



How Mitchell grass pastures change within and between years

Pasture change throughout the year

Mitchell grass pastures exhibit a **short flush of growth** in response to summer rainfall, **mature quickly** and **progressively decline** in quality through winter and spring. Provided there is sufficient soil moisture and temperatures are $>15^{\circ}\text{C}$ overnight and $>20^{\circ}\text{C}$ during the day, **Mitchell grass can respond to rainfall at any time of year**. The 6-8 week growing season typically finishes by late April/early May.



Broad leaf plants (i.e. forbs, herbage and legumes) grow throughout the year, forming a **valuable component of small ruminant diets**. Southern areas of the grasslands more frequently experience **effective winter rainfall** that promotes the growth of winter forbs. Forbs will respond to $>40\text{mm}$ rainfall any time of year.

In Mitchell grass country **>90% of the total annual forage production** occurs between **October and April**.

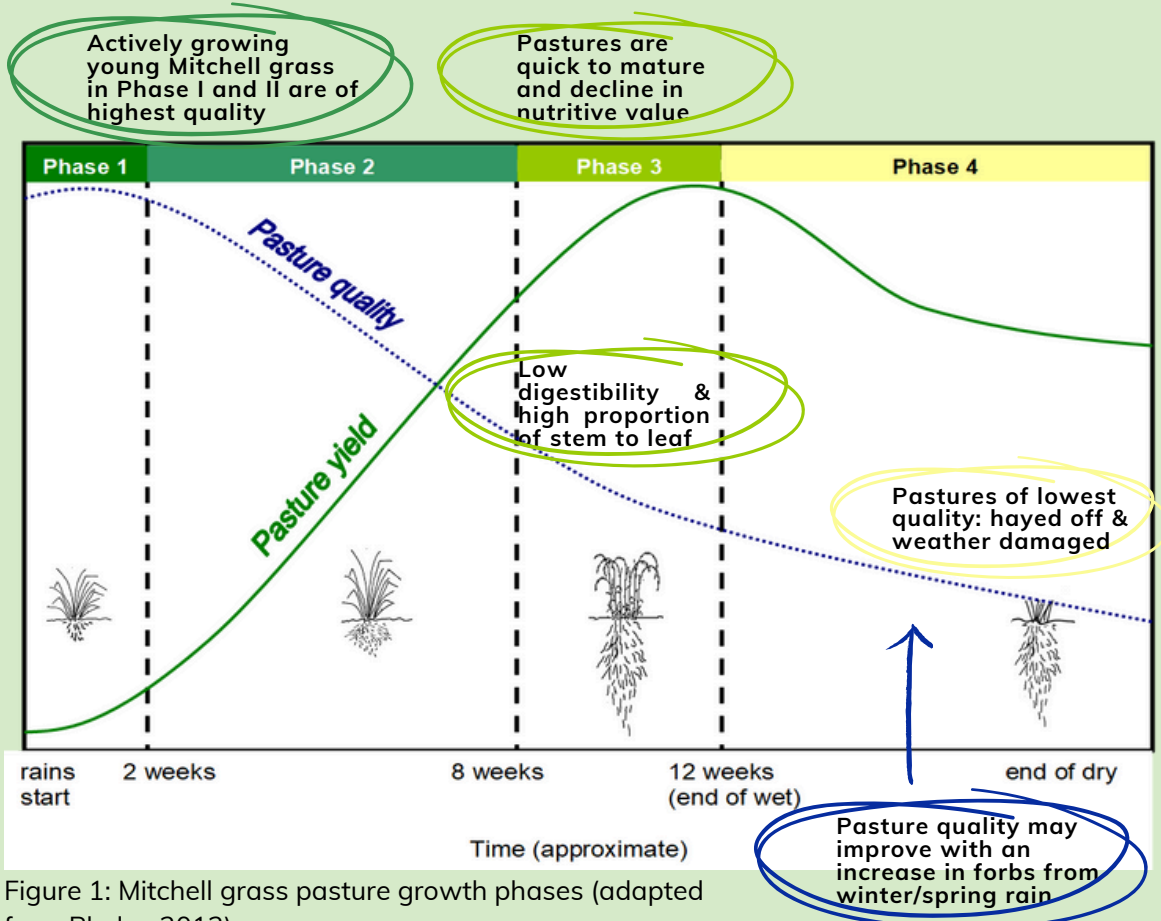


Figure 1: Mitchell grass pasture growth phases (adapted from Phelps 2012).

The **amount of rainfall and how it falls drives botanical composition** (i.e. the mix of species in a pasture) and **dry matter yield** in Mitchell grass pastures. Temperature and day length are also important.



Diversity

An **early start** to the season generally produces a **perennial grass dominant pasture** whereas a **later start** to the season typically produces a pasture with a **higher proportion of forbs** and **less grass bulk**. **Low summer rainfall followed by above average winter rainfall** tends to produce a pasture with a **wide variety of summer and winter forbs amongst perennial grasses**.



Quality

Pasture quality is tightly linked to **species diversity, soil nutrients, stage of plant growth, and damage to the pasture.**

Forbs improve the quality of the diet selected by stock, with a **higher nutritive value and digestibility** than grasses.

Rainfall and root competition drive botanical composition. With a high **competitive ability** for moisture and light, perennial grasses in **high abundance and basal cover** results in a **reduction of forbs and annuals.**

Pasture changes between seasons

- Pasture composition typically **varies more from seasonal rainfall** than grazing or paddock treatments aimed at improving forb content (i.e. burning).
- The timing of **immediate past rainfall** determines the **abundance of annual grasses and forbs.**
- The **previous 1-3 years of summer rainfall** determines the **abundance** and basal area of **perennial grasses.**
- Multiple seasons of above average rainfall increases Mitchell grass seed set, germination & seedling survival. Dominance of perennial grasses reduces the proportion of forbs & annual grasses.
- Heavy grazing decreases perennial grass cover and increases annual grasses, forbs and undesirable species indicative of a pasture declining in condition.

Periodic events that can **reduce the quality and quantity** of pasture include:

- spoiling rain
- frosts
- flood or fire
- invasion of weeds (e.g. sticky florestina)
- plagues (e.g. rats, locusts and grasshoppers).

To an extent, **management can reduce susceptibility** to some of these risks.

Protein droughts

Can occur after two or more wet years following a dry period, when available **soil nitrogen has been exhausted.** An **extended winter growing season** with high abundance of forbs **exacerbates this** as they extract larger quantities of nitrogen from the soil.

Look out for **paler grasses** and **livestock not performing** as expected (poor growth rates and lambing rates) after a run of good seasons.

A note on drought

Intense periods of drought **decreases basal area** of perennial grass tussocks and **increases the death of tussocks.** Consequently, after effective summer rainfall is received, tussocks have a **reduced ability to compete** for soil moisture giving **forbs, annuals or less desirable perennials** the chance to flourish. Pasture composition is a factor of temperature, supply of viable seed, the **overcoming of dormancy mechanisms** and **specific germination requirements** (e.g. light) being met. There is not a clear progression of species in the seasons following drought but rather 'opportunistic' flushes of species.

