LAND FOR WILDLIFE
CENTRAL AUSTRALIA
Hosted by Low Ecological Services P/L

GARDEN FOR WILDLIFE

Cryptogams

The Ecological Significance of Soil Crusting

What Constitutes a Cryptogam?

Cryptogams are a specialised and diverse group that includes single-celled algae and cyanobacteria, through to very large and complex colonies of lichens, bryophytes and fungi that may stretch over metres. Cryptogams make up the vast majority of non-vascular plants, which reproduce through the production of spores rather than seeds. In the strictest sense, fungi, some algae and lichens are neither plants nor animals but rather are classified into several separate kingdoms.

The Ecological Significance of Cryptogams

Cryptogams are one of the most poorly known and studied groups of all organisms. This lack of knowledge is not surprising given that many cryptogams are microscopic, have cryptic life cycles and specialist skills are required to identify and study individual species. They are also extremely diverse, with estimates putting the number of fungi species alone at 1.5 million worldwide.

Cryptogams, along with other microbial organisms, form the underlying ecological ‘fabric’ on which the patterns of more visible components of ecosystems are arranged. The role of cryptogams in the healthy functioning of ecosystems is fundamental to the supply of ecosystem services on which all of society depends. In other words, if your property has soil crusting, then your soils are in a healthy state!

Cryptogams play central roles in the formation and stabilizations of soils, the decomposition of dead organic material and nutrient cycling. They form symbiotic relationships with most vascular plants and are an important food source for many other organisms such as Land Snails. They store carbon and facilitate carbon storage in the soil. They also protect seeds in the soil from small falls of rain and non-viable germination. Only significant falls of rain will penetrate the surface crusting to reach seeds and result in germination with adequate soil moisture to give the seedling a chance to grow.

Soil Formation and Stabilisation

Cryptogams, particularly lichens and fungi play a fundamental role in soil formation. Lichens are pioneer colonizers of bare rock and through chemical processes break down rock material into mineral components and soluble elements, making these available to the ecosystem.

Lichen and mosses colonize bare soil, forming a visible surface crust. Under this visible surface crust, lichen and moss possess fine-root like structures (rhizines and rhizoids) that bind soil particles. Although often less visible, fungi and algae are also present in these surface crusts. Together this network of cryptogam covers and traps nutrients and organic material, assisting the build-up of a humus layer. Fungi in this layer break down dead plant material and recycle nutrients, in turn making them available for higher plants. Research suggests that the presence of a soil crust increases the availability of key nutrients such as nitrogen, phosphorous, potassium, calcium and iron to plants compared to sites with bare soil.

Protection

The soil crust also provides a protective layer that slows moisture loss, while the physical structure and nutrients available in the crust creates suitable conditions for the germination and growth of higher plant seedlings. The micro-topography created by cryptogam crusts increases surface roughness, reducing wind and water erosion and provides microhabitats for invertebrates. This process provides the crucial first steps in the re-establishment of vegetation communities on disturbed sites.

The crust provides physical protection to the soil surface from rain splash erosion – an important initial step in the erosion of bare soils. The cryptogam crust also slows the flow of surface water and may increase infiltration rates and filter surface flows by trapping sediment and organic material. This limits the amount of sediment and nutrients flowing off-site and into waterways. In drier vegetation types, lichens and mosses may provide an almost continual crust layer in the inter-tussock spaces between perennial plants.

References

- Soilcrust.org (1999). An Introduction to Biological Soil Crusts. www.soilcrust.org
- Dalpe, Y. (1997). Biodiversity of mycorrhizal fungi. *Proceedings of the Subsidiary Body on Scientific, Technical and Technological Advice*, Montreal, Canada.
- Dumaresq, D. & Greene, R. (2001). *Soil Structure, Fungi, Fauna and Phosphorus in Cropping Systems*. Rural Industries Research and Development Corporation.
- Jeffries, D.L. & Klopatek, J.M. (1987). Effects of grazing on the vegetation of the Blackrush Association. *Journal of Range Management* 40, 390-2.
- Scott, G.A.M., Entwisle, T.J., May, T.W. & Stevens, G.N. (1997). *A Conservation Overview of Australian Non-marine Lichens, Bryophyes, Algae and Fungi*. Environment Australia, Canberra.
- Tommerup, I.C. and Bougher, N.L. (1999). The role of ectomycorrhizal fungi in nutrient cycling in temperate Australian woodlands. In *Temperate Woodlands in Australia: Biology, Conservation, Management and Restoration* (eds R.J. Hobbs and C.J. Yates). pp. 190-224. Surrey Beatty and Sons, Chipping Norton.
- Warcup, J.H. (1986). The Fungi. In *The Ecology of the Forests and Woodlands of South Australia* (ed H.R. Wallace). pp. 126-36.

Land for Wildlife & Garden for Wildlife
Central Australia
Hosted by Low Ecological Services P/L
ABN 55 064 311 502
PO Box 3130, Alice Springs, NT 0871, Australia
Phone: (08) 89 555 222 Fax: (08) 89 555 722
Email: lfw@lowecol.com.au
Web: www.wildlife.lowecol.com.au

Alice Springs TOWN COUNCIL

Proudly sponsored by Northern Territory Government

Based on the article that appeared in the Land for Wildlife Newsletter – November 2007 (LINK)