Concluding Remarks

Science, Conservation and Management of Tasmanian Vegetation Change

From the information presented at today's meeting, it seems that both long-term and short-term changes in vegetation are inevitable. Such change will need scientifically based planning in both space and time. We will need to take a hard look at the apparent short-term stability which forms the basis for much of the current conservation management. There are many arguments about the acceptability for conservation of natural and exacerbated change. It is apparent from today's talks that an understanding of time scale and causal factors are basic to more informed debate.

I would like to look at some of the implications and consequences of the information presented for science, conservation and future management. Firstly, what are the implications of a scientific approach for conservation management? Has science provided all of the answers? The answer to this question is a resounding no! Certainly, this is the answer of scientists who are keen to research at yet the next fractal level of their particular branch of study. It is also no from the many who espouse other values or reference frames, and especially from those who see only the 'errors' and environmental costs associated with past so-called 'scientific advances' and technological applications. However, it is equally certain that without science, our ability to detect, monitor and correct such costs would not be possible. Furthermore, much of the current debate on the merit of conservation itself is fuelled by elaborate scientifically based techniques. For example, vegetation classification, environmental modelling and studies on conservation genetics rely on techniques such as multivariate analysis, and isoenzyme and DNA analysis, all of which have only become widely available in the last dozen or so years. Many such techniques are actively being developed.

Turning to the specifics of change, there is an enormous leap of time scales and imagination required to tie Bob Hill's well-adapted regional vegetation of the past 60 million years to Jamie Kirkpatrick's rapid changes of the past two centuries, yet both time scales need to be assimilated to provide a suitable context for conservation management.

The dynamics of eucalypt populations discussed by Brad Potts and earlier by Fred Duncan offer insights from an ecological genetic basis. A strong ecological genetic background also underlies an understanding of the impact of alien invasions of plants and animals as discussed by Tim Duckett and by Jamie Kirkpatrick on behalf of Jenny Scott. It also underlies an understanding of the impacts and likely success of pathogens and pests as discussed by Tim Wardlaw, Humphrey Elliott and Frank Podger. There are differences, however, in the degree to which these various alien organisms are tied to human influence. This leads to the relatively unappetising thought (from my own anthropocentric view!) that a new phase of evolutionary development is already upon us. Thus, species of high fitness in human environments, but of low flexibility may already have gained the upper hand. To put it another way, wheat, potatoes, sheep, cows and *Pinus radiata*, for example, have been spectacularly successful at farming human beings, thereby extending their own ecological and evolutionary potential in current environments but at considerable cost to the flexibility needed to accommodate future changes in environment.

What evidence is there for resilience, buffering and ability to turn back unwanted change? Some hope is offered by the relatively long-term studies that Jenny Scott discussed on the effects of rabbits on the vegetation of Macquarie Island. Similarly, Mirranie Barker's work on fire effects in rainforest suggests that in lowland rainforest many of the species will recover following single fire events. However, the fragility of the recovery is emphasised by Mirranie's work showing the vulnerability of the ecosystem to damage by further fire, and also by my own studies of rainforest dominated by King Billy pine, where about one-third of the forests have been fire-killed in the past 100 years and as yet show little sign of recovery.

The resilience of disturbed vegetation has received little attention to date at any level other than that of higher plants. However, Gintaras Kantvilas has outlined the possible role of lichens as indicators of late successional stages. The problems for management arising from Alistair Richardson's demonstration that invertebrates are climatic and ecological indicators which are not necessarily related to plant communities need to be addressed immediately.

The problems for managing disturbance in conservation areas are manifold and not always soluble by science. Jenny Scott and Rod Fensham discuss the management dilemma created by the competition between rare plants and exotics for mechanically created niches. Louise Gilfedder has touched on the need for appropriate management (including grazing) to maintain diversity in grassland ecosystems—can cows and sheep do the job? Do marsupials do it better?

One example of the potential to selectively use science in such situations is provided by my experience with the endemic daisy bush *Odixia achlaena*. This species was advocated by botanists for reservation and National Estate listing because it was considered rare. Subsequent study demonstrated it to be an effective coloniser of disturbed habitats, which was translated in one publication to mean 'this species is favoured by logging'.

Probably the single most important disturbance factor in the Tasmanian vegetation is that of fire. Its importance can be gauged from studies made of rare fauna such as the orange-bellied parrot, and of fire-sensitive vegetation such as alpine communities and King Billy pine, pencil pine and Huon pine communities. The super-imposition of some artificial boundaries and dedication of a reserve offers only short-term protection to such biota. The vegetation within the reserve will change with time. It will interact with the fauna and with the physical environment in ways which have not been possible before. Thus, species which require frequent disturbance will be at a selective disadvantage. For example, *Trachymene anisocarpa* is a native plant in the carrot family having a life span of two years. It had never been recorded from the Freycinet National Park until after the wildfires of 1982 when it became abundant on the dunes and was thought by many to be an invading weed! It had survived 23 years of 'benign neglect' between fires. Would it have persisted for 30 years or 50 years? If we had had the foresight to commence a one hundred year seed experiment as has been done in Britain, we might be able to answer such questions.

The paradox of the juxtaposition of the longest lived plant communities in Australia (i.e. the Huon pine communities discussed by Trevor Bird) through long-term fire-independent rainforests capable of recovery as discussed by John Hickey and Mirannie Barker, to the sclerophyll forests and extremely flammable moorlands discussed by Jayne Balmer provide management problems on a very large scale.

The broad scientific scenarios are known. The political infighting will doubtless continue, but the reality of management still awaits clear answers. Science needs to address the altered

circumstances and reality of today. We cannot go back to the halcyon days, even if we knew what they were! What do we want?

- Bob Hill's balmy days of the Tertiary, with rainforest predominantly in the landscape?
- The variability and potential for change seen in the Pleistocene?
- The immediately pre-European, Aboriginal-determined vegetation?

It seems to me that we are stuck with a post-European vegetation, and hopefully we want one capable of response to evolutionary change, but which is protected from the excesses of human activity or inactivity—whether they be development-based or based on a concept of benign neglect—especially in boundary areas between different land uses where competition for resources is the major problem.

And now a couple of other immediate management questions.

- What is to be done about protection from *Phytophthora cinnamomi* in sensitive but as yet symptom-free areas? Frank Podger and his colleagues have provided the science; managers need to address the conservation and civil libertarian implications.
- What of the protection of islands, residual small areas of vegetation and outlying genetically distinct populations, in contrast to wilderness?

Given that there is a diminishing pool of funds for research, and an increasing number of such vegetation/conservation questions, where should the priorities be placed? For example, is it more important to hasten the rehabilitation of small areas of disturbance within wilderness areas which would revegetate naturally in time and which occur in vegetation replicated in reserves many times over, or to purchase and/or manage for about the same costs smaller parcels of land in the Midlands which support populations of rare and endangered flora and fauna?

These are hard questions for which we need answers soon, and we need science to provide a basis for the answers. I suspect that, in some cases, those answers are already apparent but that we indeed wait for some courageous decisions to be taken!

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