

THESIS SUMMARY

GRAZING IMPACTS IN RANGELANDS: ASSESSMENT OF TWO CONTRASTING LANDSCAPE TYPES IN ARID WESTERN AUSTRALIA FROM DIFFERENT LAND MANAGEMENT PERSPECTIVES

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(This thesis summary has already appeared in the *Bulletin of the Ecological Society of Australia*, September 2002, pp. 39-40.)

Regional patterns of land use and systems for assessing the 'health' of rangelands have not changed their focus from production of meat and fibre, despite ecologically sustainable development becoming the dominant environmental paradigm. In this study I evaluated i) traditional range condition assessment as practised in Western Australia, and explored its capacity to predict changes in ii) biodiversity and iii) landscape patterns and processes along grazing gradients in two contrasting landscape types in the arid shrublands region, Western Australia.

I estimated grazing history using a commercially available model and a model based on sheep track density. Although distance from water was a more simple proxy for grazing history, it did not account for as much of the systematic variation in environmental response as either model. Range condition declined with increased grazing in both landscape types, and while the decline was more marked in mulga landscapes, range condition assessments may overestimate degradation in this landscape.

Approximately one quarter of plant species were 'decreasers' that declined in abundance with increased grazing, compared to 16% that were 'increasers'. The number of decreaser species also declined with grazing, more rapidly in mulga landscapes than chenopod landscapes.

Over a third of ant species (not including singletons) were decreasers in chenopod landscapes. Increaser species in chenopod landscapes, and both decreasers and increasers in mulga landscapes, comprised a relatively minor component of the ant fauna. The sensitivity of the ant fauna to grazing in chenopod landscapes contrasts strongly with conclusions from previous studies in north American rangelands.

Overall, grazing suppressed the capacity for landscapes to redistribute and conserve resources in fertile patches. Chenopod landscapes were most profoundly altered: with increased grazing fertile bush mounds decreased in density and proportional area as open areas expanded and became more saline.

While range condition was correlated with some variables that were important from perspectives of nature conservation and natural resource management, it did not reveal contrasting responses to grazing within and between landscape types. Thus it does not convey the specific nature of impacts on aspects of biodiversity and ecosystem function. Nor does it help pastoralists manage different landscapes. I present an alternative, hierarchical system of assessing rangelands that integrates concepts of non-equilibrium ecosystem dynamics, ecosystem drivers and engineers, and focal life forms. It also allows for the incorporation of emergent properties for broader scale (i.e. remotely sensed) assessment and monitoring.

On the basis of which model of grazing history best predicted response variables, I was able to interpret grazing impacts spatially. The RANGEPACK/Paddock model estimated a near linear decline in grazing with increasing distance from watering points in my region, while the track-density based model predicted very intense grazing that dissipated rapidly away from watering points.

The spatial distribution of impacts on range condition and floristic diversity may be widespread, while impacts on ants and landscape pattern and process may be more concentrated near watering points. The interests of pastoralists and natural resource managers might be best served by an increase in the density of watering points, while the interests of nature conservationists might be better served by exactly the opposite. The most practical reconciliation may be to improve the reserve network, rather than trying to integrate production and general conservation objectives at a paddock scale, particularly for mulga landscapes.

Finally, I see an urgent need for more cohesive land use planning and rangeland assessment, involving a blurring of institutional boundaries in regionally nested adaptive environmental management systems.