Macedon Ranges Shire Council

Information Sheet **3**

Pastures – Grazing Regime Effect

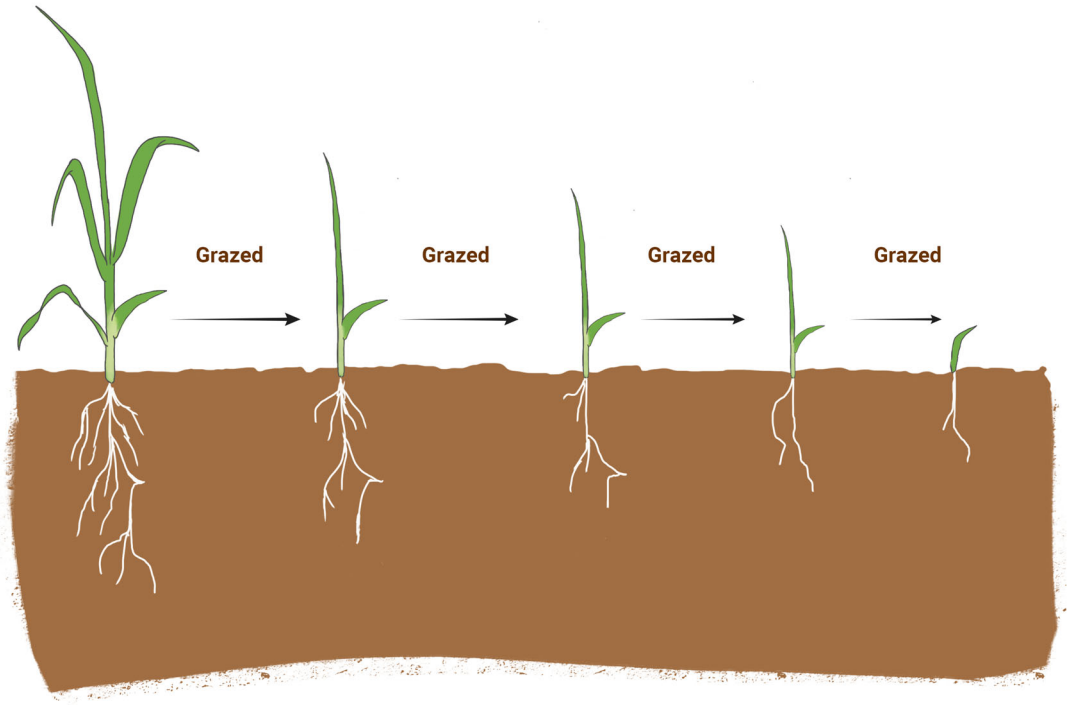
Summary

- Grazing pastures has no right or wrong, just consequences.
- Understanding recovery time and grazing height is critical for maintaining resilient perennial plants.
- The wellbeing of grazing animals is affected by nutrients ingested at different stages of pasture recovery.

Grazing animals

All grazing animals selectively graze plants, there are plants that they prefer and some they would rather not eat unless they are really hungry. The animals will also reject certain plants if they have been urinated on, too close to poo or soiled in some other way. Areas grazed will not have all the plants at the same height. The aim when grazing is to have less than 30 per cent of the pasture in clumps (which are higher than the targeted grazing height) and not too much area grazed below the target height.

The effect of grazing: quick (recovery too short)



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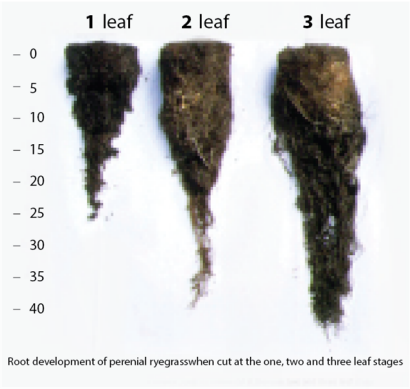
This diagram demonstrates the effect of a recovery period that is too short. As conveyed in previous information sheets, pasture plants use energy stored to grow the first leaf and to release energy into the soil, signalling to the soil biota that the plant will require nutrients. If grazing occurs again before the plant has been able to restore its energy stores, (fully recovered), the plant will again release stored energy through the roots and use energy to grow leaf – this time, growing a smaller leaf due to having less energy available and a smaller root system to access nutrients. A small leaf results in a smaller solar panel for growth, resulting in a smaller plant overall. This smaller and shallower root system is therefore unable to access as much moisture and nutrients and becomes less resilient to stresses. In a grazing regime that has animals able to graze a particular area for longer than two to three days, the animals are likely to regraze the plant resulting in overgrazing.

This picture (right) from Evergraze shows the root system of a ryegrass plant repeatedly cut at 1 leaf stage, 2 leaf stage and the largest root mass and depth at 3 leaf stage.



Root development of perenial ryegrasswhen cut at the one, two and three leaf stages

Another effect of set stocking OR a short recovery OR grazing which results in animals accessing an area for longer than three days is that the plants energy balance is affected and is going to reduce the number of daughter tillers. This lack of recovery time is often how perennial plants become less persistent in a pasture. An occasional grazing that occurs too quickly can be overcome, as the plants stored energy as well as the supporting soil biota will assist the plant's recovery.

Grazing too quickly also affects the nutrients ingested by grazing animals. Studies in a variety of C3 grasses and in clover have identified that in an immature plant (first leaf stage) the plant levels of nutrients, nitrogen, phosphorus and potassium are too high for grazing animals while nutrients such as calcium, magnesium and sodium are too low. As the plant reaches maturity (i.e. fourth leaf tall fescue), calcium, magnesium and sodium levels rise to those appropriate for grazing animals and the nitrogen, phosphorus and potassium fall to a healthy level. Appropriately balanced nutrients greatly assist the grazing animals' productivity and wellbeing.

To measure the recovery period for a diverse pasture species range of C3 and C4 plants can be difficult. The process is to evaluate a range of desired species and multiples of those plant species in the pasture. This may mean looking at 20 or more plants. In evaluating if a plant has fully recovered, all the green leaves should have a pointed tip and the remnant which is dying has a blunt tip. Viewing the blunt tip is to ensure the plant was grazed last time the livestock were in the area. The complexity in judgement of a recovery period occurs in diverse species pastures as some plants may be dormant, becoming dormant or coming out of dormancy. For example in winter, the C4 plants (i.e. kangaroo grass) will be dormant, hence assessed differently to C3 plant (i.e. wallaby grass) which will be green and growing, and that will reverse in the summer. The idea is to aim for a balanced recovery period, so that all the desired plant species, that are not dormant, have fully recovered between grazing.

The effect of grazing: slow (recovery too long)

Recovery periods that are too long can also change the grasslands, resulting in less diversity of species. This long recovery is favoured woody plants (i.e. blackberry, gorse, briar rose). The effect of recovery periods that are too long:

1) Light does not reach the base of the plant. Aerial tillering occurs and thinning out of plants resulting in more bare earth. Bare earth can allow annual plants and other weeds to establish

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2) As the pasture plant reaches leaf maturity the plant will reach an equilibrium of new leaf growth and leaf decay of the oldest leaf. This decay is a less efficient transfer of carbon compared to sugars released from roots. It is estimated that 70 per cent of carbon entering the soil in a grazed grassland is from the release of sugar (exudates) via the plants roots rather than the decay of plant material on the soil surface.

The effect of grazing: low (post-grazing residues below 4-5cm)

Grazing a tufted plant too low, below 4-5cm, diminishes energy for regrowth (as described in Information Sheet 2). Grazing on stoloniferous and taproot plants that removes or damages stolons and taproots will also affect their ability to regrow.

Some grassland species are better adapted to grazing pressure below 5cm, such as stoloniferous and taproot plants, which have their energy stores closer to the ground as long as they have had enough recovery time. Some tufted species, such as phalaris and brome grass, have adapted and will protect the base of the plant by having a lot of fibrous material. A lot of native grasses and ryegrass are palatable to grazing animals below 5cm, hence are selectively grazed. Ryegrass can be seen to adapt, in sheep pasture in particular, by growing flat (out sideways) in an attempt to persist in pasture. This adaption means valuable solar energy is captured rather than hitting bare soil, but is a significantly less efficient process than having a denser, more upright pasture.

The effect of grazing: high (post-grazing residues above 7-8cm)

Grazing which leaves a majority of pasture higher than 7-8cm–for Macedon Ranges pasture species (not subtropical species)–is considered high. High residue means that the plant's energy stores are not impacted. On the other hand, high residues result in sugars that could have been used efficiently by grazing animals or soil biota being used in plant elongating and to create more complex carbon structures (fibre). Examples of this low efficiency are:

- In dense pastures, a high residue height will not allow sufficient light to the base of the plant. Pasture species' growing points, from which the leaves start growing, rely on light hitting them for leaf growth. If light does not reach the growing point (at the soil interface), the plant will elongate and move this growing point higher, resulting in the previously described aerial tillering. Elongation uses energy to create fibrous plant material to allow the plant to stand taller.
- The new leaf which starts its growth from the growing point has to grow up through the longer residue, creating more fibrous material, before it emerges into sunlight and starts photosynthesis.

Often, with higher grazing, animals have a greater ability to selectively graze preferred species of plants. Through this selective grazing, these highly palatable plants are put at a disadvantage to the plants around them that have been able to maintain leaf and root biomass. Plants such as the highly palatable native grasses in particular are affected by this selective grazing. A decrease in diversity can occur.

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Table 1: Effect of different grazing

Negative	Positive
Effect of continual quick grazing either through set stocking or short recovery	
Results in less pasture grown, as the plant does not reach its “phase 2” growth	Can consume growth that maybe lost due to flood
Mineral within feed for grazing animal out of balance, i.e. low in calcium and magnesium, too high in potassium and nitrogen	Can be used to minimise growth, i.e. graze around house and other infrastructure as a fire protection strategy
It can also lead to feed shortages, e.g. spring growth ends quickly	
Effect of continual grazing to low (post-grazing residues below 4-5 cm or 1500kgDM/Ha)	
Removes energy reserves of plant, decreases productive growth	Allows light to base of plants
Bunch plants either adapt (to become more prostrate and less productive) or perish	A greater percentage of stoloniferous and taproot plants in pasture
Decreased root mass, decreased access to soil nutrients and moisture. Less resilient.	
Effect of continual grazing to high (post-grazing residues above 7-8cm or 1800kgDM/Ha)	
In dense pastures, it can restrict light penetration to the base of plants. Aerial tillering more prevalent.	More leaf grows more leaf. For two or three rotations this can be effective
The plant converts energy into more fibre material to grow higher, hence decreased efficiency in conversion of sugars (carbon) by animals	
Effect of continual grazing too slow (recovery periods too long)	
Favours bunch type pasture species	Plants have deep root systems
Canopy closure (plants leaning over) letting less light to base of plant where the growing point is, which can affect tillering and increase fibre level	Allows easier feed budgeting which can decrease reliance on made/purchased feed
Can create environments for less beneficial and efficient fungal (rust) and bacterial activity	Animals would have a consistent diet
Root systems are not regularly expelling sugars, and therefore not as much carbon as possible, into the soil. This could also affect soil biota composition	
Less vegetative leaf and more fibrous material resulting in low nutritional feed for animal	
Often allows woody weeds to establish	

kgDM/Ha = Kilograms of Dry Matter per Hectare

See Information Sheet 4 for a grazing regime that finds a balance.

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

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