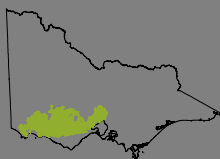




Victorian Volcanic Plains Native Vegetation Management Guide

Reducing Soil Disturbance

Native Grasslands and Grassy Woodlands



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Summary

- Soil disturbance is a major cause of native grassland and grassy woodland decline on the plains.
- A surface crust of lichens, mosses, and algae provides habitat and is important for soil health.
- Many factors can disturb the soil including ploughing, earth works, vehicles and machinery, stock-piling and rubbish dumping, livestock, rock removal, as well as fertilisers and herbicides.
- Soil disturbance is the major contributor to weed invasion.
- Activities that create soil disturbance can destroy habitat for small animals.
- After soil disturbance, some rehabilitation may be necessary.

The importance of the soil habitat

Soil disturbance is one of the major causes of native grassland and grassy woodland decline. The soils of the Volcanic Plains that support these vegetation communities have evolved over millions of years and were formed from rock created by the lava flow of many volcanoes dotting the plains.

The typically poorly-drained black or grey clay soils of low-lying areas on the plains often crack as they dry out in summer. Many indigenous grassland plants have developed strong rope-like roots to cope with these shrinking and swelling soils. Other plants have deep roots to access water that penetrates through the soil cracks during precious later summer and autumn rains. The soil cracks also provide small animals with shelter from the heat of summer and wildfires.

Rises on the plains are usually better drained and often have shallower red soils with columns of rock at the surface. Rock crevices are also important habitat. Many plants establish roots between rock crevices that hold water during dry periods. The plants are also protected amongst the rocks from close grazing. Rock crevices and loose rocks scattered on the surface of the soil provide habitat for small animals such as lizards, snakes, frogs, and dunnarts.

In many areas, the surface of the soil has an important biological soil crust. Soil crusts are a special association between a variety of lichens, mosses, liverworts, algae, and fungi with the uppermost layers of the soil. The crusts provide food and shelter for soil fauna, regulate the flow of water and nutrients through the soils, and insulate the soil surface. They can also fix nitrogen, convert carbon dioxide into soil carbon, provide a barrier against water and wind erosion, and help prevent weed invasion.

Preventing damage to the soil crust is one of the most important aspects of managing your grassy community.



What causes soil disturbance?

Soil disturbance is caused by anything that damages or alters the functioning of the soil crust, loosens or compacts the soil, changes drainage patterns, or removes surface habitat.

Small, isolated patches of disturbance such as animal diggings are expected in a natural grassy community. These sites can provide opportunities for new plants to establish in the patches. However, larger incidences of soil disturbance that impact on native vegetation and habitat are usually created by human activities.

Activities that disturb the soil in grassy communities can be divided into those caused by physical disturbance and those caused by chemical disturbance.

Physical disturbance can occur in a number of ways, including:

- Ploughing, grading, cropping, cultivation and ripping.
- Machinery and vehicle damage and compaction.
- Stockpiling, dumping and spreading of soil and other materials.
- Earthworks, utility works and roadworks.
- Heavy grazing by livestock (trampling and loss of vegetation cover).
- Livestock grazing during wet conditions (soil pugging).
- Animal digging or burrowing.
- Vegetation and rock removal.
- Inappropriate tree planting.
- Fence construction.

Chemical disturbance usually refers to:

- Application of fertilisers.
- Increased nutrient levels from manure of grazing livestock.
- Increased nutrient levels in water run-off from surrounding farmland or industry.
- Inappropriate or excessive use of herbicides, which damage vegetation and the soil crust.



Vehicle damage to a native grassland roadside.
Photo: DSE, Ballarat.



Stockpiling of soil and damage caused by roadworks on a native grassland roadside.
Photo: DSE, Ballarat



Illegal grazing of stock on native grassland roadside during wet weather, causing the pugging of soil.
Photo: DSE, Ballarat.



What are the impacts of soil disturbance?

Disturbance of the soil and damage to the soil crust can alter the function and species composition of native grassy communities.

Physical or chemical damage to the soil crust ultimately leads to the death of the component organisms (the lichens, mosses, algae etc.). Loss of the soil crust can then result in the loss of habitat, changes to water and nutrient regimes, and water or wind erosion.

In particular, the soil crust helps prevent the establishment of weeds. While numerous indigenous plants have seeds that penetrate or can germinate in the soil crust, many introduced species find it more difficult to grow through an intact soil crust. However, weeds can quickly invade a site once the crust is damaged, whether it was caused by physical injury or by being sprayed with herbicides.

Disturbance of the soil can also destroy existing native plants, creating bare ground and reducing competition. This in turn encourages germination and growth of weeds.

Soil compaction by machinery, stockpiling, or livestock trampling can also damage existing plants, change drainage patterns, and destroy the soil structure, which can reduce indigenous plant growth. Pugging of wet soil by hooves of livestock can also compact the soil and create small wells that keep their shape and hold water for some time. These moist pockets are ideal places for weeds to grow.

The addition of fertilisers increases nutrient levels and changes the chemistry of the soil to the disadvantage of indigenous plants, soil fungi, invertebrates and other soil life, while promoting weed growth.

Native grassy communities provide important habitat for many small animals that use grass tussocks and inter-tussock spaces, soil cracks and holes, leaf litter, logs, and surface rocks. Damage to these features on and in the soil removes shelter for these animals and their food sources (e.g. moths, beetles, spiders, ants). Over time, this can lead to a decline in the number of animals and species present.

How do I minimise soil disturbance?

Always consider the possible impacts of activities undertaken in your grassland or grassy woodland remnant on the soil as well as on the vegetation. For example:

- Do not plough, grade or cultivate the soil in your remnant.
- If a fire control line is needed prior to ecological burning, keep it as narrow as possible. Consider slashing and/or wetting the line rather than ploughing or grading.
- Use existing tracks and avoid driving or using heavy machinery across your remnant, especially during wet weather.
- Avoid overgrazing to maintain a good cover of vegetation and prevent damage to the soil crust.
- Avoid stocking during very wet weather.
- Do not apply fertilisers to the remnant. Check that fertilisers and other sources of nutrients from adjoining land do not drain into the remnant.
- Do not store piles of heavy materials within the remnant.
- Minimise the amount of herbicides used and direct them precisely to the target plant. Cut and paint, wipe with a wick, or very carefully spot spray weed infestations.
- Do not remove scattered rocks or logs from the remnant.

Interestingly, unlike some soil crusts of more arid areas of Australia, the soil crusts of the Volcanic Plain appear to tolerate regular fires. This is one of the benefits of using periodic burning to reduce accumulated plant material in productive grasslands, rather than grazing or mowing. But be mindful of the potential for soil disturbance and keep vehicles to existing tracks or fire control lines wherever possible.

If the soil in your remnant does become damaged, rehabilitation may be required. Depending on the size and type of disturbance and the condition of the remnant, the bare soil could be planted with native vegetation as soon as possible to help prevent weed invasion.



Definitions

Algae	Simple organisms without roots, stems or leaves, which mainly use energy from sunlight to produce nutrients.
Fungi	Organisms that obtain nutrients by absorption of organic compounds from their surroundings (e.g. yeasts, mushrooms, molds, mildews).
Lichens	Organisms that are a combination of fungi and algae living in a mutually beneficial relationship.
Liverworts	Small plants similar to mosses with flattened or leafy structures.
Mosses	Small plants with structures resembling roots, stems and leaves, which use energy from sunlight to produce nutrients.
Native grassy community	Native grassland and woodland vegetation with a ground layer dominated by indigenous perennial grasses, usually with a range of indigenous wildflowers.
Pugging	Trampling by animals that compacts wet soil, leaving footprints in the mud.
Soil compaction	Soil is compressed and becomes denser, reducing water and air infiltration. Can lead to poor plant growth and soil erosion.
Soil structure	The arrangement of soil particles into clumps or aggregates. Affects soil stability and infiltration rates.

Further reading

- Barlow, T. (1999). *Grassy Guidelines: How to Manage Native Grasslands and Grassy Woodlands on your Property*. Trust for Nature, Melbourne. www.environment.gov.au/land/publications/grassguide.html
- Eddy, D.A. (2002). *Managing Native Grassland: A Guide to Management for Conservation, Production and Landscape Protection*. WWF Australia, Sydney. www.wwf.org.au/publicationsmanaging_grasslands/
- Eldridge, D. & Tozer, M.E. (1997). *A Practical Guide to Soil Lichens and Bryophytes of Australia's Dry Country*. NSW Department of Land and Water Conservation, Sydney.
- Ross, J. (1999). *Guide to Best Practice Conservation of Temperate Native Grasslands*. WWF Australia, Sydney. www.environment.gov.au/land/publications/natgrass.html
- Waters, C., Whalley W., & Huxtable C. (2000). *Grassed Up: Guidelines for Revegetating with Australian Native Grasses*. NSW Agriculture, Dubbo, NSW.



Expansion of a fire control line that has resulted in damage to a native grassland road reserve. Photo: DSE, Ballarat.

Victorian Volcanic Plains Native Vegetation Management Guides are a joint initiative of:



These Grassland and Grassy Woodland guides are based on 'Management of Native Grasslands in the Melbourne Area' information kit produced by Department of Conservation & Environment, Victorian National Parks Association, & Australian Heritage Commission (1992). This publication may be of assistance to you but the Corangamite Catchment Management Authority, its employees and other contributors do not guarantee that the publication is without flaw of any kind or is wholly appropriate for all your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.