

Resource Redistribution in Landscapes

Water is a vital resource in the rangelands. As well as being essential for the survival of plants and animals, it has a critical role in the shaping of arid landscapes. The land surfaces of the arid interior are ancient and highly weathered, so that mountain ranges are low, and there are large expanses of gently undulating or almost flat plains. When enough rain falls to saturate the surface, water begins to flow down slopes, however slight, in shallow sheets. This “runoff” continues until it reaches a local barrier or a depression, where it accumulates as “runon”. Alternatively, it flows to drainage lines, and either empties into local creeks or terminates in larger runon areas or floodouts.

Flowing water has the energy to transport soil sediment, organic material and seeds, along with dissolved nutrients, downslope. Consequently runoff areas are important contributors to resource-rich runon areas, and the landscape is often naturally patterned, on a diversity of spatial scales, into patches or bands of profuse vegetation interspersed with sparsely vegetated runoff surfaces. The banded pattern of groves (timbered area) and intergroves (more open areas) often seen in mulga woodlands is a good example of the profound effects that subtle redistribution of water and nutrients can have on the vegetation in seemingly flat country.

Wind is another important agent for redistributing resources and creating patchiness. It can blow coarse particles across soil



surfaces until they are trapped by a local barrier such as a shrub or log. Small nutrient-enriched mounds of soil around shrubs often have enhanced infiltration which can facilitate the growth of perennial and annual plants. Wind can also transport fine dust-borne nutrients and small or fluffy plant seeds over long distances.

If these landscapes are grazed excessively, plant cover can no longer protect the resource-rich patches from the erosive forces of wind and water, and soil, nutrients and organic material begin to escape. If neighbouring patches have also lost their integrity, they are no longer effective traps, and resources are either lost from the system or collect in drainage depressions, which then become overgrown with trees and shrubs.

Repairing country which becomes damaged in this way often needs expensive treatment. The most effective way is to construct ponding banks, which trap water and other resources on a sufficient scale to replicate natural patchiness.

The best way to avoid costly mechanical works is to prevent damage in the first place, although in such complex landscapes it can be difficult to read the early warning signs.

CSIRO researchers have investigated the processes of degradation and recovery in patchy, patterned landscapes, and they have developed tools to assess these changes on the ground and from remotely sensed data.

Further reading:

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