



Information Sheet 4

Grazing Fundamentals

Summary

- Diversity is the key to a healthy soil and therefore healthy plants and animals.
- Diversity means greener leaves for longer to capture sunlight and use moisture (rainfall).
- Leaf Emergence Rate (LER) is a great tool for calculating recovery time.
- Grassland (grazing ecosystems) co-evolved with grazing animals!

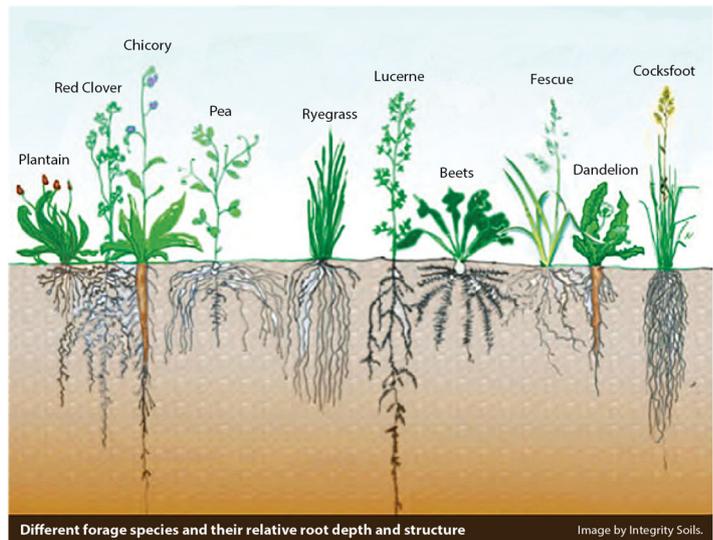
Diversity effect

On a grazing property, it's about capturing sunlight, using rainfall when it occurs and, through photosynthesis, transferring energy to the soil and stock. This relies on having pasture plants able to respond all year round. In the Macedon Ranges, having a broad range of deeply-rooted perennial species, winter (C3) and summer (C4) active plants means that when rainfall occurs the soil has green plants that are able to respond.

Having a diverse range of plant species within the grazing ecosystem also supplies the soil with a diverse spectrum of energy. In turn, the supply of nutrients from the soil is spread, with different species requiring different nutrients and minerals at different times. A diverse pasture sward will have a diverse range of root depth, structure and activity. (Diagram (right) thanks to University of Vermont.)

This diversity above ground is multiplied by a much larger factor in the diversity below ground, as fungi and bacteria have a steady supply of carbon (energy).

Grasslands have evolved with a diverse range of plants. Traditional monoculture farming shows that diversity begins to occur anyway ('weeds'). With only limited research being conducted with diverse species (greater than 10 species) in a grazing context, the research indicates that in environments where low applications of fertiliser are used, productivity is increased where there is a greater mix of species when compared to low diversity situations. Researchers have explained these results by the soil nutrient cycle being active for longer and combining this with a longer growing season. Anecdotally, in diverse grasslands, attacks from bad fungi, bacteria and insects are also lower resulting in longer periods of persistent and productive growth.





Growth rates

Often quoted in agricultural publications and websites is the ‘average’ growth rate for pasture. There is limited data for the Macedon Ranges and this historical data often does not reflect a diverse, dense and **properly grazed pasture**. (See Appendix A for an Estimated Growth Rate Range as a guide.)

Growth rates can vary considerably across a property, let alone a district. Suffice to say, growth rates of a well-managed diverse pasture will be the highest in spring and decrease through summer (but not to zero – as deep-rooted perennials and C4 plants, with some rainfall, will continue to grow). In autumn, as temperatures fall and soil moisture increases, growth will be around half of the peak in spring, and growth will fall in winter. Knowing the growth rate of your pastures helps with feed budgeting or forward planning. It can help you identify when you may need to decrease stock numbers, supplement stock with additional feed (such as hay) to ensure you don’t overgraze the pasture and ensure you maintain good groundcover. **Growth rate does not help with grazing recovery time.**

The LER is important in understanding the recovery time. As stated earlier, **leaf emergence is driven by temperature and moisture only**. Understanding both the growth rate of your pastures and the LER will help to better manage an animal-based pasture system. Balancing the recovery for a diverse pasture is about a compromise, as not all plant species will be mature at the same time. As each species has a particular temperature and moisture that will result in its peak LER. As shown, with the grass species in the table, each species has its own particular vegetative leaf maturity.

Grazing Management Summary			
<small>(adapted from a presentation by D. Donaghy with additional work by Nie et al. on Australian native grasses)</small>			
Species	Vegetative Leaf Maturity	Leaf Maturity for Grazing	Post-grazing (cm) residual height
Broome Grasses (i.e. Prairie)	5	~4	4-5
Cocksfoot	6-7	~4	4-5
Kikuyu	5	4-5	4-5
Phalaris	4	3-4	4-5
Ryegrass	3	~3	4-5
Tall fescue	4	~3	4-5
Wallaby grass	3-4	~3.4	~5
Kangaroo grass	4-5	~4.4	5-10
Weeping grass	4-5	~4.2	~5
Red-leg grass	3-4	~3.8	~5

Grasslands co-evolved with grazing animals

Managing a multi-species pasture is more than complicated it is complex, then adding animals and their changing needs to the equation can compound this complexity. Can using the mower or just leaving the area alone do as good a job as grazing animals to restoring soil health?

The simple answer is no.

The use of animals is an essential part of restoring soil health and putting carbon back into the soil. The animals add the important part, recycled nutrients (poo and wee). Animals have a fermentation vat called their gut/s. Within this vat is a multitude of bacteria that are working to break down the cell walls of their food to access the energy they contain. The by-products expelled by the animal are not wasted, as this supplies energy to a diverse range of soil animals, fungi and bacteria while replenishing the soils fungi and bacteria stocks from the gut. The soil is alive, and critically building soil while capturing and storing carbon.



By trampling and movement, animals also force leaf material contact with soil, supplying another energy source to the soil biota. Animals also break the hard, dry and lifeless soil crust, particularly where there is bare soil, creating a conducive environment for the higher evolved grassland plant to grow.

A grazing regime should ...

Hopefully by reading and understanding the principles of how pasture species grow and interact, this information can be implemented in a grazing regime that results in:

- a diverse grassland, with multiple species of bunch, stoloniferous and taproot plants
- grasses and forbs
- a variety of perennial C3 and C4 species
- density, i.e. over 80 per cent ground cover
- and hence have green leaves converting solar energy all year.

If a landowner, large or small, can always be thinking and following these few fundamental principles, positive results will follow:

1. Grazing is not a recipe, but requires thought, knowledge and observation.
2. Grazing should occur when most plant species are close to vegetative leaf maturity (energy levels restored).
3. Grazing an area should not exceed three days (ideally only 24 hours).
4. Grazing should attempt to leave 4-5 cm post-grazing residual (of desirable perennial species).
5. A pasture of a diverse species of plants extends the green feed available for stock.
6. The grazing animals' wellbeing is supported by a diet that is diverse and close to vegetative leaf maturity.
7. Grazing is about feeding the soil as well. It is not only about growing plants for stock above the land, but also the capture of solar energy by plants, which through a complex range of interaction with the soil produces nutrients for animals.

From your understanding of the principles of how grassland species grow and interact, you can trial, learn and adapt a grazing regime that will work on your property to produce a healthy grazing ecosystem. Focus on looking after the desirable perennial species.

For more information, email environment@mrsc.vic.gov.au or call 5422 0333.



Appendix A

Estimated Growth Rates for Macedon Ranges.

Importantly – grazing regime effects growth rate dramatically.

Please note: the table begins in April.

Pasture Growth rate Species and/or grazing regime	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Poor	5	5	5	2	10	15	25	25	2	0	0	0
Average	10	17	10	2	15	30	38	30	5	5	5	0
Good	20	20	15	10	20	40	60	60	20	10	5	5
Good with strong summer species %	20	17	10	8	15	30	55	55	20	15	15	15

Pasture growth is dependent on the timing and volume rainfall; i.e. rainfall, or lack thereof, can dramatically change growth rates.

The estimates stated above will give a total for the year range.

Pasture Quality	Yearly Total Range (Tonnes of Dry Matter per Hectare – tDM/Ha)
Poor	2½ to 3½
Average	4 to 6
Good	7 to 9
Good with strong summer species %	7 to 9