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SEEING THE WHOLE SYSTEM AND "KNOWING WHERE TO TAP", LOW INPUT, HIGH EFFICIENCY RESTORATION TECHNIQUES

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BACKGROUND

Australia's rangelands have a history of degradation. This legacy arises from inappropriate management strategies and a poor understanding of rangeland ecosystem interaction and the patterns and processes within the sub-catchments that comprise them. As human workforces decline through most of the rangelands it is becoming increasingly more important that any form of restoration is realistically balanced between the investment of costs and labour against the long-term effectiveness of the treatment.

Many restoration techniques have focussed on large areas that show the worst symptoms of land degradation. Mechanical or other interventions in profoundly degraded areas are expensive and localised, when often the causes may be off-site and the dysfunction considerably greater than the visually worst areas chosen for treatment. Today the economics of intensive mechanical treatments are questionable and have limited appeal to private land managers. Many restoration treatments involving mechanical intervention have largely failed because; the solutions sought were too simplistic, the treatment did not persist long enough to be effective, and success was too often dependent on favourable climatic conditions following up the treatment (Sparrow *et al.*, 2003; Tongway and Ludwig, 1996). In areas where mechanical intervention has resulted in success it may have been many years before an adequate return matched the initial capital investment, financially as well as ecologically (Bastin, 1991).

RESETTING BASE LEVELS AND DEALING WITH LANDSCAPES

Understanding how ecosystems interrelate with one another is essential before broad ecosystem management can begin. In attempting any form of restoration or rehabilitation it is necessary to have an understanding of broad scale catchment function (Pringle and Tinley, 2003), as well as how scarce resources are regulated within each landscape type (Ludwig *et al.*, 1997). Understanding the broader context of where a degraded site is situated within the catchment will allow restoration strategies to be implemented that will work with the landscape, not against it.

Working together through the Ecosystem Management Understanding (EMU) Process (Pringle and Tinley, 2001) land managers and ecologists are using local knowledge to strategically implement restoration techniques to address land degradation, on pastoral leases in the southern rangelands of Western Australia. With present day station workforces greatly reduced and large scale mechanical treatments dauntingly expensive, land managers need to be strategic where they invest their time and money when wanting to engage in restoration activities. In trying to avoid intensive mechanical treatments, the EMU Team is attempting to address catchment dysfunction through restoration techniques of low input, suitable for small station workforces, but which will have wide ranging and lasting effectiveness.

Knowing where to tap! This is a key feature of the EMU process. Focusing on the preservation of the most intact country is seen as a priority. Such intact landscapes are often of significant pastoral importance, such as grassy floodplains or chenopod shrublands, or they are areas of local or regional significance, such as wetlands that offer an important role in drought buffering. If immediate threats to these valuable landscapes exist then the processes driving those threats need to be determined. It is very likely that the immediate local issues are but part of a broader system. Seemingly unrelated

sequences of degradation along a catena of landscapes are quite possibly the far-reaching, related consequences of a dysfunctional catchment disrupted at a particular control point.

Changes bought about by a reduction in base levels (Pringle and Tinley, 2003) to the driving processes of erosion (Pickup, 1985) can initiate wide spread symptoms of degradation. When an influential base level is cut, erosion progresses upslope; stripping topsoil, desiccating and fragmenting grasslands and chenopod shrublands, breaching ephemeral wetlands and draining floodplains as incisions leave them perched on fluvial landscapes (Tinley, 1982). Once erosion is underway it is likely to continue until a new equilibrium has developed.

After identifying and assessing the driving processes responsible for causing degradation within a catchment, in terms of disruption of drainage networks, it may be possible to attempt intervention at strategic points. Working in the upper-most parts of the catchment, where feasible, and moving downstream, damaged local base levels may be reinstated by using a variety of sieves to calm the water. Filtering, rather than blocking, slows the water assisting in the preconditioning of the drainage network for treatments further down the catchment. Gully heads and certain confluences of incised channels, where conditions are appropriate, need to be stabilised to assist with the calming process. Strategic placement of water calming treatments is crucial to the process of attempting to heal a dysfunctional catchment. This in turn will benefit the main aim of preserving valuable and intact landscapes, before they are lost or become scattered remnants as fragmentation and desiccation continues unchecked. Such "low input" restoration techniques are being trialed by many land managers. Two major catchment restoration projects involving multiple properties are underway in the Murchison and Gascoyne River catchments as part of the Desert Knowledge CRC programme.

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