variation leading to increased drying out, and increased predation of native fauna by feral animals. These influences occur mostly at the edges of remnants and are called 'edge effects'. Remnants of native vegetation with relatively long edges (like windbreaks or roadsides) have a greater edge to area ratio than square or rounded blocks of native vegetation, making them quicker to degrade. Isolation of remnants of native vegetation leaves the species within them less able to migrate and more prone to catastrophic events such as fire, flood or drought. This eventually causes local and regional extinctions.

It is important to consider vegetation in a landscape context. That is, to look beyond the boundaries of the property to see where corridors exist or can be recreated, and where areas of key habitat can be found. In extensively cleared areas of the catchment, native plants and animals dependent on native vegetation are restricted to pockets of remnant vegetation of varying sizes. Many fauna populations within individual remnants are so small that they are at risk of extinction from a number of different pressures. Often waterways provide corridors where riparian vegetation has not been cleared. Travelling Stock Reserves and roadsides can also provide important corridors through the landscape, connecting 'islands' of remnant vegetation amongst a 'sea' of cleared agricultural land. Patches of remnant vegetation need to



*Photo: B. Rosenberg*



- a 20-30% higher yield was obtained in protected than in unprotected areas of a farm, with annual benefits of \$39 to \$66 per hectare (Fitzpatrick 1994 – mainland Australia)
- a 20% increase in average pasture growth was estimated for protected areas of a farm (Radcliffe 1983 – Australia and overseas)
- gross value of pasture output is at its highest level when the proportion of tree area is at 34%. Note that this figure relates to natural remnants of bushland rather than shelterbelts or windbreaks (Walpole 1998 – Gunnedah NSW).



Photo: Gregory West

### **Conserving Biodiversity on Farms**

Northern NSW has the highest diversity of marsupial, frog and snake species in Australia. However the number of animal species present on the Northern Tablelands and North West Slopes and Plains has fallen alarmingly since the 1840s, with one species becoming locally extinct every ten years. Unfortunately the extinctions of animals and plants will most likely continue with 160 species listed as threatened.

Agricultural practices and pest animals are blamed for most of these extinctions. Agriculture is an integral part of the region's social fabric and economy, so we have to find ways to integrate conservation and agriculture. For example, many of our woodland birds are disappearing as the shrub layers in their habitat are lost to clearing, grazing and fires.

Everyone living on the Tablelands has a role to play in protecting habitat - on private and public land - to help stop animal extinctions, whilst pursuing sustainable agriculture. The conservation of wildlife requires efforts to protect and enhance the complex habitat features in remaining forests, woodlands and grasslands. Many animals use more than one component of habitat e.g. Yellow-tufted honeyeaters feed on nectar in the canopy of trees but build their nests closer to the ground, in the shrubby understorey. Glossy black cockatoos require large tree hollows for nesting and a reliable source of mature fruiting native oak (*Casuarina* and *Allocasuarina*) trees for feeding. Brookfield is located near key habitat and corridors for fauna



Photo: B. Rosenberg

species such as the Koala, Spotted-tailed quoll, woodland birds and Alpine copperhead. A fauna list for Brookfield can be found in Appendix 3.

### **Endangered Ecological Communities**

An ecological community is a naturally occurring group of native plants, animals and other organisms living in a unique habitat. A healthy ecological community is vital for their survival. Ecological communities provide natural management of clean air and water, provide nutrients for the soil, protect against erosion and salinity, and provide a healthy environment for threatened species.

An ecological community can be at risk of extinction. This can occur because of a significant reduction in its distribution across regions or a decline in ecological function. The decline can occur if there is a change in community structure or composition, disruption of ecological processes, invasion by exotic species, or habitat degradation or fragmentation (Office of Environment and Heritage 2018).

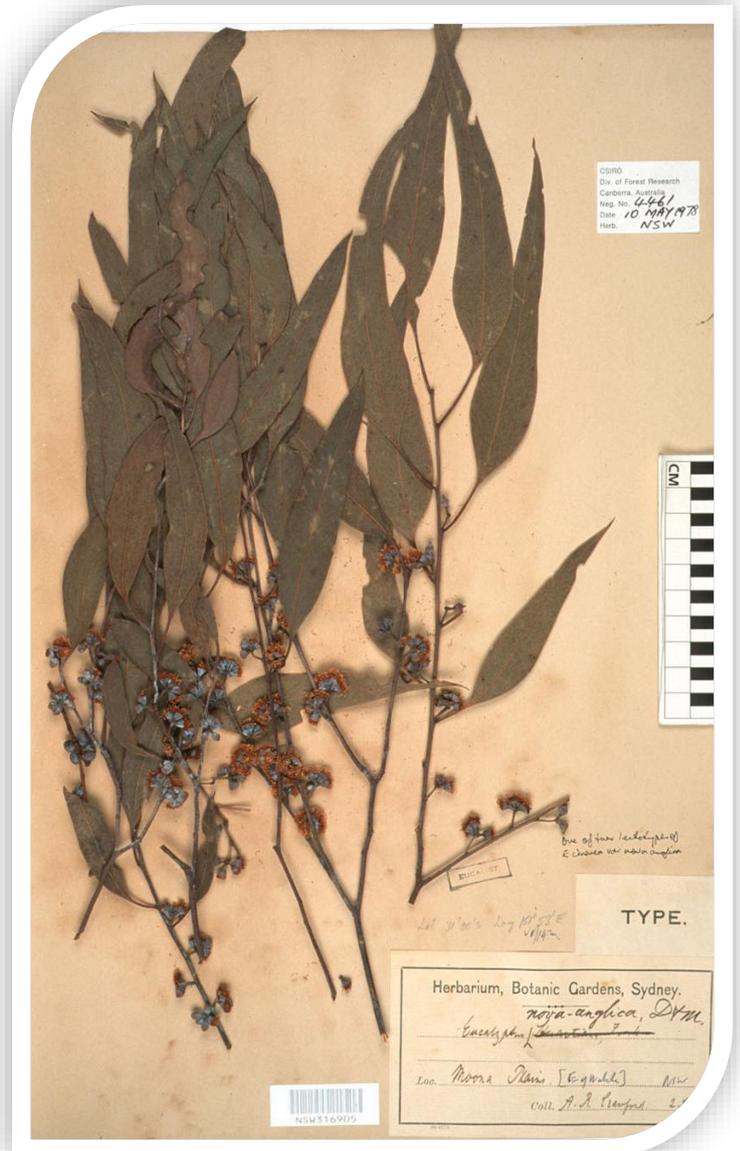
Of the Endangered Ecological Communities found on the Northern Tablelands, the one of note in the vicinity of 'Brookfield' is New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Bioregion. Brookfield does have New England Peppermint trees on the ridges, however as earlier stated, having the tree does not necessarily mean that the whole community is present.

### **Management Actions**

Farmers can undertake simple actions to manage and increase biodiversity on their land, including:

#### **Manage Existing Bushland and Ecosystems**

- Fence to manage grazing
- Control weeds
- Control feral animals



*Eucalyptus nova-anglica* Photo: PlantNET – Flora online

- Manage fire
- Make bushland patches bigger
- Increase the number of plant species

### **Manage Existing Paddock Trees**

- Keep and protect paddock trees

### **Manage Grassland / Native Pasture**

- Manage grazing
- Maintain high groundcover
- Increase species diversity

### **Revegetate**

- Create new bushland patches
- Plant scattered trees
- Create wildlife corridors
- Plant shelterbelts or alley-farming
- Protect, restore, enhance and increase riparian buffers
- Consider farm forestry
- House and shed plantings (provide habitat for fauna)
- Create seed production areas (for use in revegetation work)
- Create bug banks (dense planting of flowering shrubs among crops)
- Roadside plantings (fill in gaps of vegetation near important roadside corridors)
- Plant mid-paddock clumps for protection of stock and use by wildlife.

### **Key points**

*At the landscape level, each individual property needs to protect the ecosystem services it can provide in order to maintain a functioning ecosystem. Issues such as providing habitat, protecting beneficial fauna and maintaining healthy waterways must be considered in the broader landscape context.*



*Planting native vegetation*

## Land Capability

Farm planning is about designing a sustainable farming system that takes into account land capability so the farm can be managed to reduce present, and prevent future, land degradation. Your farm plan will identify landscape characteristics and help you plan to match land use to land capability. Land capability is an essential part of mapping your farm's resources. A land capability map is a set of guidelines for how your property should be managed sustainably which tells you which parts should be cropped, which parts should be grazed and areas that are best left in their natural state. By identifying how to manage the land sustainably within its land capability you are ensuring your management decisions will not cause your land resource to deteriorate. Land capability is not determined by the current land use but rather it is based on its potential for sustainable land use if developed.

The term land capability refers to “the ability of land to sustain a type of land use without causing it permanent damage”. In New South Wales there are eight classes within the land capability assessment system, and these are classified according to soil type, slope and erosion risk. These factors influence how you manage your land and the production techniques you use. Farming beyond the limitations of the land, by over-grazing or cultivating on inappropriate areas, can leave soil vulnerable to erosion. It is important to identify the different land classes on your property and manage them within their limitations. This will reduce the risk of erosion occurring on your farm.

Table 1 and Figure 7 present the eight class system that was used to classify land on Brookfield, and indicate how each may be best managed to maintain its productivity and sustainability. Brookfield is mapped with land classes III, IV and VI (Map 3, Appendix 1).

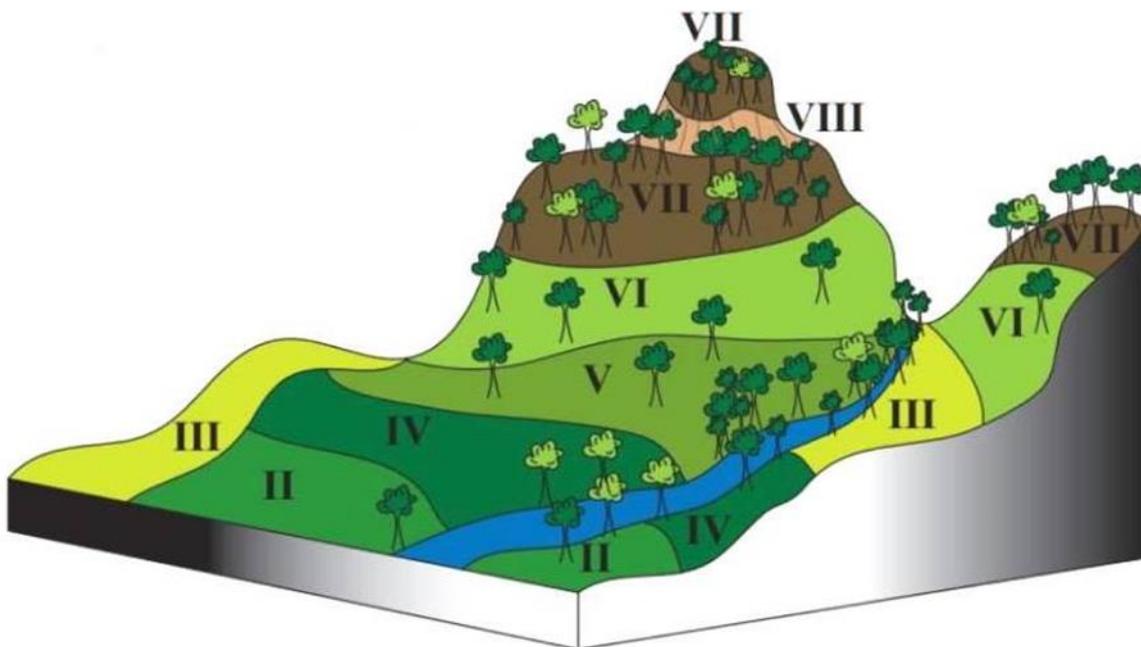


Figure 7: Land capability classes

**Table 1: Land Capability classes**

<b>Land Class</b>	<b>Soil conservation practices</b>	<b>Brief description</b>
I	No special soil conservation works or practices required	Usually flat land that is suitable for a wide variety of uses. When it is fertile it can be used for almost anything including fruit and vegetables, sugar cane, cereal crops and other grain crops.
II	Soil conservation practices such as strip cropping, minimum tillage and crop rotation	Gently sloping land suitable for many agricultural uses. Good cropping land on fertile soils. Low erosion potential.
III	Structural soil conservation works required, conservation tillage techniques and crop rotation	Sloping country that is likely to wash and erode when cultivated. The land is quite fertile and adequate for cropping as long as soil conservation practices such as contour banks are used.
IV	Soil conservation practices such as pasture improvement, stock management, fertiliser application and minimal cultivation for pasture establishment and maintenance	Good grazing country but not suitable for the practices listed in I to III. Main limitations are slope, rockiness, soil fertility, and susceptibility to soil structure decline. Maintenance of good ground cover is essential.
V	As above, as well as absorption banks, diversion banks and contour ripping	Not suitable for cultivation on a regular basis owing to slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of all of these factors. Soil erosion problems are often severe.
VI	Limitation of stock, aerial spreading of seed and fertiliser. May include some isolated structural earthworks.	Comprises the less productive grazing lands that should not be cultivated because of soils, slope, wind or water erosion hazard. Requires sound grazing management and pasture improvement.
VII	Land best protected by green timber or undisturbed ground cover.	Too fragile for grazing.
VIII	Unsuitable for agricultural production	Cliffs, lakes or swamps etc. Not capable of sustaining agriculture.

## Land Management and Erosion Risk

From the description of land classes on the previous page, there is a clear link between those classifications and the risk of erosion. All land classes of Class III and above are at some risk of erosion if land management practices are not tailored to work within their limitations.

To decide what class, or classes, your farm fits into you need to have a good idea about the soil types on your farm. Soil boundaries may follow land class boundaries. However, different soil types can also occur within the one land class and are more prone to erosion and require different management. For this reason it is advisable to do some basic soil tests.

Land management practices targeted at reducing erosion risk are generally also good for overall soil health. Maintaining or establishing well vegetated paddocks will lead to better soil structure, and plant water availability. These improvements will ultimately lead to better productivity, resulting in a win-win situation - reduced erosion and increased productivity.

### Key Points

*Using information on contours and soil, and Map 3 'Land Capability', consider what land use enterprise options and management are best suited to this property. There are several different enterprises that could be run on Brookfield. Students should consider the best land use and discuss whether they would recommend the current land uses or others. It is more economical to manage productive land better, than it is to try and convert less productive land to a higher production standard. Less productive land can still be utilised to perform important functions within the property. Fencing to soil type or land capacity may make expenditure eligible for tax deduction in the year of construction.*

## Soils

Soil is the main resource upon which plant and animal production depends, so it is essential to understand the features that determine the ability of a soil to support such production, and to be resilient towards degradation. The soil types at Brookfield are predominantly traprock which are generally shallow with fertility being variable but more commonly fair to low. There are some black basalt areas indicated on the land capability map.



Soil Pit 2019 Schools Property Planning Competition

### Soil types on Brookfield

#### Definitions and Information for Soil

**Soil texture** describes the relative proportions of sand (large particles), silt (small particles) and clay (tiny particles) in a soil. Texture indicates the ease with which a soil can be worked

and its capacity to hold water and nutrients. Texture also affects the ability of a soil to handle machinery traffic, and its susceptibility to erosion.

**Soil pH** is a measure of the acidity or alkalinity of a soil. It is an important factor in determining the availability of nutrients and trace elements to plants. At low pH for example, nutrients such as Phosphorus become deficient, while others such as Aluminium become available in toxic amounts.

**Soil colour** gives a good guide to the level of organic matter, degree of leaching and level of drainage. Red and brown soils indicate good drainage and are usually found higher on ridges and upper slopes. Yellow, grey and mottled soils are indicators of less well drained soils and are usually found in lower areas and on drainage lines.

**Soil structure** refers to the arrangement of soil particles, the strength of the bonding between them and the size and distribution of the pores throughout the soil. Structure plays an important role in determining the ability of a soil to absorb and to hold water and air. Also, the ease with which seedlings may emerge from and roots may penetrate the soil.

**Soil fertility** refers to the ability of a soil to provide a plant with the nutrients essential for growth, and also the absence of toxic species.

The **rate of infiltration** of soil affects the possible amount of run-off and recharge to groundwater.

**Soil salinity** refers to the presence of salt in the soil. A high salt level is toxic to plants, and may cause poor pasture growth and reduced crop yield, and in extreme cases, bare patches of unproductive land.

**Organic matter** helps bind soil together which maintains good structure and water holding capacity. It acts as a mulch and encourages soil biota which assist in nutrient cycling.

### ***Soil Erosion***

Soil erosion occurs if land is managed beyond its capability. Management of soil erosion relies on good land practices being adopted. In some cases remedial earthworks may be required, however these need to be well planned as ground disturbance can often lead to greater problems. It is imperative that they be used in conjunction with good land management practices.

In areas subject to erosion, suitable control structures may include contour banks, levees, pasture belts and waterways, gully filling and gully control weirs and dams. Structures that control water erosion are designed to slow water down before it can cause erosion. It may be channelled via waterways and contours into small gullies and creek lines. In some cases the water is diverted into dams to store and slow water. Water directed into dams can add to the farm water supply.

Any erosion control program that involves diversion of runoff must provide for safe disposal of that water. When considering the disposal of runoff water it is important to identify the flow-lines and point or points at which water naturally leaves the property.

## Key Points

- Consider the possibility of erosion by looking at information on land capability and soil type. If you determine contour banks are necessary, indicate the flow direction of the run-off water along the contour banks.
- There is a legal obligation to ensure that there is no diversion of run-off from one exit point to another. Once these exit points are known it is then possible to design and locate a system of erosion earthworks.
- The modification of catchments through soil erosion control works that alters the way water is delivered to watercourses may affect stream behaviour and stability. When undertaking soil erosion works the impact on downstream areas should be considered.

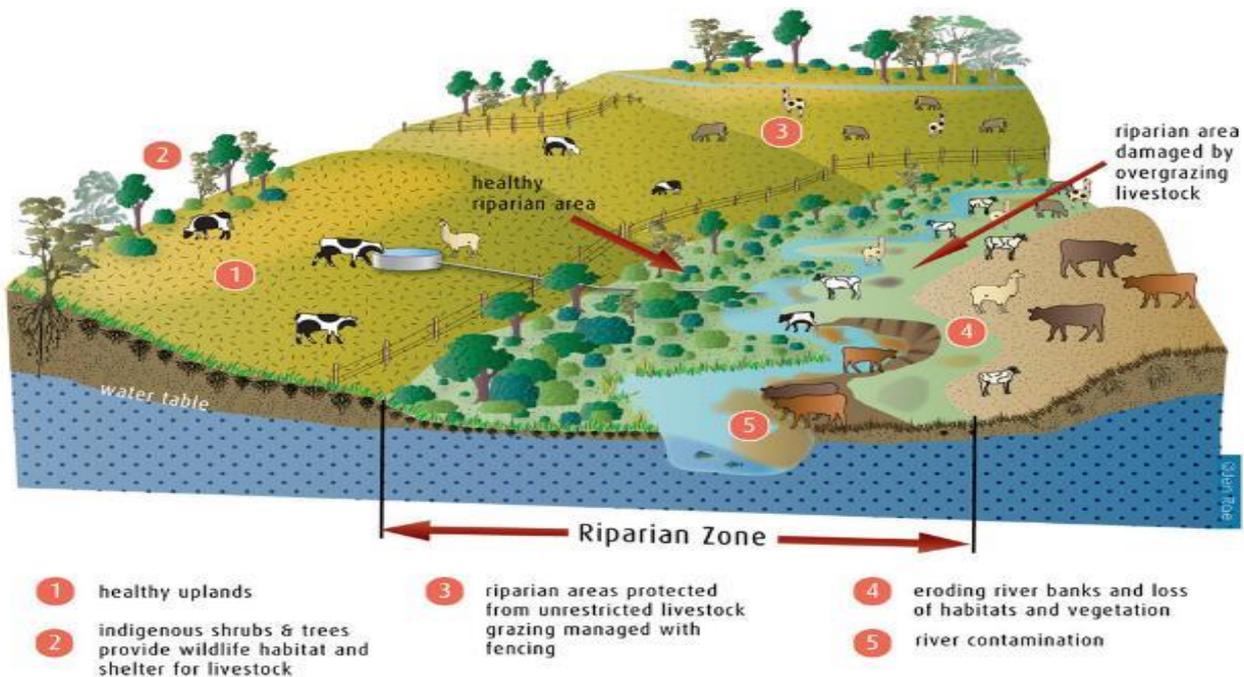


Figure 9: Potential impacts of management on a riparian zone (copyright Jen Rae, The Riparian Project <http://theriparianproject.com.au/about> )

## **Water Quality**

### ***Clarence River Catchment***

A catchment is an area of land catching rainfall that flows into a creek, river, wetland or the ocean. Hills or ridges separate each catchment and direct the flow of water into different waterways. Within catchments, there are natural features such as native vegetation, water, rocks and soils. Catchments are also the places where people live, work and play. Human use in catchments can have an impact on water quality. This will affect the availability of water for a variety of uses.

Catchments occur at a variety of scales from very large catchments such as the Murray–Darling Basin to local creeks and streams that may only flow occasionally. The interconnectedness of catchments means that changes in water quality in small local catchments will impact on larger creeks and rivers downstream. Catchments require management to be sustainable for future generations. Sustainable management will maintain and improve the quality of natural resources within a catchment and meet the needs of the community, ecosystems and the environment.

Brookfield is situated in the head waters of the Clarence River catchment. In the upper reaches of the catchment, such as mountain regions or foothills, rivers are usually fast flowing. This means they have the energy to carry large pieces of rock and gravel eroded from stream beds and banks. Vegetation along the banks (riparian) provides a buffer from overland flow, reducing the input of sediment and nutrients. The upper parts of a river system are very important to the health of the entire river because this is the source of much of the food carried downstream (Figure 8). Dams and weirs impede the distribution of food and seeds and the migration of aquatic animals, as well as altering flow rates and flood frequencies. Overhanging vegetation provides much of the food (in the form of leaves, fruits, seeds, twigs and bark) required by stream organisms such as macro invertebrate ‘shredders’, which convert coarse material to finer fragments. These macro invertebrates (water bugs) are adapted to fast moving water, e.g. by having streamlined bodies.

### ***Healthy Catchments and Rivers***

A healthy catchment is one that is sustainable and able to meet the needs of the community, ecosystems and the environment. The health of a waterway can be measured by characteristics such as:

- Water quality measured by physical, chemical and biological parameters.
- Healthy ecosystems with a high biodiversity. This includes both aquatic and terrestrial ecosystems, especially along riverbanks.
- The resilience or capacity of the ecosystem to maintain its structure and function in the presence of stress. This may be caused by natural factors such as floods or human-induced change.

Land use is a key factor determining the health of waterways (Figure 9). Human activity can impact on river health by influencing the interactions between natural resources (land, water, vegetation and soils) and between aquatic and terrestrial ecosystems. For example,

agricultural land uses such as general crops and pastures can lead to the removal of groundcover which can cause erosion and rising water tables. Runoff can pollute water with nutrients, sediments and pesticides. Poor irrigation and land use can lead to salinity problems. Some of the water quality tests that might be used to assess whether water quality has been impacted include:

- Presence of macro invertebrates
- Presence of algae
- Stream vegetation overhang
- Dissolved oxygen
- Turbidity
- pH
- Phosphates
- Salinity (EC)
- Habitat assessments.

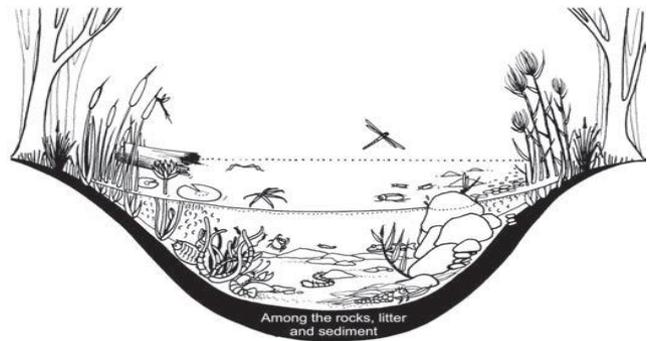


Figure 8: Cross-section of a healthy stream

### ***Water on Farms***

It is important to maintain good water quality on farms:

- For stock watering
- For the health of aquatic animals
- Downstream users – what kind of water is heading to neighbouring properties?
- It can tell us a bit about the catchment, where the water is coming from and any problems that we can address by planning.

Stock need to drink water that has low turbidity, low salinity and neutral pH. For example, consider the effect of pH on stock: water for domestic and stock use should be in the pH range of 6.5 to 8.5. If the pH is highly acidic (less than 5.5), acidosis and reduced feed intake may occur. Highly alkaline water (over 9) may cause digestive upsets and diarrhoea, lower feed conversion efficiency and reduce intake of water and feed.



*Water bore pressure gauge*

**Table 2: Effect of Saline Water on Stock**

Livestock	No adverse effects on animals expected	Animals may have initial reluctance to drink or there may be some diarrhoea, but stock should adapt without loss of production	Loss of production and a decline in animal condition and health would be expected. Stock may tolerate these levels for short periods if introduced gradually
EC in $\mu\text{S}/\text{cm}$	EC in $\mu\text{S}/\text{cm}$	EC in $\mu\text{S}/\text{cm}$	EC in $\mu\text{S}/\text{cm}$
Poultry	0 to 3100	3100 to 4700	4700 to 6300
Beef cattle	0 to 6300	6300 to 7800	7800 to 15,600
Dairy cattle	0 to 3900	3900 to 6300	6300 to 10,900
Sheep	0 to 7800	7800 to 15,600	15,600 to 20,300*
Horses	0 to 6300	6300 to 9400	9400 to 10,900
Pigs	0 to 6300	6300 to 9400	9400 to 12,500

### **Watering Systems**

In order to maintain good water quality for the benefit of stock and the environment, it is important to design a watering system to support this. Watering systems can include a reticulated system of pipes, pumps, tanks and troughs, or on some farms, stock access waterways directly to drink water. Stock access to waterways can impact on water quality by stock ‘pugging’ in the muddy banks, causing them to become boggy and the water to become contaminated with suspended soil and faeces.

This may cause stock to reject the water and impact on water quality downstream. Also, animals in weak condition may become bogged and die. The reticulated watering system avoids these problems by keeping stock out of waterways.



*Solar powered water bore*

### **Key Points**

*In order to protect water quality, riparian vegetation should not be removed and livestock are best watered through a reticulated water system which prevents them from damaging watercourses and dams. Retaining vegetation on property also helps to prevent erosion and salinity problems. Stock need clean, fresh water in order to maintain good health and put on condition.*

## Salinity

### **What Causes Salinity?**

Changes in land use since European settlement from woodland to grazing and cropping, have changed the hydrology in some areas of the Northern Tablelands. Trees and deep-rooted perennial pastures have been replaced with more shallow rooted species. This means that moisture found at depth cannot be pumped out by evapo-transpiration. This leads to an increase in the excess water in the soil across the landscape and causes a rise in the water table which, in turn, causes salts to rise through evaporation and accumulate in the soil surface. Salt toxicity impacts plant growth and cell functions. Salinity in the subsoil above a scalded site will also limit pasture production as roots will not penetrate salty soil layers. This also results in a reduced capacity for plant's roots to extract water at depth.

### **Site History**

Salinity is not currently a problem on Brookfield, however it is still important to consider in preparing a property plan in this region.

### **Indicator Plants**

Indicator plants are a group of species that provide us with an indication of the presence of salt in the soil and a shallow water table. These species are known to tolerate high levels of salt. Table 3 identifies those salinity indicator plants which may be found at saline sites. Some of these plants may also prefer wet conditions, so it is important to check whether salt incursion is occurring.

**Table 3: Indicator Plants**

Common name	Scientific name	Salt tolerance (Low/medium/high)
Sea barley grass	<i>Hordedelum marinum</i>	High
Rhodes grass	<i>Chloris gayana</i>	High
Native panic	<i>Panicum buncei</i>	High
Couch grass	<i>Cynodon dactylon</i>	Medium
Swamp fox tail	<i>Pennisetum sp.</i>	Medium (prefer damp conditions)
Wallaby grass	<i>Rytidosperma sp.</i>	Low
Rats tail fescue	<i>Sporobolis creber</i>	Low

### **Soil Salinity Test Results**

Table 4 provides guidelines for classifying the level of salinity in soils. Table 5 indicates the level of salinity that various crops and plants are able to tolerate.

**Table 4: Soil salinity classes**

Class	ECe dS/m	Comments
Non-saline	<2	Salinity effects mostly negligible
Slightly saline	2-4	Yields of very sensitive crops may be affected
Moderately saline	4-8	Yield of many crops affected
Very saline	8-16	Only tolerant crops yield satisfactorily
Highly saline	>16	Only a few very tolerant crops yield satisfactorily

**Table 5: Tolerance levels for different crops and plants**

Crop	ECe dS/m	Plant	ECe dS/m
Lucerne	2	Green Panic	5.6
Sunflowers	5.5	Couch grass	6.9
Wheat	6	Barley	8
		Salt Bush	12

**Key Points**

*Preventing salinity problems is much easier and cheaper than trying to fix them. Maintaining deep rooted perennial vegetation and monitoring indicator plants are good ways to avoid and monitor salinity in the environment.*

## Biosecurity

### What is Biosecurity?

Biosecurity is the set of measures for protecting a population at the national, regional and farm level. The object is to protect the economy, environment and community from the negative impacts associated with diseases, pests, weeds, toxins and chemical residues.



*Photo: The Land.com.au; Elli Sinclair biosecurity officer and Paul Hutchings, General Manager Northern Tablelands Local Land Services, with NSW Minister for Agriculture, Adam Marshall displaying new biosecurity signage.*

### Farm Biosecurity

Farm biosecurity is defined as reducing the risks to a farm business by limiting the likelihood of introducing or spreading animal diseases, pests, weeds etc. Most biosecurity measures are very simple and low-cost and should be part of regular management routine. Such biosecurity practices will go a long way to securing a farm and its future.

The benefits of implementing biosecurity practices include:

- Greater productivity on farm – better livestock and plant health generally leads to higher productivity
- Reduced risks on farm – less disease, pests and weeds entering the property and requiring action
- Early detection and management of any pest, weed or disease – catch the problem before it takes a hold
- Reduced costs if there is an outbreak of disease, weeds or pests – faster, easier and cheaper eradication and, in some cases, quarantine.

## Priority Areas for Farm Biosecurity

The key areas that farm biosecurity focuses on to reduce risk include:

- New livestock (introducing livestock from other properties onto a farm)
- Purchasing and storing feed, bedding and water
- Restricted animal material and swill feeding
- Moving animals off your property
- Taking animals to shows and sales
- Animal husbandry (livestock monitoring, drenching, vaccinating)
- Fences (to prevent straying stock)
- Chemical usage, and
- General farm hygiene and maintenance (Animal Health Australia 2012b).

## Livestock Diseases

On-farm biosecurity is about managing risks to meet the following goals:

- To prevent the introduction of infectious diseases to grazing livestock production properties
- To prevent the spread of diseases from an infected property to an uninfected property.

Most disease threats can be controlled before animals enter the property by putting in place an effective biosecurity plan that:

- only allows healthy stock through the farm gate
- Includes a period of on-farm quarantine for all arrivals to monitor and confirm their health status in isolation from your own stock, and
- Includes effective vaccination or preventive treatments against diseases already known to be on the property.

Disease threats relevant to Brookfield include:

- Pestivirus
- Johne's Disease
- Leptospirosis
- Vibriosis (genital campylobacteriosis).



*Photo: art4agriculutre.com*

More information is available on various DPI Primefacts or, importantly, information for specific disease problems can be obtained from Local Land Services District Veterinarians or Biosecurity staff.

## Toxins and Chemical Residues

Chemical residues are chemicals that are applied to crops, animals, water or soil that leave residues which break down over time. Common residues include:

- banned organochlorines that are persistent in soils
- antibiotics and drenches
- pesticides and external parasite products
- heavy metals such as Lead or Cadmium
- other agricultural chemicals.

Residues need to be kept out of the food chain by:

- carrying out on-farm investigations to identify sources of residues
- eliminating the source of the residue or mitigating its effects
- investigating residue detections reported from abattoirs
- using tracing systems such as National Livestock Identification Scheme (NLIS) to identify the source of a contamination
- following withholding periods on chemical labels.

Certification that livestock are free of disease and residues is essential for continued and competitive access to domestic and international livestock markets.

## **Pest Animals**

In Australia, pest animals have major economic, environmental and social impacts. Many pest animals cause significant damage to crops and seriously affect Australia's livestock industries by preying on stock and competing for pasture. Pest animals also cause severe land degradation by promoting soil erosion, stream turbidity and the spread of weeds. Competition, habitat destruction and predation by pest animals threaten the survival of many of Australia's native plants and animals (Department of Environment Water Heritage and the Arts 2009a).

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 eleven of Australia's major pest animals (wild populations of foxes, pigs, rabbits, mice, goats, carp, dogs, cane toads, camels, cats and horses) have negative impacts in Australia valued at \$797 million per year (Centre for Invasive Species Solutions, 2017).

The following species are identified as priority pest animals in the Northern Tablelands region:

**Wild rabbits (*Oryctolagus cuniculus*)**

Wild rabbits compete with native wildlife, damage vegetation and degrade the land. They ringbark trees and shrubs, and prevent regeneration by eating seeds and seedlings. Their impact often increases during drought and immediately after fire, when food is scarce and they eat whatever they can. Wild rabbits have contributed to the decline in numbers of many native plants and animals (Australian Government 2004a).



**Wild dogs (*Canis familiaris*)**

In NSW, the term ‘Wild Dog’ refers to all wild living dogs: dingoes, feral domestic dogs and the hybrid descendants of these. They can have a significant impact on agricultural production and farm profitability due to their attacks on livestock and domestic pets. They also attack native wildlife which can have detrimental impacts on populations, especially for threatened and endangered species.



**Feral pigs (*Sus scrofa*)**

Feral pigs are environmental and agricultural pests. They cause damage to the environment through wallowing, rooting for food and selective feeding. They destroy habitat for native plants and animals and spread environmental weeds. Feral pigs destroy crops and pasture and they could spread exotic diseases should there be an outbreak (Australian Government 2004b). Feral pigs will eat anything from small animals to ground nesting birds, their eggs and chicks. They are responsible for the degradation of wetlands, cause erosion, disturb rainforest floors, dig up root systems and interfere with the regenerative cycle of native vegetation. Feral pigs can carry infectious zoonotic diseases (diseases naturally transmitted from animals to people) including brucellosis, leptospirosis and Q Fever.



### ***European red fox (Vulpes vulpes)***

The fox has played a major role in the decline of ground-nesting birds, small to medium sized mammals and reptiles. It is thought to have caused a severe reduction in populations of many threatened species. The fox causes significant economic losses to farmers by preying on newborn lambs, goat kids and poultry. The fox could also act as a carrier of rabies, should the disease accidentally be introduced into Australia. Rabies mostly affects members of the dog family, but can also be passed on to humans, livestock and native mammals (Australian Government 2004c).



Fox (Photo: Jans Canon)

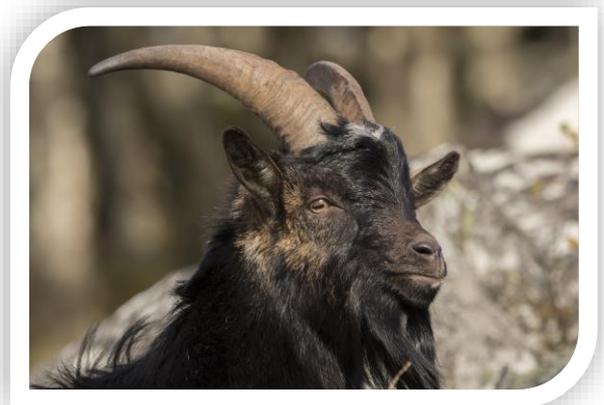
### ***Wild deer (Rusa, Chital, Fallow and Red)***

Wild deer have a significant impact on pastures, cropping and farm infrastructure. The impact of wild deer through grazing pressure is considerable and they can be a potential reservoir and vector of endemic and exotic disease.



### ***Feral goat (Capra hircus)***

Feral goats are an agricultural and environmental pest, but also a commercial resource, providing income to farmers who manage populations for production. Feral goats compete with livestock for feed, contribute to land degradation through grazing and browsing, and impact on biodiversity by damaging the vegetation and competing with native animals.



a number of **locust** species (the Australian Plague, Spur-Throated and Migratory locusts) are also considered pest animals.

Serious infestations of plague locusts cause significant economic loss to affected landholders.

Managing pest animals is everyone's responsibility under the *Biosecurity Act 2015* (NSW).

Under this Act, all landholders, both on private or public land, who know or ought to reasonably

know about a biosecurity risk posed by a pest animal, have a duty to prevent, eliminate or minimise that risk as far as reasonably practicable. This is called their General Biosecurity Duty. Taking a coordinated approach to pest animal control, where neighbours cooperate on a regional scale, is much more effective than landholders undertaking pest animal control alone.

## Weeds

A weed is a plant growing where it is not wanted. A plant that is considered a weed in one situation may not be considered a weed in other contexts. Weeds are generally unwanted in a particular situation because they threaten agricultural productivity, have detrimental effects on the natural environment or impact on human health. Weeds reduce farm productivity, displace native species and contribute to ongoing land degradation and reduced land values (Northern Inland Weeds Advisory Committee 2009). Weeds are often classed into broad groups depending on their characteristics, impact and the situation in which they grow:

- regional priority weeds
- weeds of national significance
- water weeds
- other weeds.

Many weeds can be classed in more than one of these groups. For example, Blackberry can be classed as an environmental and agricultural weed, depending on the situation where it is occurring. It is also listed as one of Australia's Weeds of National Significance (WONS). Some cultivars are also grown for commercial blackberry production or in domestic gardens for berry harvest.



*Chilean Needle Grass (Photo: John Hosking)*

### **Weed considerations at Brookfield**

Local weeds that potentially threaten the environmental and production values of Brookfield include:

- Chilean needle grass (*Nassella neesiana*)
- African lovegrass (*Eragrostis curvula*)
- Blackberry (*Rubus fruticosus* species aggregate)
- Nodding thistle (*Carduus nutans* subsp. *nutans*)
- Scotch thistle (*Onopordum acanthium*)

## Emergency Issues

The property may at times be threatened by emergencies such as bushfires, floods, extended drought and storm damage. A plan to mitigate the main risks should be recommended to the property owner. Every business or property needs an effective response plan for dealing with emergencies. In any emergency, such as a fire, flood or storm, a response plan can help to minimise loss of life, injury, property damage and costly disruption to business operations.

### Key Points

*Consider the biosecurity risks that might threaten the environmental and production values of Brookfield. What measures can be put in place to mitigate these risks? Compare the costs of putting in place measures to reduce biosecurity risks with the loss of production and remedial costs of fixing a major biosecurity issue.*



*One month apart - upper Colo River - Hawkesbury*

The farm biosecurity toolkit is a great resource to find additional biosecurity information:  
<http://www.farmbiosecurity.com.au/toolkit/>

## Cultural Heritage

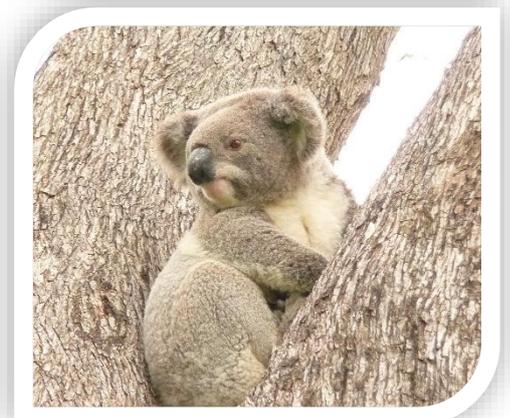
### Aboriginal Cultural Heritage

Aboriginal people have lived in NSW for more than 40,000 years. There's evidence of this everywhere- in rock art, stone artefacts and cultural heritage sites across the state. If you thought Aboriginal heritage was just about rock art, think again. Aboriginal culture is much broader than this, and it's a living, ongoing culture. It's deeply linked to our entire environment - plants, animals and landscapes.

The land and waterways are associated with dreaming stories and cultural learning that is still passed on today. It is this cultural learning that links Aboriginal people with who they are and where they belong. To protect Aboriginal heritage, we can't just look after sites in parks or artefacts in museums. Aboriginal people need to be able to access land to renew their cultural learning and they have to be involved and consulted in the conservation of our natural environment.

The Guyra area is the traditional land of the Banbai people. The Northern Tablelands region is rich in heritage, some examples of which include:

- artefact scatters and rock art
- burial sites
- scarred and carved trees
- grinding grooves and middens
- mission and reserve sites
- Aboriginal ceremony and dreaming sites
- Aboriginal resource and gathering sites
- ceremonial rings
- earth mounds
- ochre quarries
- potential archaeological deposits
- fish traps
- habitation structures
- hearths
- non-human bone or organic material
- shell middens
- stone arrangements
- modified trees
- water holes and
- stone quarries.



*Koala (Photo: Myrna Spencer)*

Important Aboriginal sites near Brookfield include Wattleridge Indigenous Protected Area (IPA), which is Aboriginal-owned land, managed for the conservation of its environmental and cultural values. The IPA is home to many iconic and threatened species such as the Koala, Spotted-tailed quoll, Powerful owl and the threatened Black grevillea.

## Preserving Aboriginal Cultural Heritage on Private Property

Both pre-European and post-settlement sites and objects hold special meaning for Aboriginal and non-Aboriginal people. Preservation of these sites and objects is important for mutual understanding of Aboriginal culture. Landholders and land managers are in the unique position of being able to look after significant parts of the history of this wonderful country. They can make a direct contribution to the preservation of its Aboriginal cultural heritage. Having Aboriginal sites on a property will not affect ownership.



Stone artefacts

If an Aboriginal site or object is discovered, this process should be followed:

Step 1: do not disturb the site or remove any artefacts or objects

Step 2: make a record of the site or object by taking photographs, recording the position and write a brief description of the find

Step 3: report the find to the Local Aboriginal Land Council in the area of the Northern Tablelands Local Land Services.

To preserve Aboriginal cultural heritage on a property, it is recommended to assess the site prior to any development or change of land use. Through a simple assessment process, landholders can determine whether the planned development or land use is likely to damage or destroy any items of importance before the development or change begins. There is a *Due Diligence Code of Practice for the protection of Aboriginal objects* which assists landholders. More information on this can be found in the brochure *Looking after our Aboriginal Cultural Heritage* (Northern Tablelands Local Land Services 2015).

After reporting an Aboriginal site or object, a Local Aboriginal Land Council representative can:

- Arrange a visit to the site where appropriate, to examine and confirm the findings
- Arrange formal recording through the Aboriginal Heritage Information Management System if the find is substantiated and of significance
- Help the landholder to develop ways to secure the site to prevent erosion or any possible degradation until a formal agreement between the landowner and the Office of Environment and Heritage has been reached for managing the site.



Aboriginal art work

## Farm Business Planning

### Farm Business Enterprises

Part of a land manager's role as a decision maker is to decide which enterprises suit his/her land and his/her financial, environmental and lifestyle goals.

Currently 'Brookfield' is a clean slate, meaning there is not one established enterprise on the property, and that there are many opportunities or different enterprise configurations to be looked at when planning for the business. With those opportunities comes a few constraints. Considerations need to be made in the planning, for the landholder's other businesses, for the landholders being absentee or not on farm all of the time and for the aims and goals of the landholders.

Other enterprises and sources of income could potentially suit the land whilst maintaining the goal of profitability and sustainable use of resources. Some of the factors land managers take into account when choosing an enterprise include the potential profit, labour requirements, overheads, farm design, water availability and environmental impact.

### Financial Information for Farm Decision Making

#### *Gross Margin Budgets*

One of the tools that farmers use to decide on enterprises is to try to calculate the gross margin of an enterprise. A gross margin is the gross income from an enterprise, less the variable costs incurred in achieving it. It does not include fixed or overhead costs such as depreciation, interest payments, rates or permanent labour. Variable costs are those costs directly attributable to an enterprise and which vary in proportion to the size of an enterprise. For example:

- If the area of wheat or sorghum sown doubles, then the variable costs associated with growing it, such as seed, chemicals and fertilisers, will roughly double.
- If the number of breeding cows doubles, then the variable costs associated with carrying the additional stock, such as drench and vaccination costs, will also roughly double.

The gross margin budgets are intended to provide a guide to the relative profitability of similar enterprises and an indication of management operations involved in different enterprises. A gross margin is not profit because it does not include fixed or overhead costs such as depreciation, interest payments, rates and permanent labour, which have to be met regardless of enterprise size.

Gross margins are generally quoted per unit of the most limiting resource, for example, land, labour, capital or irrigation water. Crop gross margins are provided on a per hectare basis and also per megalitre of water in the case of irrigated crops. It is also common for livestock gross

margins to be quoted on a per dry sheep equivalent (DSE) basis reflecting returns on the grazing resource.

The livestock budgets express outcomes in terms of:

- gross margin per animal e.g. per breeding cow/ewe or per steer/wether;
- gross margin per hectare; and
- gross margin per DSE (dry sheep equivalent).

### **Cash Flow Budgets**

Farmers utilise cash flow budgets to provide a detailed estimate of all the income and the expenses coming into and going out of the business. A cash flow budget helps a farmer to work out if they have enough cash to meet their financial commitments in a timely manner. Preparing a cash flow budget is an essential part of farm business management as it assists the farmer to make informed business decisions.

### **Key Point**

*To enable the farmer to evaluate the recommendations provided in your report it is essential that you provide estimates of income from suggested enterprises and accurate costings for your recommendations. The farmer can then use these estimates in their gross margins and cash flow budgets and make informed decisions about the recommendations provided.*

## **Pasture Management**

### **Pasture Composition**

The quantity and quality of feed available on your farm impacts on your profit, livestock condition/wellbeing and the condition of your land. A diverse pasture is more resistant to the impact of drought. Pastures are usually composed of a range of different plant species which can include exotic (introduced) grass, naturalised grass, native grass, legumes and weeds. Different plants dominate the pasture during different seasons e.g. summer versus winter dominant species, and some plants are annuals while others are perennials. Annuals are plants that perform their entire life cycle from seed to flower to seed within a single growing season. All roots, stems and leaves of the plant die annually. Only the dormant seed bridges the gap between one generation and the next. Perennials are plants that persist for many growing seasons.

Different pasture species have various levels of palatability and growth and perform various functions in the ecosystem. For example, legumes (e.g. White clover, Lucerne) are important nitrogen fixers which make nitrogen more available to other plants.

Higher quality feed is easier to digest by stock, meaning that their digestive systems do not need to use as much energy to break down food. Stock on quality pasture can convert this feed to meat faster than stock on lower quality pasture. Cattle on high quality feed do not produce as much methane as cattle on lower quality feed. Methane has been found to have an impact on greenhouse gas emissions and climate change.

Native pastures and their management are critical for enterprises on the Northern Tablelands. They are accustomed to Australian conditions and help to maintain native biodiversity. They are responsive to rainfall events, and tend to be more resilient in the extremes of the Australian climate. Many introduced species are harder to maintain given the conditions mentioned above. Some introduced species can become invasive (e.g. African lovegrass and Chilean needle grass) overtaking large portions of agricultural lands, making it increasingly difficult and expensive for farmers to maintain their properties and their production. Other introduced pastures can be planted to increase production such as tropical and temperate pastures.

Quantity of pasture is very important. Farmers must budget their feed and monitor stocking rates to ensure that their pastures remain healthy and resilient so that they can survive during the cold winter when growth slows whilst being ready to prosper during the growing season in spring and summer.

### ***Ground Cover***

Managing pastures to maintain adequate levels of groundcover is the most effective way to minimise run-off and erosion. By reducing run-off, more water is made available for plant growth. By reducing erosion, soil, nutrients and organic matter are retained in place and siltation problems are minimised. In addition, groundcover is important for soil health and assists in weed control. Groundcover is defined as any material on or near the soil surface that protects the soil against the erosive action of raindrops and overland flow. Per cent groundcover is the converse of per cent bare ground. Plant material, either alive or dead, is the most common and most important form of groundcover. Other materials such as loose surface stones, dung and snow can also provide an effective groundcover (Lang and McDonald 2005). 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.

**Common Plants at Brookfield**



*Red clover flower*



*White clover leaf (Photo: A. Sendall)*



*Red grass (photo: Harry Rose)*



*Tall fescue*



*Phalaris*



*Cock's foot*



*Rye grass*

## Developing the Farm Plan

### Land Use Hazards

Existing issues within the property will influence the final plan (Table 7). What remedial action will be required? What enterprises and management strategies are most suited to these areas?

**Table 7: Land Use Hazards that exist within the competition property**

Land Use Issues	Points to be aware of when developing management options
Tree decline	<ul style="list-style-type: none"><li>• Several areas of the property have a relatively low tree cover % because of past clearing, loss of trees due to dieback, grazing, and competition from pastures.</li><li>• Tree decline can reduce agricultural production through loss of shade and shelter, as well as contributing to other forms of land degradation such as erosion, salinity and waterlogging.</li></ul>
Water quality	<ul style="list-style-type: none"><li>• Stock access to some dams and watercourses means some waterways on the property experience high levels of turbidity (muddy water).</li></ul>
Invasive weed species	<ul style="list-style-type: none"><li>• Weeds are a land use issue. In particular, invasive perennial grass species including <i>Nassella neesiana</i> (Chilean needle grass) and <i>Eragrostis curvula</i> (African love grass).</li><li>• If allowed to persist in the pasture, these grass species seed profusely and have a tendency to grow to dominate the pasture composition. The lack of palatability of this grass in particular leads to production declines in grazing stock.</li></ul>
Groundcover	<ul style="list-style-type: none"><li>• The percentage of groundcover influences water infiltration, erosion, potential weed invasion and feed quality and quantity.</li></ul>

### Rainfall Use Efficiency

When rain falls, there are four paths it may take – run off, deep drainage, transpiration or evaporation (see Table 8 below). There are a number of factors relating to the physical landscape and to management that influence what happens to rain that falls on the property.

Property management plans should make the most of rainfall, that is, increase the rainfall use efficiency, reducing losses from run off, deep drainage and evaporation.

**Table 8: Rainfall can go to the following places when it falls**

Component	Description	% of total rainfall
Run off	<p>The amount of rainfall that runs off is determined by slope, groundcover, soil structure and depth to any impermeable layers in the soil profile.</p> <ul style="list-style-type: none"> <li>• The steeper the slope, the easier it is for water to run</li> <li>• Less than 70% groundcover makes it easier for water to run</li> <li>• Soils with poor structure have low infiltration rates and run water more easily</li> <li>• Shallow soils fill quickly and the balance runs off</li> </ul>	<p>Low 4%</p> <p>Common 10%</p> <p>High 15%+</p>
Deep Drainage	<p>Deep drainage occurs when water that cannot be stored in the soil passes beyond the plant root zone. Soils with coarse texture have less capacity to retain water and drain more easily. Agronomic systems that rely on stored soil water also encourage deep drainage.</p>	<p>Average 2-4%</p> <p>High 6-8%</p>
Evaporation/ Inefficiency	<p>Loss from bare earth, ineffective transpiration or losses due to soil nutrient status.</p>	<p>Low 15% High 60%+</p>
Transpiration	<p>Amount of rainfall actually required to grow grass to feed animals, or to grow crops and to form a litter layer on the soil surface.</p>	<p>Balance</p>

\* See Figure 10 on the following page for a pictorial representation of this table

For more detail about groundcover and optimum levels for varying conditions, refer to Primefact P2.1.14 (Lang and McDonald 2005)

[http://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0018/162306/groundcover-for-pastures.pdf](http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0018/162306/groundcover-for-pastures.pdf)

**To make the most of rain that falls**

Aim to maintain as much groundcover as possible with 12mm of litter to reduce evaporation and to maintain optimal soil temperature.

Maintain a minimum 80% groundcover (everything other than bare earth) at all times to reduce runoff and erosion.

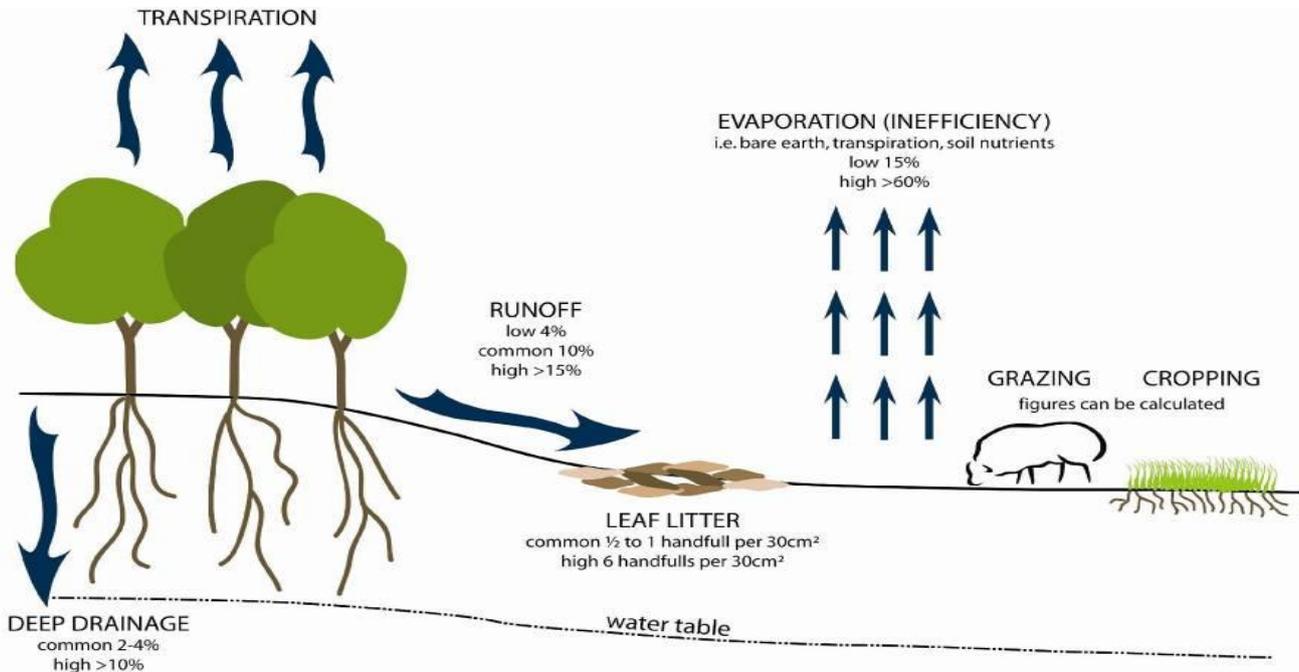


Figure 10: Rainfall uses

**Legal Obligations**

Many legal constraints affect the final property plan. Table 9 briefly outlines the current legal constraints and their implications for the property. More information can be found at relevant websites.

**Table 9: Legal constraints within the competition property**

Issue	Legal constraint
Native Vegetation Clearing	<p><i>Local Land Services Amendment Act 2016</i></p> <p>The new laws make provisions for a Native Vegetation Regulatory Map that will indicate rural land where:</p> <ul style="list-style-type: none"> <li>• Native vegetation clearing can occur without approval (non-regulated)</li> <li>• Landholders need to comply with the Local Land Services Amendment Act 2016 (regulated)</li> <li>• Native vegetation may be managed on regulated land via the use of Codes of Practice and Allowable Activities.</li> </ul> <p><a href="https://www.landmanagement.nsw.gov.au/">https://www.landmanagement.nsw.gov.au/</a></p>
Threatened species	<p><i>Biodiversity Conservation Act 2016</i></p> <p>The key pieces of legislation that identify and protect threatened species, populations and ecological communities in NSW are the <i>Biodiversity Conservation Act 2016</i> and its regulations.</p> <p><a href="http://www.environment.nsw.gov.au/threatenedspecies/">http://www.environment.nsw.gov.au/threatenedspecies/</a></p> <p><i>Environment Protection Biodiversity Conservation Act 1999</i></p> <p>Threatened species and ecological communities are protected by this Federal Act.</p> <p><a href="http://www.environment.gov.au/epbc/index.html">http://www.environment.gov.au/epbc/index.html</a></p> <p><a href="http://www.environment.gov.au/biodiversity/threatened/index.html">http://www.environment.gov.au/biodiversity/threatened/index.html</a></p>
Protected land	<p><i>Soil Conservation Act 1938</i></p> <p>This applies to stream banks (no native vegetation removal within 20 metres of stream bank). Also applies to lands that are steep, greater than 33 % / 18 degrees. Existing native vegetation must be retained and allowed to regenerate. This includes grasses as well as shrubs and trees.</p>
Noxious weeds, biosecurity issues	<p><i>Biosecurity Act 2015</i></p> <p>The Biosecurity Act provides the framework to protect our community from the adverse effects from animal and plant pests, diseases and weeds to maintain market access. <i>The Biosecurity Act 2015</i> will also help protect our environment from invasive pests and diseases, allowing the continued enjoyment of our lifestyle.</p> <p><a href="https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity/legislation/factsheets">https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity/legislation/factsheets</a></p>
Local Government Planning Zones	<p>Rural Zone</p> <p>Generally encourages rural pursuits within this zone, and incompatible development should be controlled.</p>

## Making Decisions on Land Use

The important part of this plan is to determine the broad area land management practices for land within the property. The management recommendations should take into account all the resource information provided, address the Land Use Hazards outlined in Table 6, and consider the legal constraints given in Table 8. If legal obligations affect your recommendations then you need to cover this - be specific.

### Using Land Management Units

Land use is going to be different across the property. Land management can be defined by delineating paddock units. The boundary and size of each management unit has to be decided based on the information provided in your maps and from the information in this resource book. Land management units are best shown as shaded areas, or using a numbered system on the property map with a summarised legend.

Land management issues that should be considered over the whole or parts of the property may include:

- enterprise selection e.g. grazing sheep or cattle
- soil management
- weed and pest control
- fire prevention and control
- drought management
- management of riparian areas
- protection of environmentally sensitive lands
- use of land within its capability
- tree and native vegetation management.



Students undertaking soil tests

### Key Points

- *Consider long term issues such as fossil fuels, global warming and climate change. What risks might these impose on farming operations? How can these be best managed?*
- *Effective property planning occurs over a long period of time. Don't plan all of your changes for tomorrow. Prioritise the most valuable things to get done first, but also provide "vision" for future priorities.*

## Monitoring

Once a property plan is developed, monitoring becomes essential. There is no system or practice that applies everywhere and gives uniform results and there are a number of variables interacting in the farming system to consider. Monitoring practices enables the landholder to evaluate the effectiveness of the changes they choose to implement in their farming system,

provides an early warning system if there are weaknesses in the plan and helps reduce risk and uncertainty regarding implementation of the plan.

Suggested monitoring practices should be considered carefully and kept simple to make them more achievable for the landholder. You can select a number of sites in which the landholder can carry out regular monitoring. The sites should either be representative of a large proportion of the property or have an obvious or suspected land degradation problem. Decide on some indicators of change that you can use to monitor changes on the property. Some examples could include:

- Pasture and/or groundcover percentage
- Pasture and/or crop yields
- Soil carbon or structural changes and soil pH
- Records of bird sightings as an increase in the number and diversity of species. These signal better environmental conditions
- Water quality
- Production records
- Financial records.

Mark the sites on your map and refer to them in your report.

An example of a monitoring tool you could use is the Groundcover App which is a free App for iPhone and Android devices. It was developed to provide graziers with a tool to measure groundcover across their paddocks using the step point method. You will measure the percentage of pasture and other material that is covering the soil surface when looking down on it. Monitoring pastures using an objective tool such as Groundcover provides a valuable benchmark for managing paddocks and pastures across the property.

## **The Plan and Report**

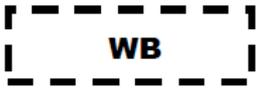
### ***The Physical Plan***

Once you have considered the information and issues, the next step is to draw up your property plan. Download and print the boundary map then draw directly onto the page. The north arrow, scale and boundary are already marked so all you need to do is draw on your plan. Standard mapping symbols used in property planning are given below (Table 10) but you are not limited to using these symbols as long as you label and include a legend.

### ***How to Map***

A good tip when drawing your plan is to use standard mapping colours i.e. blue for water, brown for earthworks, green for vegetation. Using shading or hatching over an area can show what the plan is for that area i.e. changing the land use for that paddock.

**Table 10: Suggested symbols to be used on your map**

Dam		Contour	
Yards		Waterway	
Windmill		Tree regeneration area	
Tank		Windbreak	
Watering point		Tree lot	

### ***Mapping Land Use***

Using an aerial view of your property, the Land Class table (Table 1, page 18) and field checking, identify the most limiting factor for each parcel of land on your property. Consider the nature of any ‘problem areas’ on your farm. These can indicate whether the land has been used beyond its capability in the past. The most limiting factor determines the capability of the area.

In the example below (Figure 11), boundaries between different land classes are drawn and numbered in green and soils have been marked in yellow.



*Students undertaking water tests*

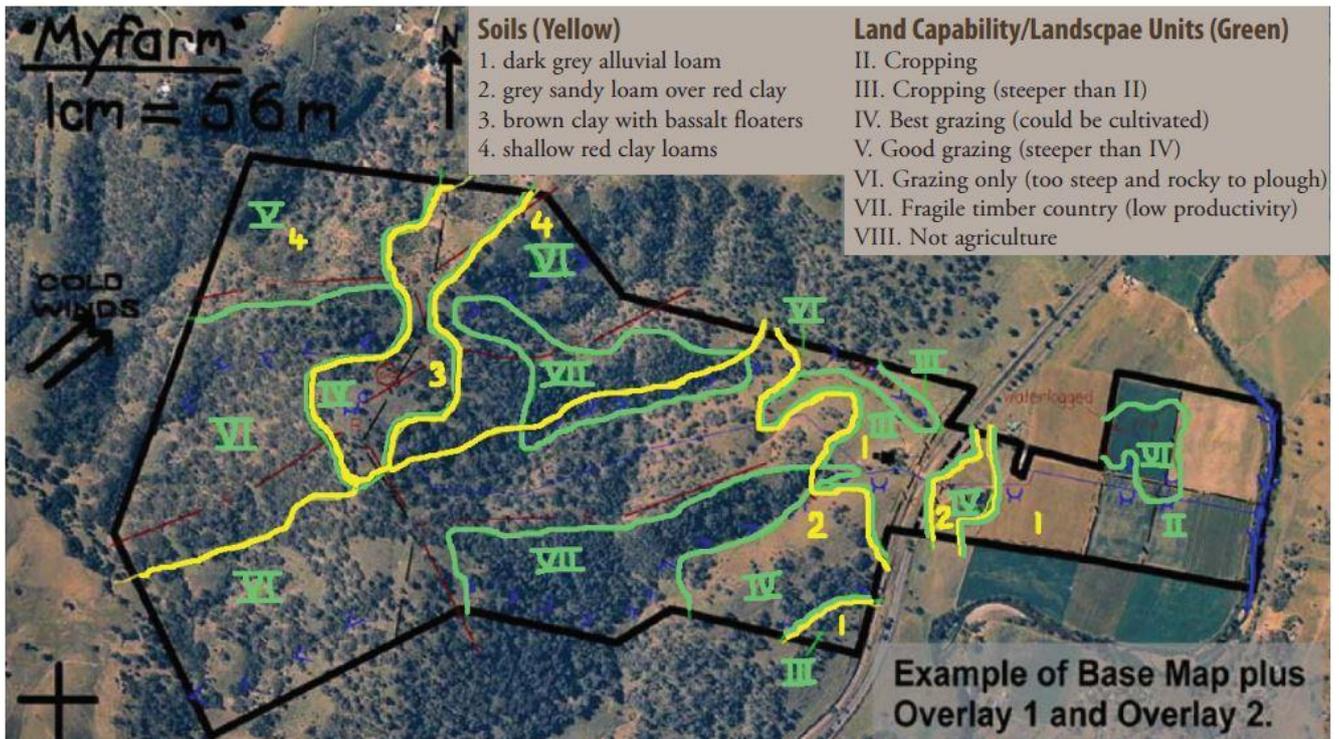


Figure 11: Example of mapping land use

### ***Your Ideal Farm Layout***

Revisit your assessment of farm infrastructure and review and update your improvement strategies for your farm plan by drawing these on your map and noting them in your farm plan.

#### Fences:

- Plan fencing to achieve as many outcomes as possible
- Fencing to facilitate grazing management
- Cost effectiveness and the best design for least cost
- Planning relocation at time of replacement
- Placement in relation to water courses, watering points and to avoid damage from floods
- Placing fences on contours or on land capability boundaries
- Fencing to soil type
- Fencing degraded areas
- Location of gates on well drained areas.

#### Laneways:

- Width to enable vehicle access
- Stable ground
- Watering points so they can be grazed
- Strategic placement of gates
- Shelter

- Accessing as many paddocks as possible
- Can your laneway serve multiple purposes e.g. firebreak?

#### Roads and access:

- Avoiding crossing on waterways if possible
- Locating tracks along ridgelines or contours
- Erosion protection
- Contours and slope.

#### Stock yards:

- Placement close to centre of property
- Placement close to laneway for ease of access
- Is a set of loading yards useful at front of property to improve truck access?
- Drainage and direction of runoff away from yards
- Providing shade and shelter.

#### Water supply:

- How to best provide good quality, clean, reliable water
- Potential dam, tank, trough and bore sites
- How to place water to facilitate good grazing management.

#### For cleaner water you can consider (Brouwer, 2012):

- Filter zones for dams: a well grassed filter zone where water runs into dams to filter out material such as silt, fertiliser, manure, dead vegetation, litter and rubbish will improve water quality in dams
- Restricted stock access to farm dams: fencing dams and leaving a small area of the dam open for stock access can improve water quality
- Buffer zones along creeks and rivers: fencing sections of creeks and rivers enables revegetation and stabilisation. Buffer zones of 5 – 100m are recommended. Generally 20 – 30 metres is best
- Fencing dams and piping water from them to troughs: this improves water quality and encourages vegetation regeneration around the dam.

#### Considerations for location of water infrastructure (Brouwer, 2012):

- Stock access – continual tracking from one direction can lead to soil erosion and possible siltation of the storage
- Large paddocks may be more evenly grazed by providing more watering points. If you can provide water, smaller paddocks will improve grazing management
- Distance stock need to walk for water. Travelling long distances for water will increase the energy required and can result in lost production
- A permanent pipeline with transportable troughs to provide improved grazing management and allow options for managed grazing
- Ensure flow rate and capacity of pipes and troughs meet peak water demands in summer

- Can you turn off water in unused paddocks to minimise the attraction of additional grazing pressure from feral animals and kangaroos?

#### Tree planting:

- Consider planting trees for windbreaks, woodlots, shade and wildlife habitat
- Utilising higher points in the landscape increases the effective area of wind protection from windbreaks. Plantings on upper slopes and ridgelines provide maximum wind protection
- Plantings on lower slopes will shelter livestock, crops and pastures
- Avoid planting shelter belts up and down hills if there is potential for erosion from channelled water
- Place shelter plantings across damaging hot and cold winters and along contours
- Contain a mixture of species, trees and shrubs and a range of ages. Include plantings of local plants that flower at different times of the year to attract predatory birds and insects
- Plant shelter belts where they can link together and with existing remnant vegetation and woodlots to provide additional food, shelter and movement corridors for wildlife.

#### Design shelter belts so that they (Brouwer, 2012):

- Are approximately 20 times the height of trees in the belt from the next shelter belt
- Are wider than the height of trees in the belt
- Are longer than 20 times the height of trees in the belt
- Have porosity of approximately 50% from ground to top of canopy (so some light can be seen through foliage)
- Consist of at least three rows of trees and shrubs.

#### Remnant vegetation management:

- Retain existing clumps of remnant vegetation
- Connect vegetation into corridors
- Have some larger remnants
- Consider prevailing winds
- Smaller paddocks and managed grazing can reduce pressure and encourage natural regeneration of paddock trees
- Fencing off areas of remnant vegetation to control livestock access
- Fencing areas around mature trees to encourage natural regeneration
- Retain where possible, fallen and standing dead timber, rocks, logs and stumps for wildlife habitat.

#### Infrastructure:

- Buildings, sheds, silos
- Existing infrastructure can be relocated and eventually will need to be replaced.

#### Consider options for solving problems. Problem areas can include:

- Soil erosion
- Dryland salinity
- Access problems

- Weed infestations
- Pest animals (e.g. rabbit burrows)
- Lack of shelter
- Animal health issues (e.g. liver fluke)
- Inadequate water supply
- Rocky shallow soil
- Problem soils
- Bushfire risk
- Tree decline.

### ***The Report***

You are allowed a maximum of 3500 words using standard page formatting for the report.

- Remember that land use, management and marketing proposals should be outlined in your report along with reasons for your decisions. List options then justify the recommended action
- DO NOT use appendices to explain your report findings as they WILL NOT be read or marked.

A major part of property planning is evaluation of alternative enterprises for each particular management unit. This usually includes a comparison and assessment of the economic viability of the alternative enterprises as well as addressing physical requirements. However, for the purposes of this exercise it is not necessary to produce a detailed report on economic aspects. A simple summary is sufficient along with a short explanation of why a particular enterprise was recommended. Nevertheless, it is still important to consider how you would fund any specific works suggested.

## Further Resources

### ***Expertise***

There are many sources of information you can access for technical information. Below is a list to get you started and also see Table 11:

- NSW Office of Environment and Heritage
- NSW Department of Primary Industries
- Northern Tablelands Local Land Services
- Commercial agronomists
- Your local library, school resources and the internet

### ***Funding Opportunities***

Think about if works and management changes you are considering are able to be funded through external means. Environmental works that have public benefit (in addition to benefits to the landholder) may be able to be supported financially through different organisations. The following sources of information may be useful:

- Grants Information: <https://www.grants.gov.au/>
- Northern Tablelands Local Land Services: [www.northerntablelands.lis.nsw.gov.au](http://www.northerntablelands.lis.nsw.gov.au)

## Other Relevant Organisations and Websites

Table 11: Useful contacts

<b>NSW Departments and Organisations</b>	
NSW Department of Primary Industries	<a href="http://www.dpi.nsw.gov.au/agriculture">www.dpi.nsw.gov.au/agriculture</a>
NSW Office of Environment and Heritage	<a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a>
NSW Water	<a href="http://www.water.nsw.gov.au">www.water.nsw.gov.au</a>
NSW Soil Conservation Service	<a href="http://www.scs.nsw.gov.au/">http://www.scs.nsw.gov.au/</a>
Landcare NSW	<a href="http://www.landcarensw.org.au">www.landcarensw.org.au</a>
NSW Rural Assistance Authority	<a href="http://www.raa.nsw.gov.au">www.raa.nsw.gov.au</a>
<b>National Departments and Organisations</b>	
Australian Department of the Environment and Energy	<a href="http://www.environment.gov.au">www.environment.gov.au</a>
Australian Department of Agriculture and Water Resources	<a href="http://www.agriculture.gov.au/">http://www.agriculture.gov.au/</a>
Greening Australia	<a href="http://www.greeningaustralia.org.au">www.greeningaustralia.org.au</a>
Murray Darling Basin Authority	<a href="http://www.mdba.gov.au">www.mdba.gov.au</a>
CSIRO	<a href="http://www.csiro.au">www.csiro.au</a>
Austrade	<a href="http://www.austrade.gov.au">www.austrade.gov.au</a>
<b>Others</b>	
Landline ABC	<a href="http://www.abc.net.au/landline">www.abc.net.au/landline</a>
Meat and Livestock Australia	<a href="http://www.mla.com.au">www.mla.com.au</a>
Farm Biosecurity	<a href="http://www.farmbiosecurity.com.au">www.farmbiosecurity.com.au</a>
Animal Health Australia	<a href="http://www.animalhealthaustralia.com.au">www.animalhealthaustralia.com.au</a>
The Land	<a href="http://www.theland.com.au/">http://www.theland.com.au/</a>

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## Glossary

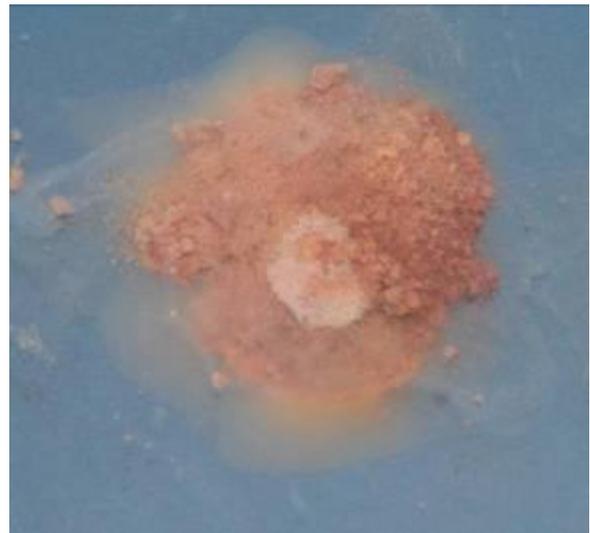
**Catchment:** That area determined by topographic features within which rainfall will contribute to runoff at a particular point under consideration.

**Contour:** An imaginary line on the surface of the earth connecting points of the same elevation.

**Contour bank:** A bank which is constructed along the contour and graded to discharge at either or both ends depending on requirements.

**Discharge area:** An area in which groundwater is discharged at the ground surface. Discharge can occur via springs, seepage or through capillary rise and evaporation.

**Dispersion:** If a soil disperses (example pictured on right), it is likely to erode and is likely to have high exchangeable sodium.



**Drainage line:** A channel down which surface water naturally concentrates and flows, conveying water only during and/or immediately following periods of heavy rainfall.

**Footslope:** A moderate to very gently sloping landform at the lower end of a slope.

**Hillslope:** A gently inclined to precipitous landform usually comprising *side slopes* and *foot slopes*.

**Organic matter:** That fraction of the soil including plant and animal residues at various stages of decomposition, cells and tissues of soil organism, and substances synthesised by them. Is a major source of plant nutrients and substances which assist in soil structure maintenance.

**Outcrop:** The exposure at the surface of rock that is inferred to be continuous with the underlying bedrock.

**Recharge area:** Where water can enter the soil and move downward to the groundwater. Recharge is greater in rocky areas and in soils which are highly permeable.

**Rill erosion:** The removal of soil by runoff from the land surface whereby numerous small channels, generally up to 30cm deep, are formed. Typically occurs on recently disturbed soils.

**Runoff:** That portion of precipitation not immediately absorbed into or detained upon the soil and which thus becomes surface flow. The amount of runoff depends on rainfall intensity and duration, land slope, surface roughness, vegetative cover and surface soil conditions including moisture content.

**Scald:** A bare area produced by the removal of the surface soil by wind and/or water erosion. The result is exposure of the more clayey subsoil which is, or becomes, relatively impermeable to water. The term is also used for a bare surface area caused by salting.

**Sheet erosion:** The removal of a fairly uniform layer of soil from the land surface by raindrop splash and/or runoff. No perceptible channels are formed.

**Shelterbelt:** An area of living trees and/or shrubs established and maintained for the protection of grazing animals from climatic conditions. Shelterbelts may also act as windbreaks.

**Slope:** A landform which is neither a crest nor a depression and that has an inclination greater than one percent.

**Slaking:** If slaking occurs (example pictured on right) it is caused by trapped air being forced out and a lack of organic matter. If slaking occurs very quickly, the soil is very low in organic matter. If this occurs at the surface it can block surface pores, it is more likely to erode and form crusts on the surface.



**Stream bank erosion:** The removal of soil from stream banks by the direct action of stream flow, and/or wind/wave action. This typically occurs during periods of high flow.

**Topographic map:** A map which indicates both the horizontal and vertical relationship of the feature represented.

**Topography:** The shape of the ground surface as depicted by the presence of hills, mountains or plains.

**Topsoil:** That part of the soil profile, typically the A<sub>1</sub> horizon, containing material which is usually more fertile and better structured than underlying layers. Topsoil is the most important part of the soil with respect to the growth of crops or pastures and its loss or degradation represents the most serious aspect of soil erosion.

**Water erosion:** An erosion process in which soil is detached and transported from the land by the action of rainfall, runoff, and/or seepage.

**Water table:** The upper surface of groundwater below which the pores of rock or soil are saturated.

**Wind erosion:** An erosion process in which soil is detached and transported from the land surface by the action of wind. Where the removal of a fairly uniform layer of soil from the land surface occurs the term sheet erosion may be used.

**Windbreak:** A barrier of living trees and/or shrubs or other materials which reduces the velocity of the wind near the soil surface, thus protecting the soil from wind erosion.

# Appendix

## Appendix 1 – Maps

### Map 1 'Brookfield' Infrastructure

**Property Planning Competition "Brookfield"**

**Map 1 Farm Infrastructure**

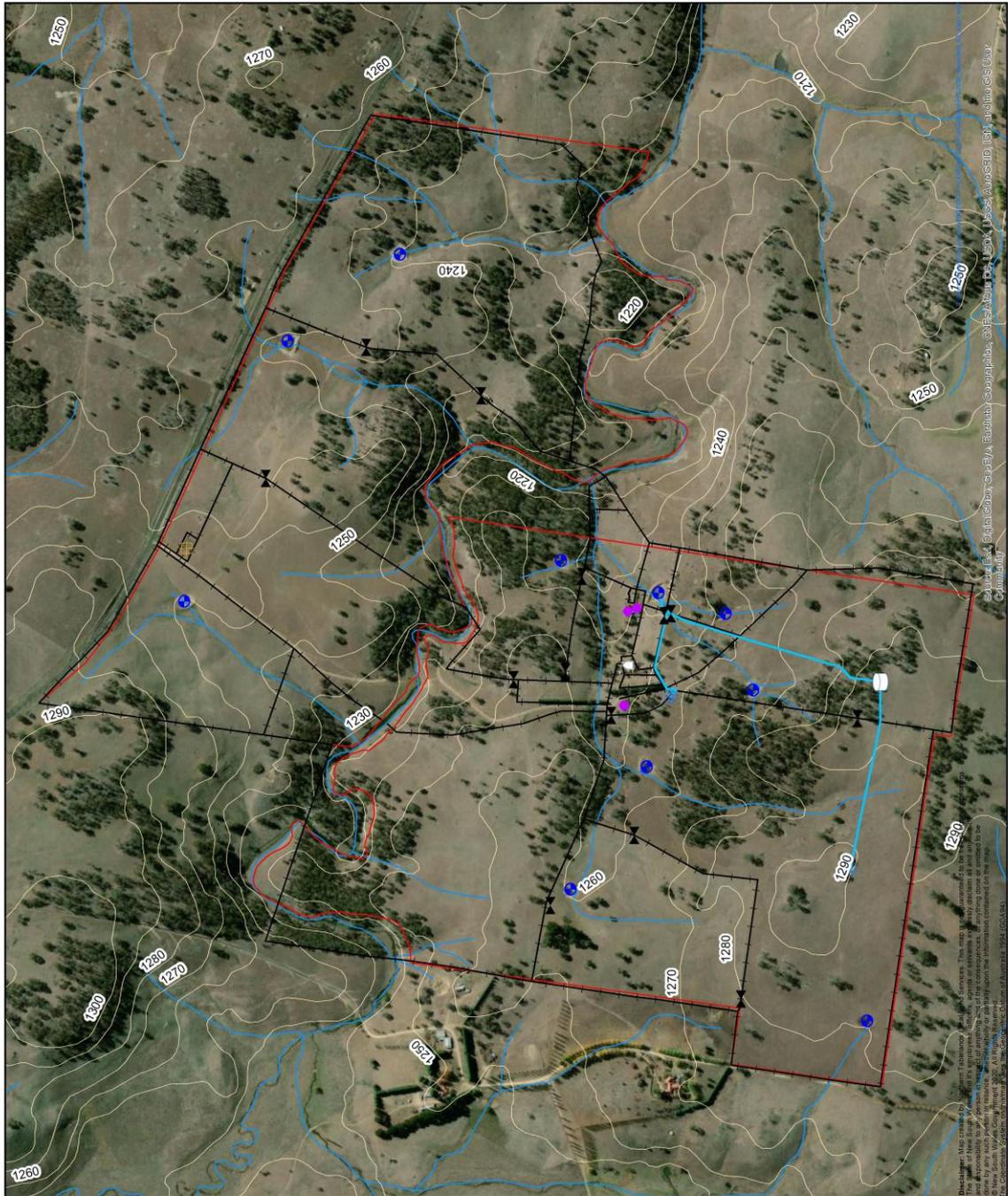
**Legend**

- Cattle Yards
- Dams
- Gates
- House
- Old Sheds
- Tank
- Troughs
- Reticulated watering system
- Brookfield Fences
- Contours
- Brookfield Cadastral Boundary
- Drainage

Prepared By: J. Stevens  
Date: 26/02/2020

Source: Data used in this map includes aerial photography, topographic maps and forests. NSW Land and Environment Services (Lands and Water) and the NSW Government. Includes material © CNES 2009, Distribution Spot Image S.A. France. All rights reserved.

NSW GOVERNMENT  
**Local Land Services**



# Map 2 "Brookfield" Landscape/Environmental Values



Property Planning Competition

'Brookfield'

Map 2

Landscape/  
Environmental  
Values

### Legend

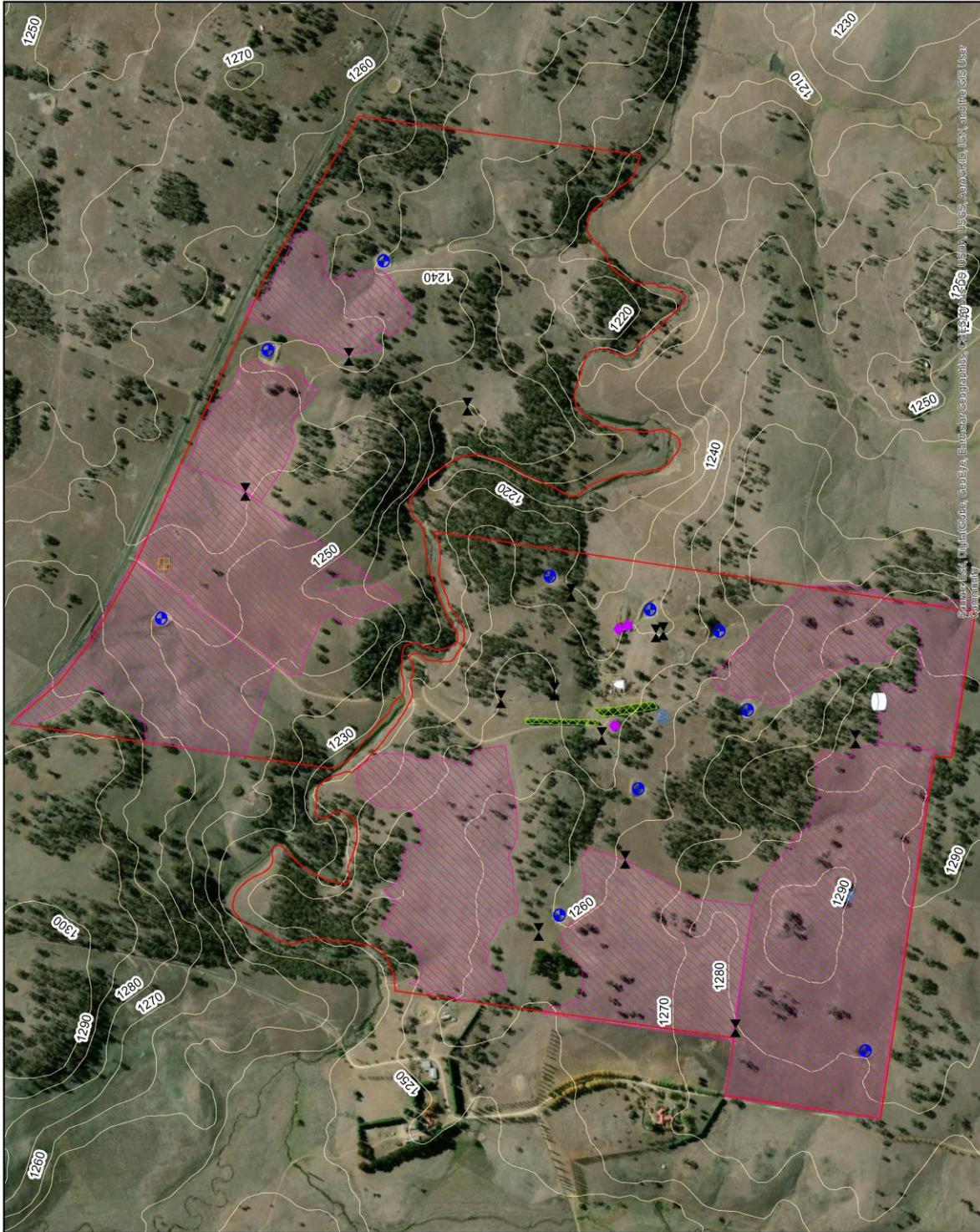
- Brookfield Cadaster Boundary
- Previous Improved Pastures
- Tree Lines
- Cattle Yards
- Dams
- Gates
- House
- Old Sheds
- Tank
- Troughs
- Contours



1:9,500

Source: Data used may include NSW Land and Property Information - Towns, parks and forests, NSW Dept of Industry - Administrative boundaries, Includes material © CNES 2009, Distribution Spot Image S.A. France, all rights reserved

Prepared By: stevenjn  
Date: 26/02/2020



# Map 3 "Brookfield" Land Capability



Property Planning Competition

'Brookfield'

Map 3

Land Capability

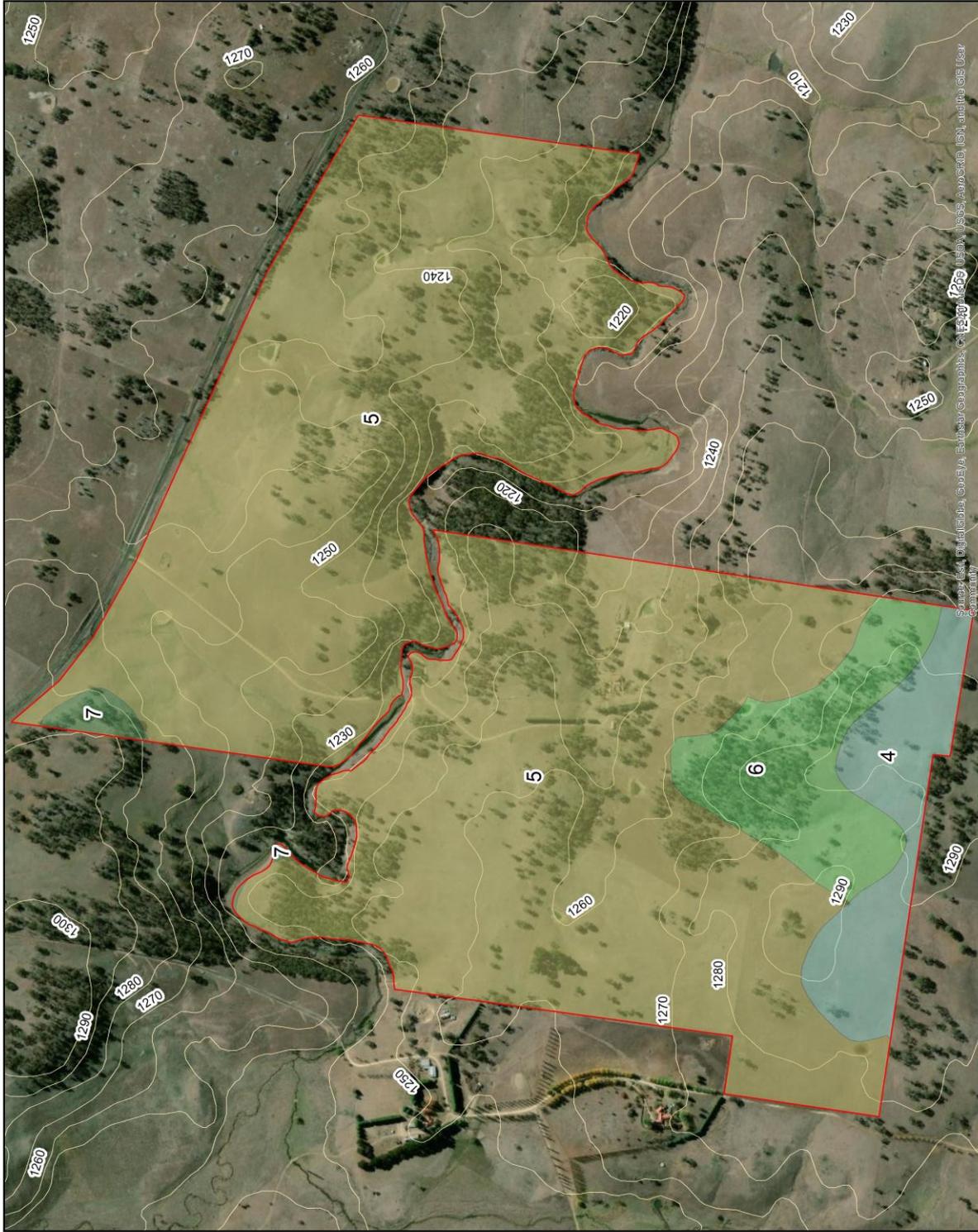
**Legend**

- Brookfield Cadaster Boundary
- Land Capability Class 4
- Land Capability Class 5
- Land Capability Class 6
- Land Capability Class 7
- Contours



Source: Data used may include NSW Land and Property Services, NSW Dept of Industry - Administrative Boundaries, Includes material from the Australian Space Agency, all rights reserved.

Prepared By: Stevenjin  
Date: 26/02/2020



# Map 4 'Brookfield' Student Map

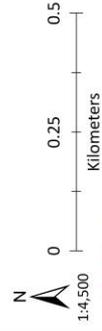
## Property Planning Competition

### 'Brookfield'

### Map 4 Student Map

#### Legend

- Brookfield Cadaster Boundary
- Contours
- Drainage



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Author: Johnella Shivers  
 Image Date: 2016  
 Date Created: 31/01/2020

## Appendix 2 - Vegetation Species List

### Common flora found on and around Brookfield (including planted tree lines)

Botanical Name	Common Name
<b>Trees</b>	
<i>Eucalyptus dalrympleana</i> subsp. <i>heptantha</i>	Mountain gum
<i>Eucalyptus nova-anglica</i>	New England peppermint
<i>Eucalyptus pauciflora</i>	Snow gum
<i>Eucalyptus viminalis</i>	Ribbon gum
<i>Eucalyptus stellulata</i>	Black sallee
<i>Eucalyptus acaciiformis</i>	Wattle leaved peppermint
<b>Shrubs</b>	
<i>Acacia filicifolia</i>	Fern-leaved wattle
<i>Acacia dealbata</i>	Silver wattle
<i>Acacia melanoxylon</i>	Blackwood
<b>Groundcovers</b>	
<i>Themeda australis</i>	Kangaroo grass
<i>Bothriochloa macra</i>	Red grass
<i>Sporobolus creber</i>	Slender Rat's Tail Grass
<i>Poa sieberiana</i>	Snow grass
<i>Paspalum dilatatum</i> *	Paspalum
<i>Festuca arundinacea</i> *	Tall fescue
<i>Lolium perenne</i> *	Rye grass
<i>Phalaris aquatic</i> *	Phalaris
<i>Dactylis glomerata</i> *	Cocksfoot
<i>Trifolium pratense</i> *	Red clover
<i>Trifolium repens</i> *	White clover
<i>Nassella neesiana</i> *	Chilean needle grass
<i>Eragrostis curvula</i> *	African lovegrass
<b>Other plants</b>	
<i>Amyema</i> sp.	Mistletoe

\* denotes exotic species

## Appendix 3 - Fauna Species List

### Common fauna found on and around Brookfield \* Indicates introduced species ^ threatened species

Birds			
Australian pelican	Dusky moor hen	Pacific heron	Swamp harrier
Australian raven	Eastern rosella	Peaceful dove	Tawny frogmouth
Black duck	Eastern spinebill	Pee-wee	Wedge tailed eagle
Black-faced cuckoo-shrike	Eurasian coot	Pied currawong	Weebill
Black swan	Forest raven	Purple swamp hen	Welcome swallow
Black-winged stilt	Fuscous honeyeater	Red wattlebird	White bellied sea eagle
Blue-faced honeyeater	Galah	Reed warbler	White-browed scrubwren
Brown falcon	Golden whistler	Richard's pipit	White-faced heron
Brown honeyeater	Grey butcherbird	Ring-tailed possum	Willie wagtail
Brown songlark	Grey fantail	Rufous whistler	Wood duck
Brown thornbill	House sparrow*	Sacred kingfisher	Yellow-faced honeyeater
Brown quail	Indian myna bird*	Silvereye	Yellow robin
Corella	Jacky winter	Spur-winged plover	Yellow-tailed black-cockatoo
Crested pigeon	Kookaburra	Starling*	Yellow-rumped thornbill
Crimson rosella	Little friarbird	Straw-necked ibis	
Crimson robin	Little pied cormorant	Striated thornbill	
Dollarbird	Magpie	Sulphur crested cockatoo	
	Nankeen kestrel	Superb fairy-wren	
	Noisy friar bird		
	Noisy miner		
Amphibians			
Bleating tree frog		Eastern dwarf tree frog	
Eastern banjo Frog		Striped marsh frog	
Mammals			
Brown hare*		Short-beaked echidna	
Brushtail possum		Sugar glider	
Eastern grey kangaroo		Swamp wallaby	
Fox*		Various microbat species	
Koala^		Wallaroo	
Rabbit*			
Reptiles			
Eastern bearded dragon		Highland copperhead	
Eastern blue-tongue		Pale-flecked garden sunskink	
Eastern brown snake		Red-bellied black snake	
Eastern snake-necked turtle		Tiger snake	
Eastern water dragon			
Invertebrates			
Freshwater yabby			

## Appendix 4 – Student Entry Package

The entry package is available as a PDF and word document on the Northern Tablelands Local Land Services website. Students please use the entry package with your report. You can type straight into the word version.



**Schools Property Planning Competition 2020**

Name of School:

Name/s of Contributing Student/s:

Year level of Student/s:

Date Submitted:



Other funding options considered	<p>You have a budget to work from, however this is not limiting. Consider;</p> <ul style="list-style-type: none"> <li>- if your enterprise will generate extra income</li> <li>- other options for funding i.e. grant funding (not just from LLS)</li> <li>- you can go over budget if you have reason for it and you can stay well under budget also (this is just a guide).</li> </ul>
Monitoring and evaluation	<p>All good property plans include a strategy to monitor and evaluate the improvements that have been implemented to ensure they are in fact improvements. When thinking of what to monitor, it could be in relation to but not limited to; finances or cost: benefit ratios, natural resources, animal health and husbandry, water quality etc. Monitoring usually has timelines associated.</p>



Elements to consider when completing your Property Plan for *Brookfield*:

Consideration of Land Capability in Land Use and Management strategy recommendations	You have been given the Schools Property Planning Competition Manual in which the land capabilities have been outlined in there and the maps given have the approximate areas of the land capabilities.
Issues and hazards addressed	For your 'Brookfield Property Plan' please think of and address any issues or hazards associated with the changes or in general. Note these and any relevant solutions or risks involved.
Enterprise selection and suitability and Marketing options	<p>When deciding on your plan consider if your enterprise selection is suitable for what the landholders' aims, values and goals are. If you decide that your plan will be intensive, cell grazing, free range moose meat production, consider;</p> <ul style="list-style-type: none"> <li>- The level of labour needed, and if your enterprise will generate enough income to employ the labour required?</li> <li>- Consider if there is a market for moose meat in the local area or if you will need to find export options and transport etc.</li> <li>- Consider other technologies that will help with your enterprise and the aims, goals and values.</li> </ul>
Consideration of land manager's conditions	Consider yourself contracted to deliver a working, feasible property management plan for the Savage family and Brookfield. Consider their goals, aims and values and also consider that they are absentee landholders living in another state and visiting sporadically throughout the year. Don't limit yourself with traditional thinking, think outside the box.
Legal consideration accounted for	All properties in NSW need to understand and account for any legal considerations. For example, if you are looking to sow down a new pasture in your plan to rejuvenate a paddock for your moose, then please consider your legal constraints.
Biosecurity and Emergency Planning	Everyone in the region has seen the devastation of the prolonged drought and the bushfires. Properties such as Brookfield need to be prepared for these events and with the Savages being absentee landholders, they need to be highly organised and equipped with forward planning, for such events. They also need to be up to date with their biosecurity. Are there any technologies that can help them? What are the legal requirements to consider? Allow for these in your plan.



Your plan for *Brookfield* should include the following:

**1. Brookfield Property Plan**

This is where you outline your changes, and implementation of improvement/changes. Don't forget that the plan will be for the next 5 years and can be put into stages if necessary.

**2. Risk Analysis**

All good plans include a risk analysis to ensure that the changes and the impact of them on the business are understood and accounted for. A risk analysis will determine which risk factors would potentially have a greater impact on your enterprise and therefore must be managed by the landholders with these factors in mind. There are many different types of risk analysis. Choose one that works for you and your changes. Below is a guide for a SWOT analysis.

Internal	<b>Strengths</b>	<b>Weaknesses</b>	Internal
External	<b>Opportunities</b>	<b>Threats</b>	External



3. Overall budget and timeline

Your budget for 'Brookfield' is \$200,000 over 5 years. Please outline how much of the budget will be spent on what changes and indicate these on the timeline. Don't forget to include the costs of contractors if they are big jobs that can't be completed while the family is on the property. Below is a sample table. Please feel free use another format if you wish.

Year	ACTION	FINANCIALS (Start Up Budget \$200,000)		
		INCOME	EXPENDITURE	PROFIT/LOSS
Year 1 2020				
Year 2 2021				
Year 3 2022				
Year 4 2023				
Year 5 2024				
Year 6-10				



5. References

In the Property Planning Competition Manual there is a great deal of information, but it isn't the only source; consider other options for information, including people and please reference all information used.

4. Maps

The plan needs to be put onto a map. There are mapping guides in the manual to help you. You need to have at least one map to represent your plan, however, don't forget you can zoom in to show exactly what your technical ideas are. These can be added here or attached.



Property Planning Competition 2020 - Brookfield - Marking Criteria

Criterion	Not Done: 0	Consideration Given: 1-2	Adequate Standard: 3-5	High Standard: 6-8	Score
Enterprise selection and suitability, marketing options with consideration to the landholder's considerations.	No information presented to show enterprise selection or marketing. No consideration given to landholders aims.	Irrelevant or inappropriate enterprise selection or marketing, no reasoning. Some consideration given to some aims.	Appropriate enterprise and marketing selection. Relevant and adequate explanation. Some consideration given to all aims.	Appropriate enterprise and marketing selection. Innovative ideas demonstrated that meet the requirements of the landholder and high level of consideration shown for all aims.	
Consideration given to 'elements' table, where changes were made.	No consideration given to elements.	Some consideration given to some elements.	Some consideration given to all elements.	High level of consideration shown for all elements.	
Risk analysis and understanding of risks associated.	No risk analysis or discussion addressing risks.	Inappropriate risks analysed.	Appropriate risks analysed addressing some issues.	Through risk analysis addressing all risks associated.	
Budget and timeline.	No consideration of budget or timelines.	Some consideration of budget or timelines.	Some consideration of budget and timelines of some improvements.	High level of consideration given to outlining the budget, and any income generated. Timelines of all improvements.	
Report presentation of the plan.	No effort shown, poor presentation.	Some effort shown to present report.	Report presented clearly with some effort made with presentation.	Report presented very clearly and to a high standard with effort made with presentation.	
Map presentation reflecting the plan.	Not included, poor presentation.	Some effort shown to present map.	Map presented clearly with some effort made with presentation.	Map's presented very clearly and to a high standard with effort made with presentation.	
References.	No references provided.	Some references provided but irrelevant resources used.	References given to use of resources. Relevant resources used but not referenced.	List of all relevant resources mentioned, and references given.	
Comments:					Total: .../56



For further information please contact:

Jhonnelle Stevens on mobile 0409 791 619 or email [Jhonnelle.Stevens@lrs.nsw.gov.au](mailto:Jhonnelle.Stevens@lrs.nsw.gov.au)

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Meat and Livestock Australia (MLA)

University of New England (UNE)

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