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From CONFLICT to CONSERVATION

Native Vegetation Management in Australia

A focus on the South Australian program
and other Australian initiatives

Past Present and Future

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Biodiversity conservation after vegetation clearance controls

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INTRODUCTION - EXTINCTIONS IN THE PAST

The world is currently in the midst of its sixth mass extinction. Current global species extinction rates are over 100 times faster than the "background" extinction rate (May et al. 1995). Since 1600 approximately 1% of all mammals and birds are known to have become extinct while 11% are currently threatened (Mace 1995). Scientists expect that up to 50% of the world's species will become extinct and it will take 10-100 million years for the world's species diversity to recover (May et al. 1995).

In Australia a discussion of extinction depends primarily on which group of organisms is being discussed. It is now a well known fact that about 10% of our mammal species are extinct, and many more are likely to become extinct in the next century. Of those that are not extinct, many are threatened and/or have suffered huge reductions in distribution. In contrast the number of bird and reptile extinctions on mainland Australia are minimal. The only "extinct" Australian reptile was recently rediscovered (Milne 1995), while there are still hopes that our only extinct mainland bird, the paradise parrot *Psephotus pulcherrimus* survives. For groups like insects we will never know how many extinctions have occurred, while in places like Western Australia many plant species disappeared before they were described. The extinction situation differs from state to state and region to region.

In the past 200 years South Australia has lost a significant amount of its biodiversity. Again, extinction rates differ from group to group. Consistent with the national pattern, mammals have fared badly. However on the local scale of this state we know that several species of bird have become locally extinct (although they are extant elsewhere in the country). Many species of plant are locally extinct, and in groups like the terrestrial orchids many taxa are likely to have disappeared before they were described (Bates and Weber 1990). On an even more local scale we know that bird species, which may persist elsewhere in the state or continent, have disappeared from entire regions. For example eight species of breeding bird have probably disappeared from the Mount Lofty Ranges in the past 100 years: western calamanthus *Sericornis campestris*, southern stone-curlew *Burhinus magnirostris*, azure kingfisher *Ceyx azureus*, king quail *Coturnix chinensis*, spotted quail-thrush *Cinclosoma cinnamomeum*, regent honeyeater *Xanthomyza phrygia*, ground parrot *Pezoporus wallicus* and glossy black-cockatoo *Calyptorhynchus lathami*.

These patterns of extinction across different taxa and at different spatial scales are becoming increasingly well documented. While documenting the loss of biodiversity is useful from a political and educational perspective, no biologist in the world needs convincing that the loss of biodiversity is rapid and serious. Recently, responses to future threats to biodiversity have been organised under the banner of bioregional planning.

In this paper I try to broadly understand the mechanisms of extinction, focussing particularly on birds and terrestrial orchids in South Australia. I begin by considering the past and future impact of vegetation clearance. I use this understanding to recommend a future direction for nature conservation in South Australia. This direction has two strategic initiatives that both fit within the context of

bioregional planning. First we need to work out how to manage an integrated network of vegetation fragments to retain as much biodiversity as possible. Second we need to dedicate and manage at least one large and contiguous conservation area in every bioregion (Thackway and Cresswell 1995).

TWO KINDS OF EXTINCTION - DRIVEN AND CHANCE

There are two types of extinction - driven and chance. Driven extinctions occur when a species has a negative growth rate throughout its distribution. Chance extinctions occur when a species is still able to survive and increase in parts of the landscape, however an unfortunate sequence of local extinctions cause it to disappear. The majority of species extinctions in Australia so far have been driven extinctions. Those species sensitive to the arrival of Europeans, in particular the pests and diseases they bring, have already disappeared. The driven extinctions are the first wave of extinctions that has largely been and gone. Extinctions caused by a combination of habitat loss and chance are largely yet to come.

Driven extinctions occur when the processes that enable a species to persist are changed throughout its entire range. For example, if *all* the habitat for a plant or animal is cleared for another purpose, that species will certainly become extinct. Similarly, if mortality rates increase because of an introduced predator or disease, then a species may be driven to extinction. For a driven extinction the death rate exceeds the birth rate throughout the range of the species.

Habitat loss has contributed to species extinction for all eight locally extinct bird species in the Mount Lofty ranges. Only about 10% of the original vegetation of the region persists in an intact state, and almost all of that has been modified in some way. Predation has probably been another driving factor for five of the species: the calamanthus, southern stone-curlew, king quail, ground parrot and spotted quail-thrush. Despite this some suitable habitat probably remains for the azure kingfisher, regent honeyeater and glossy black-cockatoo. Why did they disappear?

The loss of the azure kingfisher may well represent one of our first "chance extinctions". Some suitable habitat still remains for this species. However the remaining habitat in the Mount Lofty Ranges, permanent streams and estuaries, would certainly not be big enough for more than 50 pairs. Even if the species had persisted until now, a maximum of 50 pairs is certainly not sufficient for long term persistence. The disappearance of the regent honeyeater and glossy black-cockatoo may also be primarily a result of small population sizes and an unfortunate sequences of events.

Chance extinctions occur when, despite a positive population growth rate, a series of unfortunate events cause a species to become extinct. For example, where habitat for a species is fragmented in to small parcels, the population in a single parcel can be wiped out in a single catastrophe like a fire. Unless recolonisation of suitable habitat patches is fast, castrophes can sequentially wipe out population after population. There are many chance events that can combine together to cause chance extinctions. The chance nature of birth and death, demographic uncertainty, can cause very small populations to become extinct. A series of bad years, say droughts, can cause quite large populations of a species to collapse to very low levels. Catastrophes like fires, epidemics and severe droughts can cause a sudden drop in the abundance of a species. It is now thought that some sort of catastrophe is implicated in most recent species extinctions. The beautiful firetail *Emblema bellum* is suffering this sort of sequential chance extinction in the Mount Lofty Ranges. Now it is largely restricted to the largest areas of native vegetation in the southern ranges Newland Head, Deep Creek and Cox's Scrub.

Chance extinctions typically occur when the amount of suitable habitat available to a species has been severely reduced and/or fragmented. Chance extinctions are just beginning to occur and will continue to occur for many centuries as a long-term consequence of past vegetation clearance. Habitat loss in the past has pushed many local populations to levels that are unlikely to persist in the long term. Bad luck will eventually catch up with them. So, despite an end to broad-scale habitat loss, we owe an extinction debt, the chance extinctions that we are yet to pay (figure 1).

THE EXTINCTION DEBT

The phenomenon of chance extinction means that many more species will become extinct, despite an effective cease to habitat loss. The amount of suitable habitat available to almost all species has been severely reduced. The remaining habitat may be as low as 1% of its former extent in the case of habitats like grassy woodland and grassland. In the least cleared parts of the agricultural districts of SA 20-30% of the vegetation of an area remains intact. In all cases the remaining habitat is fragmented. In these reduced and fragmented landscapes populations can disappear one by one simply through bad luck until extinction eventually occurs. Unfortunately many species are likely to suffer chance extinctions and there is little we can do to save them. Consequently we owe a debt of extinctions, brought about by past actions, that has to be paid over the next few centuries.

Returning to the terrestrial birds of the Mount Lofty Ranges. Of the eight species that have disappeared most were driven extinctions. Their habitat has been completely cleared or predators have increased mortality to the point that populations are unable to sustain themselves. Many other species of bird have isolated populations in the Mount Lofty ranges. Several of these species now almost certainly number below 500 individuals - for example the black-chinned honeyeater *Melithreptus gularis* (Chapman 1994),

southern emu-wren *Stipiturus malachurus*, scaly thrush (*Zoothera australis*), chestnut-rumped hylacola *Sericornis pyrrhopygius* and beautiful firetail. Despite the presence of some suitable habitat all of these species are vulnerable to chance extinction. The black-chinned honeyeater has recently disappeared from large areas of suitable habitat in the Barossa valley area (Chapman 1994), the range of the beautiful firetail continues to contract, while populations of the southern emu-wren are vulnerable to devastation by fire and/or flood (Littley and Cutten pers comm.). The situation for the Mount Lofty Rsimilar areas in Western Australia (Saunders and Ingram 1995).

Using an island biogeographic perspective, Ford and Howe (1980) argued that over 30% of the terrestrial avifauna will disappear from the Mount Lofty Ranges. While their prediction may be a gloomy overestimate for a variety of reasons - it does serve to highlight the severity of the long-term consequence of over-zealous vegetation clearance in the past.

There is a very high diversity of terrestrial orchids in the Mount Lofty Ranges. While only one or two species appear to have become extinct - another 20 species are in tiny isolated populations (Bates 1990). Species like *Caladenia behrii* and *Caladenia rigida* are endemic to the Mount Lofty Ranges so their loss is a global loss. Local extinctions of orchid populations are now frequent in the fragments of vegetation that remain. Even large populations of terrestrial orchids can disappear from changes in land-use, weed infestation or an unfortunate sequence of fires. Again, despite a halt to vegetation clearance, I expect a steady stream of regional orchid extinctions.

This extinction debt means that South Australia will continue to lose orchid species despite a halt to broad scale vegetation clearance and a major commitment to revegetation. The parts of Australia which are continuing to allow broad-scale modification of native vegetation will not see the impact of their irresponsibility on biodiversity, for decades.

MANAGING THE REMNANTS

Because so many of our species persist in fragments, each of which is too small to ensure long-term persistence, we need to devise strategies for biodiversity conservation in these fragmented landscapes. To maintain species in fragmented habitats we cannot manage each patch of habitat in isolation. The fragments include land dedicated to nature conservation, like conservation parks and heritage areas, and areas used for other purposes. Management plans for these isolated patches of vegetation need to be placed in a regional context - there needs to be regional biodiversity management plans.

Regional biodiversity management plants will place the management of each patch in a broader context. Fire management, corridor management and revegetation strategies must all be developed in the context of the special biodiversity values of each region. For example, the biggest

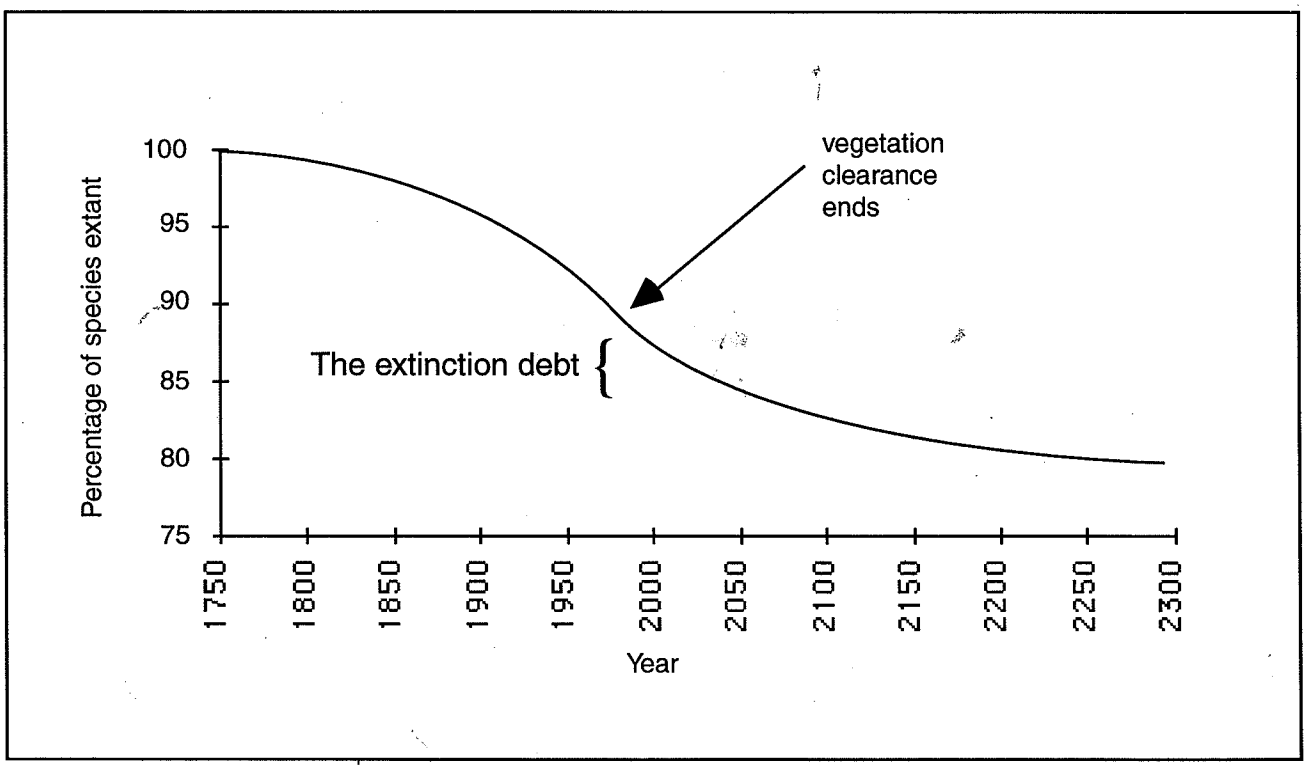

Figure 1: *The extinction debt*

and best patches in every region need special protection and effort, corridors linking patches cannot be allowed to degrade and disappear, and fire management needs to be coordinated. In some areas attention may be devoted to single key species. This approach, although scientifically sometimes dubious, serves to focus community interest (see papers in this book on malleefowl *Leipoa ocellata* and glossy black-cockatoo in this issue).

Efforts to manage biodiversity in a fragmented landscape are worthwhile, yet for the reasons outlined above, no amount of effort will stop us having to pay a substantial extinction debt in every region. To retain and recover as much biodiversity as possible we need to adopt some longer term strategies.

THE IMPORTANCE OF LARGE RESERVES

Because sequences of catastrophic events will play an increasingly important role in future extinctions in South Australia, a long-term state conservation strategy must include the construction of at least one large reserve in each bioregion (Thackway and Cresswell 1994). Only large reserves (>50 000 ha) will be capable of supporting populations large enough to withstand sequences of unlucky events, and populations big enough to avoid chance extinction. Reserves need to be big enough to provide refuges for fire sensitive species when subjected to repeated wildfire.

The state government needs to begin defining these large reserves now. In one or two places in each bioregion the areas with the most intact native vegetation should be defined. These conservation areas need to be consolidated with revegetation and by seeking the cooperation of landowners, adjacent to, these areas. There needs to be a long-term strategy so that, eventually, the primary land-use in the area is nature conservation. In this way we will have a chance for retaining viable populations of those species that will certainly disappear from the remainder of the landscape.

SUMMARY

The fact that many more species will become extinct in SA despite widespread government and community effort should not be allowed to deter us from the nature conservation effort. First we need to continually remind ourselves that no further reduction in natural habitat is the cornerstone of the state conservation strategy. Vegetation clearance controls are a necessity not a luxury. Second we need to move the emphasis of our conservation efforts away from crisis management and towards a long-term strategic plan. That long-term strategic plan must include at least one large, well-managed, conservation area in every bioregion.

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