

Submission to:

Inquiry into Australia's biodiversity in a changing climate
House of Representatives Standing Committee on Climate Change, Environment and the Arts
Parliament House, Canberra

From: The Research Centre for Applied Alpine Ecology

Thank you for the opportunity to contribute to this important Inquiry into the vulnerability of Australia's biodiversity in a changing climate.

This submission was prepared by and on behalf of members of the Research Centre for Applied Alpine Ecology at La Trobe University and the University of Melbourne. The focus of this submission is the Australian mainland alpine environment, with particular reference to the Victorian Alps, where the Members of the Centre have a long and robust track record of undertaking scientific research on alpine ecology. Members of the Research Centre would be prepared to appear before the committee if required for elaboration of the views expressed in this document.

We address each of the terms of reference below. However, before addressing the particular terms of reference we wish to highlight a number of important guiding principles regarding the management of Australia's biodiversity in general, and the Australian Alps in particular, in the face of changing climate. With respect to biodiversity, current managements approaches (such as restoration corridors, and habitat management within protected areas, management of migrations) to increase the adaptive capacity of ecosystems to adjust to climate change are poorly understood in most ecosystems. Significant new resources need to be provided to the conservation management R&D community so that conservation management in the face of climate change can, if need be, be 're-engineered'. The Australian Alps provides an environment in urgent need of such investment.

Biodiversity issues in the Australian Alps relate to the following:

- The Australian Alps occupy less than 1% of the area of the continent, and are therefore a very rare landscape. The biota and associated communities of the Alps are special, and not found anywhere else in Australia (or other parts of the world). They are at particular risk from climate change, as are alpine systems globally.
- The Australian Alps are at risk from land use changes brought on by human use – past, present and future. Thus understanding how climate change and other stressors affect the Australian Alps is nationally and globally significant.
- Several plant communities which are of national conservation significance – e.g. snow patch herbfields and *Sphagnum* peatlands – are at risk of decline or even disappearance as a consequence of climate change.
- Some species and communities are at their altitudinal limit, and there is nowhere else for them to go in response to climate change.

- Climate change will bring novel disturbance regimes to the alpine regions, via increased potential for invasion by exotic plants and animals, upward migrations of native plants and animals, and altered fire regimes.
- Grazing by domestic livestock, historically an important land use in the Australian Alps, has no environmental benefits, and many well-known environmental costs. Any plans for livestock grazing within the Australian alpine conservation estate on the pretext of improved land management is ill-informed and in fact represents poor land management.
- There is a long history of ecological research in relation to land use in the Australian Alps that can be brought to bear on the problem of climate change and the Australian Alps. Further investment in this research infrastructure is warranted given the dramatic changes expected and value of long term monitoring in decision making.

We now address the specific terms of reference of the Inquiry.

The Committee will inquire into and report on biodiversity in a changing climate, in relation to nationally important ecosystems. The inquiry will have particular regard to:

Terrestrial, marine and freshwater biodiversity in Australia and its territories

The Alps ecosystems are inspiring and have some of the highest biological and conservation values in Australia. The whole of the Australian Alps is listed under Commonwealth heritage legislation. There is a high level of endemism in both plants and animals at the National and local levels (e.g. about 60% of vascular plant species are restricted to the Alps). Alps biodiversity also displays important genetic links with other mountain ecosystems (e.g. New Zealand, the Andes and New Guinea). Because of the steep climatic gradients in the Alps, local effects of climate change on endemic plants and animals may be especially pronounced. Topographic complexity, however, may provide important refugia for alpine species.

Connectivity between ecosystems and across landscapes that may contribute to biodiversity conservation

The mainland Alps are an extensive and continuous range of mountains (extending from near Melbourne to the ACT) providing the largest elevational connectivity on mainland Australia. It is vital that that connectivity and continuity are not compromised or even destroyed through destructive land uses (such as logging, excessive fuel reduction burning and grazing by domestic livestock). Patterns of historical connectivity can be mapped through genetic analysis but this has not yet been achieved. It may also be possible to assist in the conservation of species that are endangered (or otherwise at-risk) through genetic translocation of these species (Weeks *et al.* 2011). Such an effort has recently been realized with the Mountain Pygmy-possum where genetic diversity for resilience was increased by translocating individuals from Mt Hotham to Mt Buller. Such programs need to be carefully evaluated and can be highly cost effective for threatened species.

How climate change impacts on biodiversity may flow on to affect human communities and the economy

The diversity of plants, animals and landscapes in mountain environments provide considerable ecosystem services to all Australians. First and foremost is water – a large proportion of the water in the Murray River is derived from the Australian Alps. Protecting these high level

catchments in the face of projected changes in precipitation patterns is vital to all Australians. The Australian Alps also provide benefits to the tourist industry (e.g. as wild landscapes, wild-flower displays). Local tourist economies will be under increasing pressure with the expected downturn in winter skiing tourism as a consequence of climate change. Many winter tourism operators will look to summer tourism for survival by promoting the unique biodiversity and landscape of the Alps along with cooler mountain temperatures.

Strategies to enhance climate change adaptation, including promoting resilience in ecosystems and human communities

Climate change, particularly warming, presents risks to alpine biodiversity. In the Australian Alps, the most profound changes are likely to occur because of the interaction between climate change and other stressors, which in turn may also change as a consequence of climate change. This includes potentially more frequent and severe fires and droughts (Williams *et al.* 2009), movement of alien and native plants (McDougall *et al.* 2005), and increased summer use of mountains by people (e.g. Tryhorn and Lynch, 2010). Adaptation will therefore be greatly enhanced by managing these factors.

To predict resilience, information on the likely evolutionary adaptive capacity and plastic capacity of the local flora and fauna need to be defined (Byars *et al.* 2007). This needs to involve a combination of physiological and phenological assessments (e.g. Hoffmann *et al.* 2010), a description of patterns of genetic diversity and uniqueness across the Alps, and an assessment of evolutionary potential and gene flow. To build resilience in the Australian Alps, historical patterns of connectivity and refugia need to be mapped and defined, and linked to regional predictions for climate change. This information needs to be incorporated into management plans including the conservation value of particular areas. For threatened species, a decision framework needs to be established to determine appropriate times when genetic translocation (shifting genes in landscape) might be appropriate, as well as the more dramatic step of species translocation, though the latter is a risky and “last resort” strategy (e.g. Williams *et al.* 2008).

More immediate practical measures that would reduce the pressure on Alps biodiversity are: 1) substantial reductions in the number of feral horses and other feral animals (i.e. rabbits, foxes, cats, dogs, pigs, deer); 2) removal of all grazing by domestic stock, e.g. in the Victorian Alpine National Park and adjoining State forest areas above 1000m altitude; 3) controlling destructive plant invasions, which now are mainly restricted to disturbed areas (roadsides, ski resorts and hydro-engineering works), but which are likely to increase substantially over the next few years (McDougall *et al.* 2005).

These actions will bring environmental benefits regardless of uncertainty about climate change and its impacts – they are ‘no-regrets’ actions. Substantial reductions in the numbers of feral animals, cessation of grazing by domestic stock, and allocating adequate resources to the control of invasive plants are three obvious components to strategic and cross-jurisdictional management policies designed to enhance resilience of the Alps.

Mechanisms to promote the sustainable use of natural resources and ecosystem services in a changing climate

Sustainability in the use of the natural resources of the Australian Alps, and the provision of ecosystem services, will be best achieved through the conservation of the natural values. As described above, the protection of these natural values is more likely to be successful if the additional threats, such as invasive plants and animals and destructive human activities are successfully managed. For invasive animals, the primary mechanism is a managed reduction in numbers. While small, isolated populations of horses, pigs and rabbits can be eradicated, large

scale eradication of feral animals is unlikely in the medium term. The ultimate aim can and should be to reduce numbers greatly. Programs for the control of invasive plants should be sufficiently well funded to allow eradication of small occurrences, and containment of larger infestations.

The major (historical) resource extraction activities in the Australian Alps have been mining, cattle grazing, and hydroelectric power production. While mining activities are long discontinued, grazing is still proposed by some groups as a legitimate (even beneficial) activity; this view is ill-informed. Grazing by livestock to achieve conservation outcomes in the Alps has no basis in science. Grazing is selective, it alters plant community composition and does not reduce the incidence or severity of wildfire (Wahren *et al.* 1994; Williams *et al.* 2006 a, b). Hydro-electric power production has resulted changes in catchment yields and stream flows through cross-catchment transfers and water impoundment. The impacts of these engineering works on catchment health remain largely unknown.

Providing water to lowland rivers is one of the most important ecosystem services derived from the Australian Alps. A high proportion of the sustained summer flows in lowland rivers is derived from the Australian Alps. This landscape provides both a high water yield, and water of an exceptionally high quality. It is unknown what the impacts of climate change on this ecosystem service will be, but the likely outcomes are: 1) reduced groundwater recharge and summer base-flows as a consequence of reduced winter snowpack, and 2) deterioration in water quality due to contraction or loss of alpine peatlands (Silvester, 2009). In this context cattle grazing represents an extremely poor value proposition given the well-demonstrated detrimental effects of this activity on the integrity and function of alpine peatlands.

A major human activity in the Australian Alps is tourism and recreation. There are a large number of visitors to the Alps annually. This presents a major opportunity to educate the general public about the outstanding national natural heritage values of the Australian Alps, and their vulnerability to climate change and other human impacts.

An assessment of whether current governance arrangements are well placed to deal with the challenges of conserving biodiversity in a changing climate

Landscape management in the Alps is difficult due to the remoteness of the land and its harsh climate. It is likely that current management is under-resourced. For example, current management is not coping with invasive species – feral animals and exotic plants are increasing in abundance and number, and climate change is likely to exacerbate this situation. Nevertheless, achieving good governance despite resource constraints, a major issue for conservation research and development globally, is vital to sustaining alpine biodiversity in the coming decades.

Because the Alps ecosystem extends across three jurisdictions (ACT, NSW, Victoria) and contains multiple land managers (e.g. resort management, state government agencies, hydro-electricity producers, road authorities), co-ordinated action to deal with climate change and the threats associated with it are needed. The last 30 years has told us that these ideals are extremely difficult to implement. In some cases (e.g. prevention of further weed invasion), mitigation of risk is unlikely to be effective with current governance. The Australian Alps Liaison Committee is a good concept for sharing information on management but it lacks authority, scientific knowledge and funding, and does not effectively engage private and corporate bodies. In addition, management of threats to the Alps will require better links between Alps managers and managers of surrounding lowlands. For instance, prevention of new threats (e.g. weeds, goats) will probably require funding of control programs in lowland areas surrounding the Alps (including freehold land) to protect Alps biodiversity. This is done

(for instance) in Hawaii for weeds. Catchment management authorities are well placed to deliver such programs but this is not explicitly recognised as part of their role.

Monitoring is crucial for good governance. To be effective, monitoring systems need to: 1) be capable of detecting changes that are of concern to conservation managers; 2) have data that are readily accessible; 3) be linked to the decision making process.

The history and practice of scientific discovery in the Australian Alps has provided a considerable knowledge base on land use research for all Australians. This knowledge base is a fundamental resource for current and future researchers, managers and policy makers charged with the complex task of designing governance structures and arrangements for biodiversity conservation in the Australian Alps in the face of climate change.

Mechanisms to enhance community engagement.

Greater community involvement will be essential for adaptation strategies to work and, in particular, to make governments allocate adequate funding for weed and feral animal control. The situation is more difficult where there are groups in the community that oppose effective actions to protect biodiversity (e.g. reduction in feral horse numbers; removal of livestock grazing), but ultimately the natural values of the Australian Alps, and the ecosystem services provided, must take priority. Financial support and encouragement for non-government and volunteer organisations would be useful in achieving these goals. Currently there are few such organisations in the Alps (at least those dedicated to broad conservation of biodiversity). This is ironic, given the national conservation significance of the Alps ecosystems.

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