Dr. Adrian D. Manning – Conservation Biology, Landscape & Restoration Ecology

PhD research

Manning, A. D., 2004, A multi-scale study of the Superb Parrot (*Polytelis swainsonii*); implications for landscape-scale ecological restoration, Australian National University, Canberra.

I used a multi-scale approach to undertake research the Superb Parrot; a vulnerable, internationally-listed bird, endemic to south-east Australia. Three scales were examined in this study:
Macroscale - investigations across the whole distribution of the species. This had two components:
1. The bioclimatic domain of the Superb Parrot was investigated (to provide a context for other investigations in this study).
2. Using Birds Australia atlas data the relationship between abundance of the Superb Parrot and a number of key environmental variables was explored.
Mesoscale - local-landscape and intra-regional relationships were investigated across a field study area of approx. 23260 km^2. Eighty one, 1km^2 sites were systematically selected and surveyed for Superb Parrots.
Microscale - behaviour patterns and nest trees were investigated at this scale.
1. The microscale behaviour of the Superb Parrot was examined in relation to immediate surrounds to investigate the effect of landscape conditions.
2. Nest trees were located and compared with randomly-chosen non-nest trees to determine the characteristics of favoured trees.

At the **macroscale** the distribution and abundance of the Superb Parrot varied in both time and space in relation to environmental variables. At the **mesoscale**, the Superb Parrot was influenced by factors at the site level and in the surrounding landscape. At the **microscale**, behaviour was influenced by tree cover and tree species composition in the surroundings. Nest trees of the Superb Parrot were found to be larger, many were dead or affected by dieback, with little tree regeneration in their surrounds.

Overall, results show that the Superb Parrot persists in the privately-owned farmland. However, these landscapes were highly modified and, without landscape-scale efforts to re-start tree regeneration, the future of the Superb Parrot is uncertain.

Post-doctoral research

Almost all temperate woodland in south-eastern Australia is on private farmland. Identifying new ways to better manage it is of major national importance for sustainable land use practices. It is also critical for conserving the nation's biota because temperate woodlands are some of Australia's most threatened vegetation communities. The Mulligans Flat-Goorooyarroo Woodland Experiment will implement a long-term, large-scale "natural experiment" to provide critical new data, analyses, and scientific insights on the simultaneous effects of management regimes on temperate woodland biota. We will examine the broad question: Does woodland management affect woodland biota, and if so, which groups and in what ways? To answer this, we will quantify and statistically assess:

- The effects of major woodland management treatments (prescribed fire, addition of coarse woody debris, kangaroo grazing and feral pest control) on an array of animal groups and plants.
- Temporal changes in populations in response to management practices.
- Relationships between animal life history and response to management intervention.
- Whether statistically significant effects relating to prescribed burning, addition of coarse woody debris, and combinations of exclusion fencing are of practical use as predictors of animal abundance.

Experimental design
- Vegetation classified in 4 vegetation classes:
  - High Tree Cover, Low Shrub Cover
  - High Tree Cover, High Shrub Cover
  - Low Tree Cover, Low Shrub Cover
  - Low Tree Cover, High Shrub Cover
- Six polygons within each vegetation class, 24 polygons – 12 in Goorooyarroo Reserve and 12 in Mulligans Flat Reserve.
- Within each polygon, four 1 ha "plots" (200m x 50m)

Plot level treatments
Addition of coarse woody debris
Fire

Polygon level treatments
- Kangaroo grazing will be controlled using exclusion fences.
- Feral predators will be excluded with a large predator-proof ring fence, which is planned for Mulligans Flat Reserve.

Animal groups
- Reptiles, invertebrates, birds, small mammals

Vegetation
- Vegetation and habitat structure will be assessed in all plots.

Other research

There are numerous barriers which prevent large-scale ecological restoration projects. Two potentially useful approaches to help overcome barriers are:
- "Stretch-goals": ambitious, long-term goals used to inspire creativity and innovation to achieve outcomes that currently seem impossible.
- "Backcasting": a technique where a desired endpoint is visualized, and then a pathway to that endpoint is worked out retrospectively.

Scattered trees are prominent features in many landscapes worldwide, including natural landscapes, cultural landscapes, and recently modified landscapes. They have many ecological functions, and are consequently often "keystone structures". That is, their contribution to ecosystem functioning is disproportionately large given the small area occupied and low biomass of any given tree, and the low density of scattered trees collectively.

Although understanding of the effects of global change is increasing, progress on conservation actions in response is limited. Furthermore, the implications of change through time in relation to concepts of habitat or landscape connectivity, particularly in the context of unprecedented rapid global change, have hitherto been poorly developed. We believe this is, in part, because there is a lack of appropriate terminology and conceptual frameworks for understanding and coordinating conservation actions through time.

We use the multi-faceted term "landscape fluidity" to describe the response of organisms, ecological communities, ecosystems and ecological processes to environmental change through space and time. Enhanced landscape fluidity can be used as a target for landscape managers, and corresponds to the "maintenance and restoration of habitat connectivity, landscape connectivity and ecological connectivity through time and space in anticipation of ongoing global change".

Selected publications:
- Manning, A. D., Fischer, J., Lindenmayer, D. B., 2006, Scattered trees are keystone structures - implications for conservation, Biological Conservation, 132, 311-321.
- Manning, A. D., Lindenmayer, D. B., Barry, S. C., Nix, H. A., 2005, A bioclimatic analysis for the highly mobile superb parrot of south-eastern, mainland Australia, The Emu, 105, 193-201.
- Manning, A. D., Lindenmayer, D. B., Barry, S. C., 2004, The conservation implications of bird reproduction in the agricultural "matrix": a case study of the vulnerable superb parrot of southeastern Australia, Biological Conservation 120, 363-374.
- Manning, A. D., Lindenmayer, D. B., Nix, H. A., 2004, Continua and *Umwelt*: novel perspectives on viewing landscapes, OIKOS 104:3, 621-628.
- Manning, A. D., Lindenmayer, D. B., Fischer, J., in press, Stretch-goals and backcasting: approaches for overcoming barriers to large-scale ecological restoration, Restoration Ecology.
- Manning, A. D., Lindenmayer, D. B., Barry, S. C., Nix, H. A., in press, Multi-scale site and landscape effects on the vulnerable superb parrot of south-eastern Australia during the breeding season, Landscape Ecology
- Manning, A. D., Lindenmayer, D. B., Barry, S. C., Nix, H. A., in press, Large-scale spatial and temporal dynamics of the vulnerable and highly mobile Superb Parrot, Journal of Biogeography.
- Manning A. D., in press, Ecosystems, ecosystem processes and global change: implications for landscape design. In Managing and designing landscapes for conservation: moving from perspectives to principles (eds Lindenmayer DB, Hobbs R J). Blackwell Science, Oxford.
- Manning, A. D., Fischer, J., Lindenmayer, D. B., Steffen, W. L., in review, Landscape Fluidity: a target in a changing global environment.

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