

## Section 2.6: Soils and Pastures

### WHAT IS THE ISSUE?

The history of soil conservation in Australia goes back to colonisation when the “unusual quality and friability of the soil” was reported (Pascoe 2018). In western Victoria, “The ground had been so protected by mosses and lichens it was difficult to ride across country...”. However, “with the onslaught of the sharp little hooves and teeth of the herbivore sheep, goats, pigs, and cattle driven by the settlers, the ground covers were destroyed, and the dews ceased. Once the soil hardened, rains ran off the compacted surfaces, and rivers flooded higher than the Aboriginal people had ever seen”.

Ecologist, Joan Gibbs from the Adelaide Hills says that “ninety-seven percent of the biodiversity on earth is in the top 10 centimetres of the soil” and that “if we ignore the soil, then we don’t get the whole system functioning”.

Grazing and crop production are affected by the quality of pastures and the type of soils. Vegetative cover and soil health will influence the quality of groundwater and run-off water entering watercourses. While a cover of grasses and herbaceous plants will filter run-off as effectively as perennial woodland vegetation, seasonal baring or overgrazing will lead to increased and more turbid run-off.

Perennial grasses (both native and exotic) provide more consistent vegetative cover than annual species. Native grasses are efficient water users and have higher biodiversity value than introduced grasses. The Adelaide Hills and Mt Lofty Ranges have lost 99% of the grasslands and 90% of the open grassy woodlands that were there prior to colonisation (A. Fairney, pers. comm., 2020).

The compaction of soils by livestock or machinery is a major factor in soil degradation. Excluding livestock and machinery from seasonally waterlogged areas will lessen this impact.

In an intensive grazing enterprise (where the maximum carrying capacity of a holding is approached or exceeded for part of the year), cell or strip grazing will maximise pasture productivity. The longer that livestock graze a given area, the more the pasture is trampled, and the soil compacted. Overstocking can result in issues such as low feed, high feed bills and animals in poor condition. Along with this it can also bring bare paddocks in summer and autumn. Excess grazing pressure can create bare soil and expose the soil surface and result in issues such as erosion, poor soil structure and weed invasion.

There is often a fine line between what is a drainage line and what is a watercourse. The management of pasture within minor watercourses, 1<sup>st</sup> and 2<sup>nd</sup> order, should consider the seasonal sensitivity of such areas. A property fenced to **land class**, or the use of temporary fencing, can relieve pressure on seasonally waterlogged areas or drought affected areas. Refer to Appendix 1 for Land and Soil Capability Classes. Note: Class VIII “includes beds and banks of streams”.

Vegetative cover (70%) is an essential factor in the maintenance of healthy soils (Costin 1991). Refer to Information Sheet – Analysis of green Warm Season Native Pasture and Pasture Establishment & Management Datasheet.

Natural mulch is important in maintaining soil micro-organisms and in returning nutrients to the soil. However, with intensive use, the maintenance of productivity will require the introduction of various elements. Soils should be monitored for essential elements (N, P, K), pH, trace elements and salinity to ensure that they remain productive. This approach is the best way to address the chemical needs of the soil.

Soil and pasture may be impacted after a bushfire event such as soil erosion and loss of pasture and weed invasion will be likely in these pasture fire affected areas.

## HOW DOES IT AFFECT YOU AND YOUR CATCHMENT?

The maintenance of pastures should reflect the carrying capacity of its soil, land class and water resources.

A significant threat to agricultural production in the Mount Lofty Ranges Watershed is acid soils. High soil acidity (low pH) will lead to the leaching of nutrients (including trace elements) and may result in the degradation of riparian environments and water quality. The development of toxic acid sulphate soils in low lying areas may occur in certain geological provinces.

Testing of soil **amelioration** for heath, pH and nutrient levels may be necessary to gauge an understanding of your soil's heath and capacity. A food web test will focus on the drivers of soil health which can be made up of billions of bacteria, actinomycetes, fungi protozoa and nematodes, while a general soil test will determine your soils pH (acidity/alkalinity) and nutrient levels and therefore assist in deciding what applications can be applied to improve deficiencies.

Productivity often means the export of alkaline products (fodder, manure, crops and livestock) off the land. Managing acidification, particularly in already acid soils, involves the conservation of alkaline materials or their introduction through the application of products such as lime ( $\text{CaCO}_3$ ). Expert advice should be sought before treating your soils. Liming is not advised for native grassland pastures.

The application of fertilisers may be useful in treating other identified soil nutrient deficiencies, while application of organic is another approach.

The use of native pastures, instead of traditional pasture types may be appropriate for your property. A typical pasture mix (e.g. Southern Horse Mix) which is a combination of  $C_3$  (winter active) and  $C_4$  (summer active) grasses, consists of Weeping rice-grass, wallaby, wheat, and Windmill Grass. Native pastures typically respond to nitrogen but

not phosphorus which reduces the use of traditional fertilising applications. Native grass species are almost always growing in woodlands and grasslands of the eastern and western foothills and not usually found in the high rainfall forest. However, Weeping rice-grass and some wallaby grasses can still be found in the wetter central hills (R. Myers, pers. comm. 2020).

The term '**carrying capacity**' is sometimes used when referring to **stocking rates**. It is critical to get the numbers right for animal welfare, for maintenance of pasture productivity and for management of the natural resources. The term '**grazing pressure**' refers to the number of animals grazing an area of pasture for a limited time. Overall good management of the property will allow for more livestock while at the same time improving the condition of natural resources through: improving pasture, controlling weeds, improving grazing strategies, increasing soil fertility, combating soil acidity and matching livestock numbers to pasture productivity. Rotational grazing can also improve pasture productivity and the application of the appropriate dry sheep equivalents (DSE) will ensure both pasture and animals are kept healthy.

Mapping land classes shows where you can and cannot graze and allows fencing to land class which separates an agricultural area from biodiversity areas or of environmental value, such as a watercourse which may be prone to erosion or be an area of revegetation. You can also maintain a good perennial pasture cover in adjacent paddocks to increase water infiltration and decrease topsoil loss and pathogen loads into adjoining creeks. This will increase the quality of water which ultimately is being utilised on farms for stock water and further down our catchment for our drinking water.

The extent of damage to pastures and crops after a bushfire event will be evident over time and will depend on the type of burn, pasture species, fertility of the soil and rainfall, but action can be taken to prevent further damage, such as management of livestock and paddocks, and weed control. Planting native grasses mitigates bushfire

risks with its low fuel load (J. Gibbs, pers. comm 2020). The 'fuel load' per hectare of un-grazed native grassland is about two to five tonnes, compared to 10 to 25 tonnes per hectare of exotic grassland (A. Fairney, pers. comm. 2020). These exotic fuel loads are commonly seen on the roadsides of the Mount Lofty Ranges.

Effective soil conservation and sustainable productivity ultimately relies on an understanding of the dynamic relationship between soils, water, vegetation, and animals.

## MANAGEMENT OPTIONS

- Seek advice from experts on how best to achieve these goals.
- Familiarise yourself with the basics of soil and pasture biology.
- Monitor the health and productivity of your soils and pastures.
- Actively promote healthy and productive soils.
- Investigate and undertake soil testing methods to determine soil amelioration. Soil food web testing is available in South Australia.
- Apply appropriate soil amelioration to the suitable pasture situation to improve deficiencies such as organic (organic poultry or guano) or synthetic based fertilisers or/and products to fix soil pH.
- Do not overgraze your pastures.
- Adhere to appropriate stocking rates, carrying capacity and dry equivalents (DSE).
- Implement rotational grazing to minimise over-grazing and improve pastures.
- Fence your property to land class for grazing purposes and to minimise soil damage – fencing to land class.

- Fencing combined with pasture management of adjacent properties will improve watercourse (particularly quality) and catchment health.
- Exclude livestock from seasonally waterlogged areas or drought affected paddocks.
- Consider investing in native grass pasture application and production.
- Manage erosion and livestock after a bushfire with [stock containment areas](#).
- Monitor and control weeds after bushfire event and as part of your general property management regime.

## FURTHER RESOURCES

### Landscape SA documents & websites:

[Best practice land management guidelines for small grazing properties](#) (2017)

Landscape SA Boards -

<https://landscape.sa.gov.au/hf/find-us>

[Managing soil and pasture](#)

[Land, livestock and pasture care after fire](#)

### Other resources:

[Agriculture Victoria website – Farm recovery after a bushfire](#).

Coopers Farm Supplies of Mt Torrens or Mt Pleasant -

<https://www.coopersfarmsupplies.com.au/>

Primary Industries and Resources South Australia (PIRSA) - <https://www.pir.sa.gov.au/>

PIRSA - [Soil Consultants](#)

Local livestock consultants (e.g.

<https://eldersrural.com.au/livestock/>)

Seeding Natives Incorporated -

<https://www.seedingnatives.org.au/>

### Other resources:

Soil Foodweb Institute -

<https://www.soilfoodweb.com.au/>

### Datasheets provided:

*Soils of the Mount Lofty Ranges*

*Pasture Establishment and Management*

*Perennial Pasture Native Grasses – Grassland  
Establishment and Management  
Information Sheet - Analysis of green Warm  
Season Native Pasture*