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**Comments on: Consultation Paper: Developing a National Biodiversity and Climate Change Action Plan.**

The following comments are directed particularly to Strategy 2, but not address the questions listed under that strategy specifically. Instead, they attempt to address in the time available concerns that overlap several questions, and relate to issues from the workshop report.

**1. The certainty of environmental change**

It is clear that environmental change has occurred in a great many supposedly natural Australian ecosystems, through the arrival of pests and diseases. These incursions have continuing and serious impacts on natural systems, particularly small areas surrounded by agricultural or urban lands. The control of weeds and pests on managed lands is often undertaken assiduously, but on remnant vegetation this effort is much less common because there is no immediate financial reward for exercising such control.

Although the effects of climate change on ecosystems has been demonstrated in relatively few situations as compared with the total number of identified regional ecosystems, the effects of climate change can be expected to become more apparent in future. Therefore, it is imperative to ensure that the various categories of biodiversity are protected by practical action.

**2. Increasing the effective area of conservation reserves**

Fragmentation of the natural landscape by agriculture, grazing and residential use has been extensive in many regional ecosystems. This fragmentation places direct pressures on the existing individuals, but it is also inimical to long-term population viability. The establishment of corridors between habitats may be very effective in reversing the impact of landscape fragmentation, but natural processes of dispersal or migration cannot necessarily be relied upon to establish species in environments that may become more favourable in the future. In the first place, the physical connections enabling dispersal or migration may not be in place, or may take too long to become established. In the second place, the rate of environmental change may be greater than the rate of development of connecting ecosystems or the rate of dispersal. Either of these conditions would render ineffective the light-handed approach of facilitation of natural processes.

Reversing the trend of fragmentation and degradation requires that land now being used for commercial purposes is allocated to conservation. For private landholders, this is acceptable provided sufficient land remains to provide a sustainable income and to pay for conservation works. For public lands, a change in focus from commercial production to conservation requires the allocation of funds from consolidated revenue, rather than from the enterprise on the land itself.

**3. Increasing the quality of land management**

Under both private and public land tenures, conservation measures can only be funded from surpluses gained through other activities, and provided there is a will to make these investments.

Typically, small-scale producers cannot afford to invest substantial land or effort in conservation, and large-scale producers are not interested in doing so because it detracts from their business objective. Conversations with farmers recently confirmed that they are not prepared to spend large amounts of time or money on conservation measures. For example, a farmer may be prepared to plant several rows of trees along a paddock boundary in order to enhance wildlife populations, or to provide shelter, but there is a great reluctance to providing continuing management of these trees, even when there would be a prospect of commercial return in the future. If the community at large requires farmers to become conservation managers, farmers be shown that discerning and sensitive land management practices increase their wellbeing, either through increased financial returns or through reduced management burdens, for example for weed and pest control. At present, there does not appear to be any mechanism in place that persuades farmers to make such a change in their management approach, and there is great resistance to enforced changes in land use practices.

#### **4. Taxation incentives**

I am not a taxation specialist, but my perception is that taxation incentives operate most effectively where an enterprise has an income level that can benefit from tax minimisation activities. In recent years, very many farmers have not been embarrassed by excessive incomes, and they have had to borrow in order to maintain flocks or herds, or to sow the next crop. Under these conditions, usually associated with severe natural environmental stresses, they do not have the financial or physical resources to devote to conservation measures. As a result, in the most difficult years, conservation work would be relegated to a very low position on the list of priorities, possibly jeopardising several years of effort during more favourable seasons. If conservation is to be treated seriously, it must become the principal activity for an area, and funded as such, rather than being an optional extra.

#### **5. The need for direct intervention**

For species or ecosystems that currently occupy small isolated areas, the unpalatable but probably inescapable conclusion is that maintenance of biodiversity will require determined human intervention. This intervention may involve one of two types of activity:

1. activities designed to enable a species or ecosystem to persist at a given locality in the face of environmental change,
2. activities designed to enable a species to become established or an ecosystem to develop in an environment that is anticipated to become suitable for the target species or ecosystem at some time in the future.

These activities will result in ecosystems that may be regarded as unnatural, and may be eschewed for that reason. However, it is clear that, if change is to occur, and if species or ecosystems are threatened, inaction will result in their demise.

Different strategies may be required to secure the continuation of species and ecosystems, but there are some important similarities in the threats and potential actions. Species and ecosystems at greatest risk from climate change are those with presently limited distributions and for which the habitats are surrounded by environments that, supposedly already unfavourable, are likely to become even more unfavourable in the future.

## 6. Maintenance of species biodiversity

Genetic diversity may be maintained by the preservation of provenances, ecotypes or families in isolated locations, but it may also be maintained by promoting gene flow between populations that have been brought together from a variety of sources. The success of autonomous adaptation will depend chiefly on the rate of change within the population at a site and the rate of change of the environment. It may be possible to predict the rate of genetic change within a population, but it would require considerable detailed work.

Species biodiversity may be maintained by collecting genetic material and cultivating it, either *in situ* or *ex situ* under circumstances that permit breeding processes to occur in ways analogous to those in the natural environment. For plants, this may require:

- i. *Ex situ* conservation. The establishment of gardens or arboreta where selected individuals or ecotypes are maintained, and where breeding may be managed to the degree required for successful regeneration. Howden et al. (2003) identify alpine and upland wet tropical areas as examples of environments at risk. Hilbert (2003) suggests that some species from upland rainforest environments in the wet tropics of north Queensland may only survive at subtropical latitudes in northern New South Wales. Depending on the latitude and the anticipated temperature rise, different distances of translocation may need to be sought to ensure that plants would be able to complete their life cycles in the new environment (Figure 1).

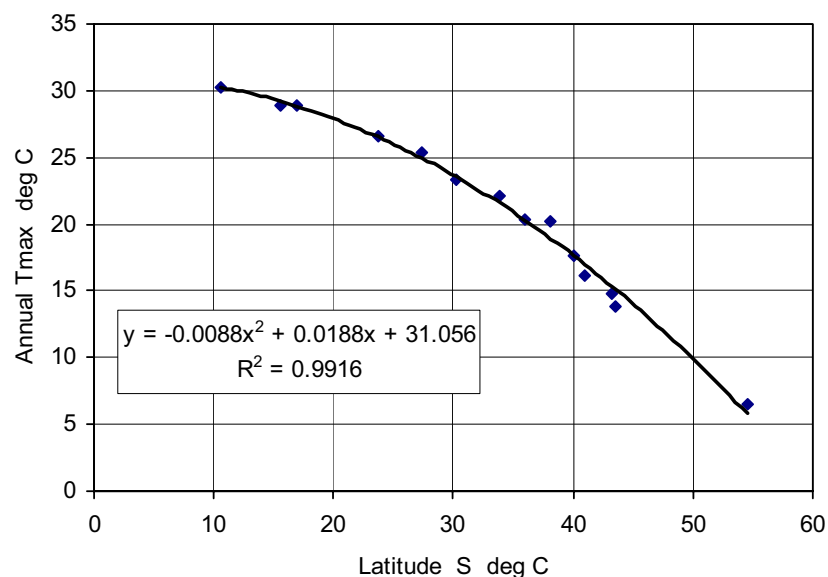


Figure 1. Relationship between mean annual maximum temperature and latitude for stations on the east coast of Australia and Macquarie Island.

This method of conservation is being used for the Wollemi pine, while at the same time creating a commercial opportunity. The introduction of rare species into cultivation should be encouraged, particularly where they are acceptable to

horticulturists or gardeners. However, the number of species that will be conserved in this way is likely to be small, and adoption by domestic or institutional gardeners cannot be relied upon as a general measure for species conservation.

- ii. *In situ* conservation. The establishment of selected individuals in environments that are presently not managed intensively (e.g. in a conservation reserve). Many species can be grown in environments different from those in which they occur naturally, and the environmental range of most domesticated plant species is much greater than that of the wild progenitors. Part of this increase is the result of breeding, but a number of forest tree species for which there has been very little breeding have been grown successfully well outside their natural environmental ranges.

This difference in environments occupied by a species between managed and unmanaged environments may be described as the difference between the physiological and ecological ranges of a species. If the physiological range of a species is greater than the ecological range, then manipulation of the environment may enable a species to be retained in an altered environment.

A consequence of manipulation of the environment is that the ecosystem may be altered unless the management is sufficiently comprehensive that suitable procedures are developed for the maintenance of all species.

A further consequence of this manipulation is the need to select a condition (composition and structure) of the ecosystem that is regarded as ideal, or at least a range of conditions that is regarded as acceptable.

## **7. Maintenance of ecosystem biodiversity**

Howden et al. (2003) recognised that it may not be possible to preserve ecosystems in the future exactly as they now appear, and that maintenance of very closely defined ecosystems may not be appropriate. It is suggested that, in the long term, ecosystems will change, and that as population pressure increases, the Australian landscapes will more closely resemble those of Europe or Asia, where people interact more intimately with the landscape than is the case in Australia at present. Ecosystems that are 'healthy', in that they perform the functions required for production of goods and services, should be the objective. Consequently, the notion of pristine landscapes is tenable for the present, but it cannot be a template for the future.