



DIFFERENT AUSTRALIAN VEGETATION TYPES - Sheet 3

As mentioned in Sheet 2, it can be helpful to picture natural vegetation in Australia as falling into four vegetation types, derived from different historic disturbance types:

- rainforest - treefalls, cyclones, landslips
- sclerophyll forest, woodlands and heaths - fires, droughts
- grassy vegetation types - fires, grazing, drought.
- wetlands - fluctuations in water regimes, erosion, siltation.

Interestingly, it is not uncommon for all four to occur even on a single property. So each will benefit from a slightly different style of management.

The main point is that vegetation in each of these recovers differently after disturbance - because different disturbances tend to occur in the different types...(which may have something to do with why they are different in the first place?)

In all of them you will find two main mechanisms of recovery:

1. **Resprouting** (including suckering, rooting along stems etc)
2. **Seed germination**

...and it is important to note that some species do not resprout and are completely dependent on seed for regeneration. Those that can resprout can usually also regenerate from seed, but usually don't store their seed for long periods in the soil.

Rainforest, for instance, usually grows in more fertile, fire-protected areas and is surprisingly widespread across Australia from millions of years ago when it used to be the main vegetation type. Rainforest species are often found in gullies or fire protected rocky areas even in lower rainfall inland regions. It is not really resilient to fire and so fire cannot be expected to result in regeneration. But it is resilient to tree falls and storms which tear down trees etc but do not kill the parent as most species can resprout and pioneers can store in the soil. This longevity and resilience means that remnants can recover fairly well from even extremely heavy weed invasions, given the right treatment. But after very big disturbances (broad scale clearing) mature phase species may be removed completely and so cannot resprout. As only some early colonising species store in the soil for any length of time, a weedy phase may be needed to attract new seed dispersal or species need to be planted in. Fortunately many species have fleshy fruits and can be spread even quite long distances by birds (who feed and perch in more isolated clusters of trees and drop the seed as they perch). So natural regeneration can happen even in sites where all vestiges of previous rainforest have been



cleared, if perches are planted on the restoration site to attract birds and if seed sources are not too far away.

Some weed control implications arising from shade and dispersal adaptation of the natives. *'Closed canopy' rainforest ecosystems differ from more 'open' ecosystems in that it follows a 'seral' successional model whereby exposure-adapted shorter-lived pioneers are gradually replaced by longer lived later phase species that can germinate in shade. This means that removal of all ground weed is less of a challenge because it will be shaded out and future disturbances should be only small. Furthermore, the fact that many rainforest plant species are dispersed by flying frugivores means that rainforest recovery in cleared areas can be 'started' by a bird-spread woody weed phase, although this weed usually needs to be removed to trigger germination of (or 'release' of seedlings of) the natives. These characteristics allow landscape level rainforest restoration to focus on*

- *facilitating recovery in species rich remnants and plantations to act as seed sources of mature phase species and,*
- *facilitating extensive secondary regrowth and pioneer-dominated plantings into which primary species can be dispersed by flying frugivores.*

Sclerophyll forest and woodland are adapted to particular regimes of disturbance (e.g. droughts and fires) to the extent that many plant species require such events to remove seed dormancies. Other species resprout well after a fire. These **resprouters** also often hold their seed for at least a short time in woody fruits that are held on the branches. Many species reserve seed this way for the entire inter-fire period. Another set of species, **obligate seeders**, cannot resprout and tend to reserve their seed in the soil during the interfire period or in some cases for decades. This means that the obligate seeders, but not resprouters, can sometimes have some capacity to regenerate even after prolonged human activities that destroy the parent plant - except where the soil seed bank has also been destroyed (by repeated fires or repeated grazing.) There is no way to tell whether seed is still in the ground except by disturbing the site by either tillage or a reasonably hot fire to see if anything comes up after the next rains. Seed of resprouters such as eucalypts and casuarinas can sometimes be spread some 20 metres and more by the wind, but often need bare areas for germination. Other shrubs such as many Proteaceae species that are resprouters are less likely to travel and may have to be reintroduced. For information on the herbs and grasses that grow in woodland and forest sites, see the next section.

Some weed control implications arising from exposure adaptation of the natives. *Sclerophyll ecosystems are adapted to more frequent disturbances than rainforest and many species require bare conditions to germinate. Herbaceous weed – particularly if high biomass or stoloniferous grasses - can readily suppress sclerophyll regeneration and shade levels produced by woody vegetation is often not sufficient to shade out weed. Weed control during the recovery or planting phase is therefore highly important.*

Grassy types (including the ground layer of woodlands) are composed of both grasses and forbs (collectively referred to as herbs). Many (other than desert systems) are adapted to drought and some grazing, as well as fairly regular fires. Long exclusion of disturbance can result in losses of species. In terms of how the species respond to disturbances, like elsewhere the shorter lived species tend to store their seed in the soil for long periods, but



the longer-live species tend to store seed for less than 5 years in the soil and depend more on resprouting. (After fire they may flower and fruit and so can readily replenish soil seed reserves). If the resprouters are missing due to overgrazing or prolonged shrub domination, little germination might be expected, with low genetic diversity represented. Herbaceous species can, however, germinate prolifically after fire and rain and can proliferate rapidly because they have short periods to reproductive maturity. After regeneration, all species need a grazing free period to restock soil seed reserves.

Some weed control implications arising from exposure adaptation and high competition levels. *Native grasses and forbs respond readily to disturbance and proliferate quickly. But so do weed grasses and forbs, the seeds of which are often very well represented in the topsoils of retired grazing lands. Shading is not a viable option in this vegetation type because the shade levels of open forest or woodland ecosystems are insufficient to completely shade out weed and because these ecosystems experience regular disturbances which allow diverse understorey species to periodically have their 'day in the sun'. This means that extremely rigorous weed control is needed in grassy ecosystems to ensure natives gain the upper hand on the site and weed seed banks are reduced sufficiently to help natives rather than weeds provide the main cover after the next disturbance. (Post disturbance follow up work will strengthen resilience over time.)*

Wetlands (including marshy areas dispersed within other ecosystems) are adapted to fluctuations in water levels, and sometimes to erosion and siltation. Again, many longer lived species are capable of resprouting from broken stems and roots (which means they are sometimes easy to transplant) while other shorter-lived ones depend on germination and can store seed in mud for quite some time. Longer lived species can also germinate from seed and germination usually occurs on muddy banks or flats - though some species have unusual ways of surviving as seedlings in water. Seed often floats and can be dispersed in water or in mud. This means that new species can be spread from healthier wetlands nearby and is particularly the case in saltmarsh species whose seed is spread on the tide. Again, many species are often quick to reproduce and spread and sometimes a range of water levels or periodic disturbance are needed to ensure that one species doesn't completely take over.

Some restoration pointers due to fluctuating disturbances. *Wetland plants also respond readily to disturbances and wetland sites experience very high variability in terms of disturbances and the species that might appear and disappear in response to different water levels. Weed management is important to native species recovery, with some wetland weeds being highly invasive. Great care needs to avoid herbicides that impact upon aquatic or amphibious animals, making weed control sometimes difficult, although some weed species can disappear after drowning by high water levels.*