

CF 226

22/06/2007

Project Director,  
Lands and Biodiversity, white paper project team.  
Department of Sustainability and Environment  
East Melbourne

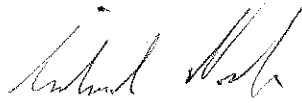
Dear, Sir/Madam

Please find enclosed our ideas relating to biodiversity in Victoria in response to the released White Paper.

Thank you for the opportunity to participate in this process.

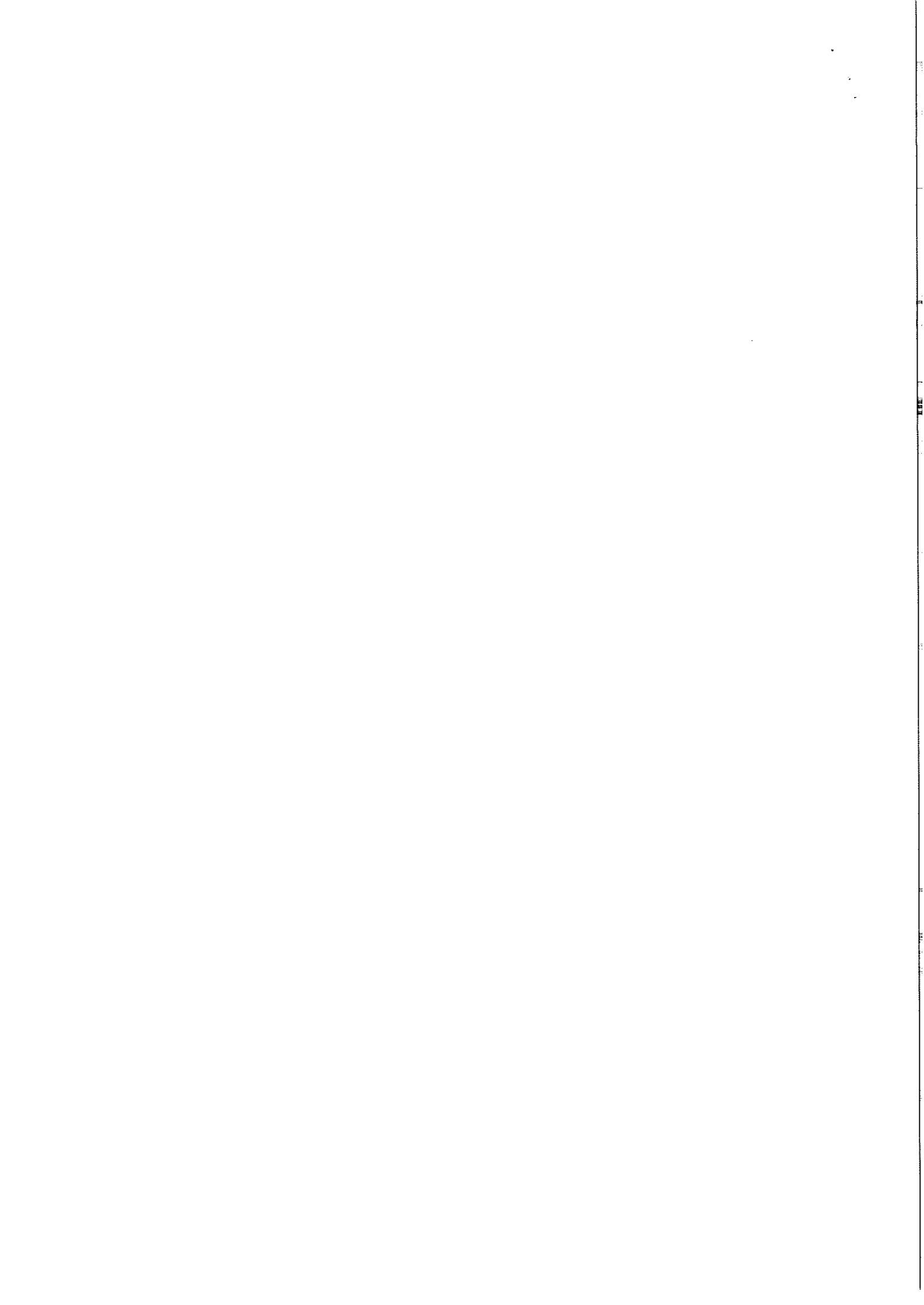
Look forward to any future correspondence

Yours Sincerely



David Sharley, Michael Nash and Linda Thomson

Centre for Environmental Stress and Adaptation Research  
Bio 21  
30 Flemington Rd  
Parkville 3010



## Land and Biodiversity at a time of climate change

The "White Paper - call for submissions" consultation paper contains a number of key policy questions around which the strategic framework for the White Paper will be built. These are repeated below. Submissions addressing these key questions and any or all of the others posed throughout the paper are invited by Friday 22<sup>nd</sup> June.

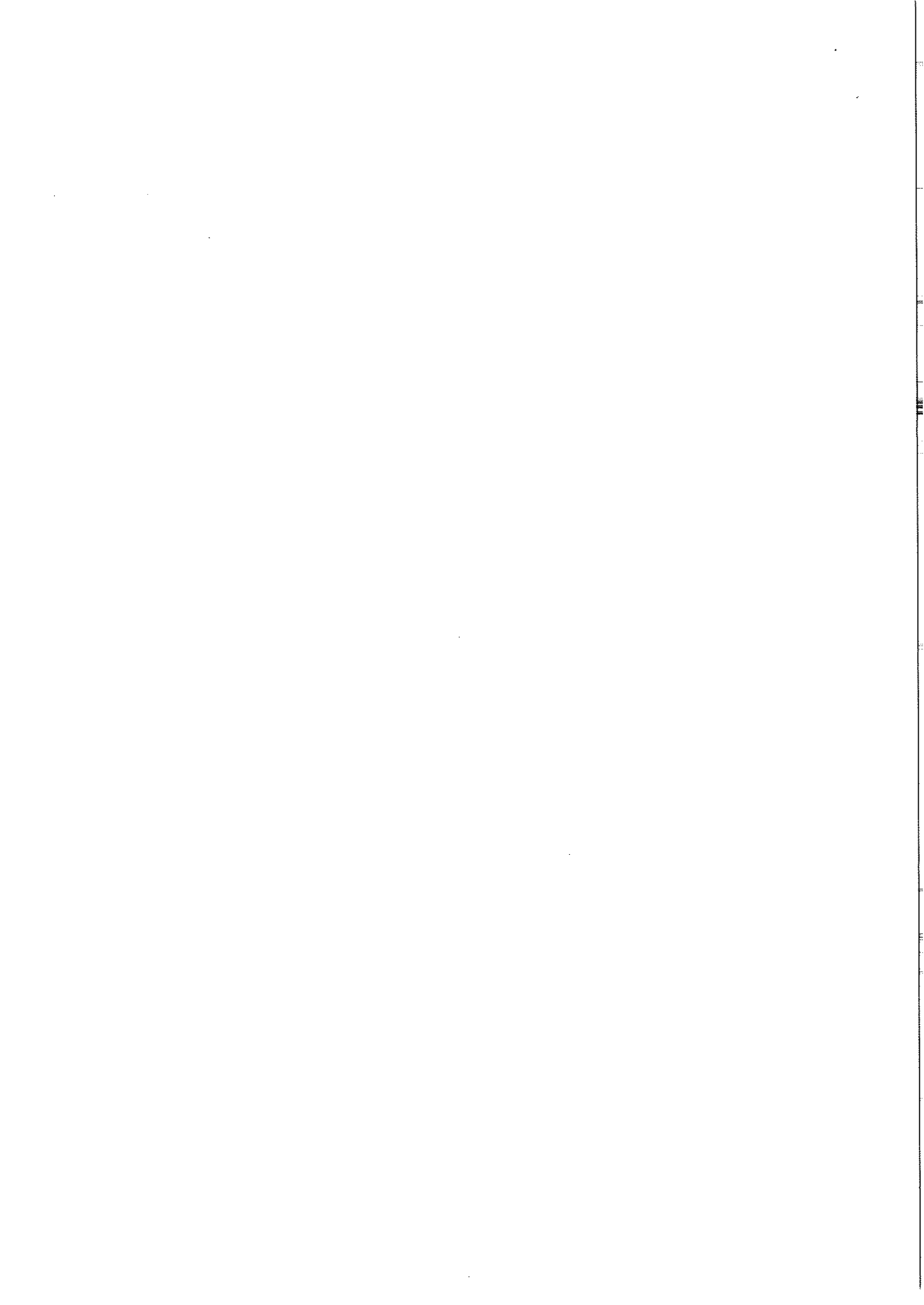
### *What are the environmental, social and economic values provided by healthy land and biodiversity?*

The functioning and sustainability of ecosystems depends on their biological diversity (Tilman *et al.* 1996). There is a growing realization worldwide that biodiversity is fundamental to agriculture, food security, and as environmental conservation (Thrupp 2000). Past focus on biodiversity in Victoria has been driven by the need to conserve for social and cultural reasons; e.g. aesthetic landscape value and the central role biodiversity play in indigenous culture.

The economic reasons to maintain biodiversity generally focus on tourism benefits, due to lack of data on productivity gains. Most importantly the hypothesis that diversity insures against lack of production is often neglected. An example of this is the provision of shelterbelts in agricultural systems providing pest control (Tsitsilas *et al.* 2006). A second neglected area is the increased production of a system due to increased diversity, which is in direct conflict with the present agriculture ideology based on monocultures.

Environmental values also rely on ecosystem function provided by the maintenance of biota. There is a wealth of information in the scientific literature linking the environmental benefits of increased biodiversity with system processes. For example, nutrient recyclers within the soil play a pivotal role in the decomposition and incorporation of waste material.

Many more examples can be given highlighting the interaction between the social, environmental and economic values and the link to biodiversity. Still, the greatest need is to demonstrate why biodiversity is needed at all?



## Land and Biodiversity at a time of climate change

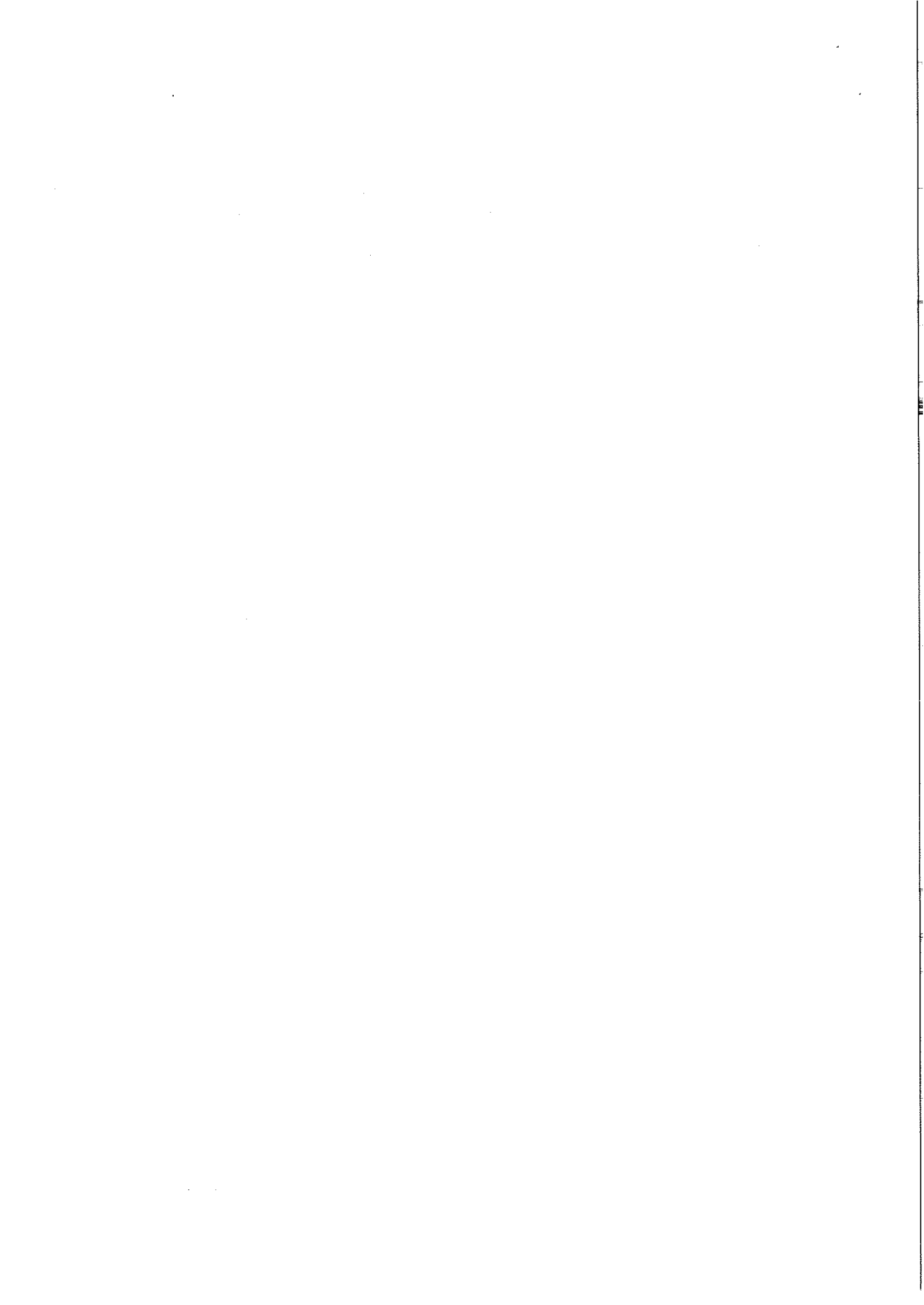
### *What impacts will climate change have on these values?*

The increasing threat of changes to climate highlights the value of maintaining biodiversity.

Society is largely unaware that the maintenance of a diversity of insurance species will guarantee resilience to changes in climate. In the case of Victoria, climate models are predicting decreasing average rainfall and increasing mean annual temperature. The key question is what does this mean for the biodiversity of Victoria. If the ecosystems are functioning sustainably then the biota will adapt to the changing climate. However, it has been demonstrated that not all species have the genetic capacity to adapt (Hoffmann *et al.* 2003). For this reason it is necessary to engage effective monitoring programs that will be able to indicate where further resources need to be targeted.

Work in the Australian Alps (ITEX) is already looking at the potential change in processes that may be altered due to climate change. The outcomes of this research should provide a clear indication of potential impacts that may occur in the face of climate change. The conservation of aesthetically pleasing species, e.g. the Pygmy possum (*Burramys parvus*) will lead to conservation of socially important landscapes – alpine areas. In turn, conservation of these alpine areas has flow on effects such as improvement to water quality downstream of these areas. Thus, the conservation of diversity will lead to a buffering against possible disturbance of the Alps which can result in the protection of water quality to important irrigated areas in Victoria and NSW as one example.

Ultimately if the productivity of agriculture is reduced by climate changes the greatest challenge will be limiting the encroachment of agriculture on more threatened and marginal land. This encroachment has already caused a major impact on biodiversity within Victoria and will not be limited by legislation alone. The importance of understanding how maintaining biodiversity will buffer against a changing climate is paramount.



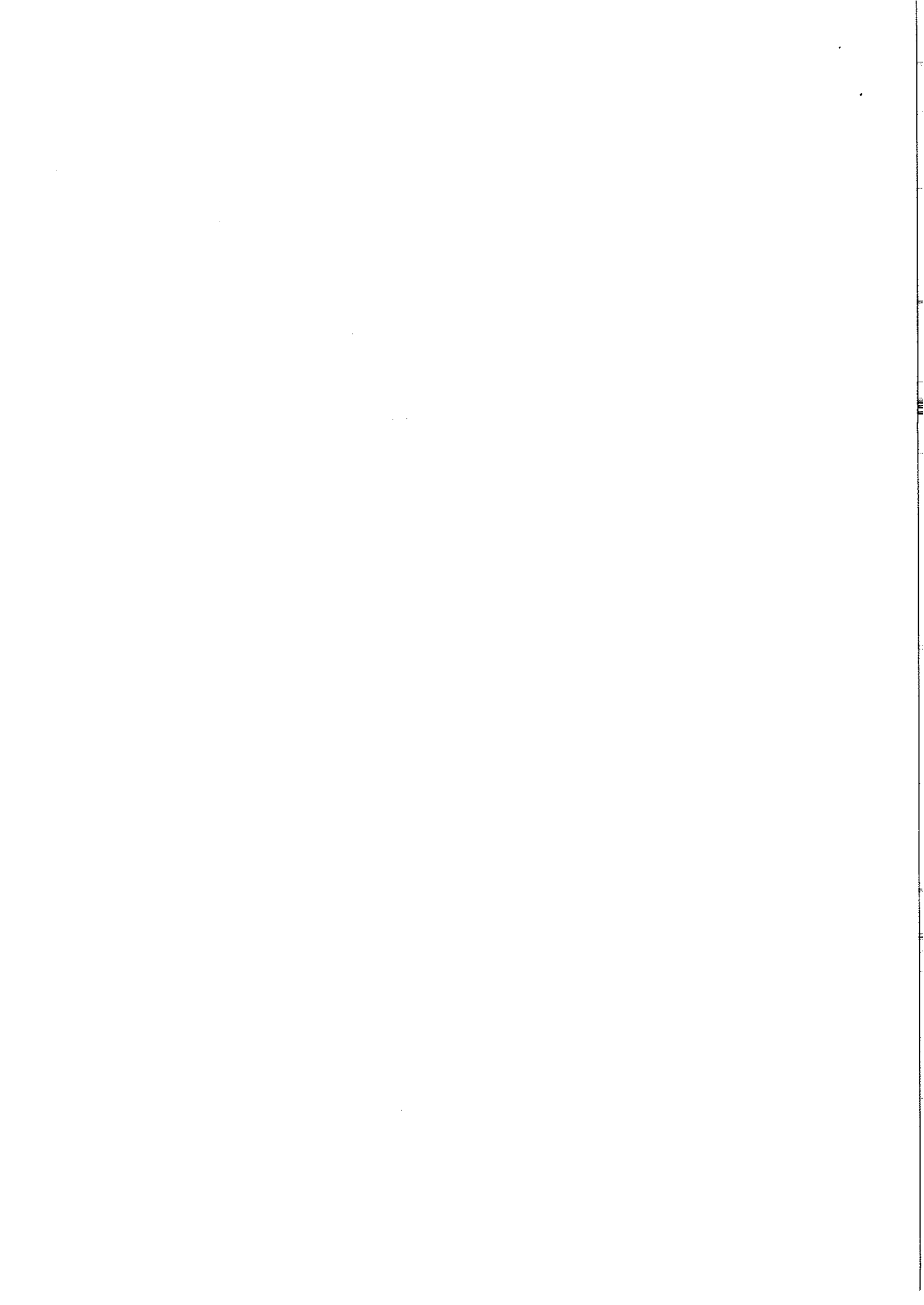
## Land and Biodiversity at a time of climate change

### *What are the other threats and opportunities?*

Along with climate change, the intensification and commercialisation of production systems threatens biodiversity on a large scale. A large proportion of Victoria's biodiversity has already been lost through the establishment of European based farming methods. The changing nature of rural societies towards a world-wide trend of large highly mechanised corporate farms further threatens the remaining biodiversity. These large production areas also impact on the surrounding landscape due to the loss of a variety of farming practices. Traditionally, smaller family based farms have helped maintain a heterogeneous landscape. The intensification of agriculture has also seen an increase in the dependency on a variety of agrochemicals for pest control. Is this increase reliance on chemicals due to the loss of ecological function (biological control) caused by the loss of diversity? Understanding this key question is vital to predicting agricultural and environmental systems ability to adapt to changes in not only climate but also changing management.

Changes in agricultural management need to occur to enhance biodiversity, hence ecosystem services; this can be seen as an opportunity to buffer declines in productivity. Unfortunately the provision of system function generally occurs unnoticed due to the lack of knowledge of key taxon that provides such services. This includes invertebrates which provide functions such as pollination and pest control (Tschardtke *et al.* 2005). A golden opportunity presents itself to implement policy that will not only conserve what remains, but link conservation to agriculture as one system where biodiversity is utilized by land managers to provide sustainable agricultural systems. In addition, the opportunities to investigate the role of non-native species in providing ecosystem services are immense. A great example of this is the beneficial role of weedy species in agricultural systems through the maintenance of parasitoid wasps and the control of pests (Landis *et al.* 2000).

This is one of the many areas where biodiversity can create opportunities to sustain us as a society through increasingly threatening times. By building on these ideas we can insure a sustainable Victoria.

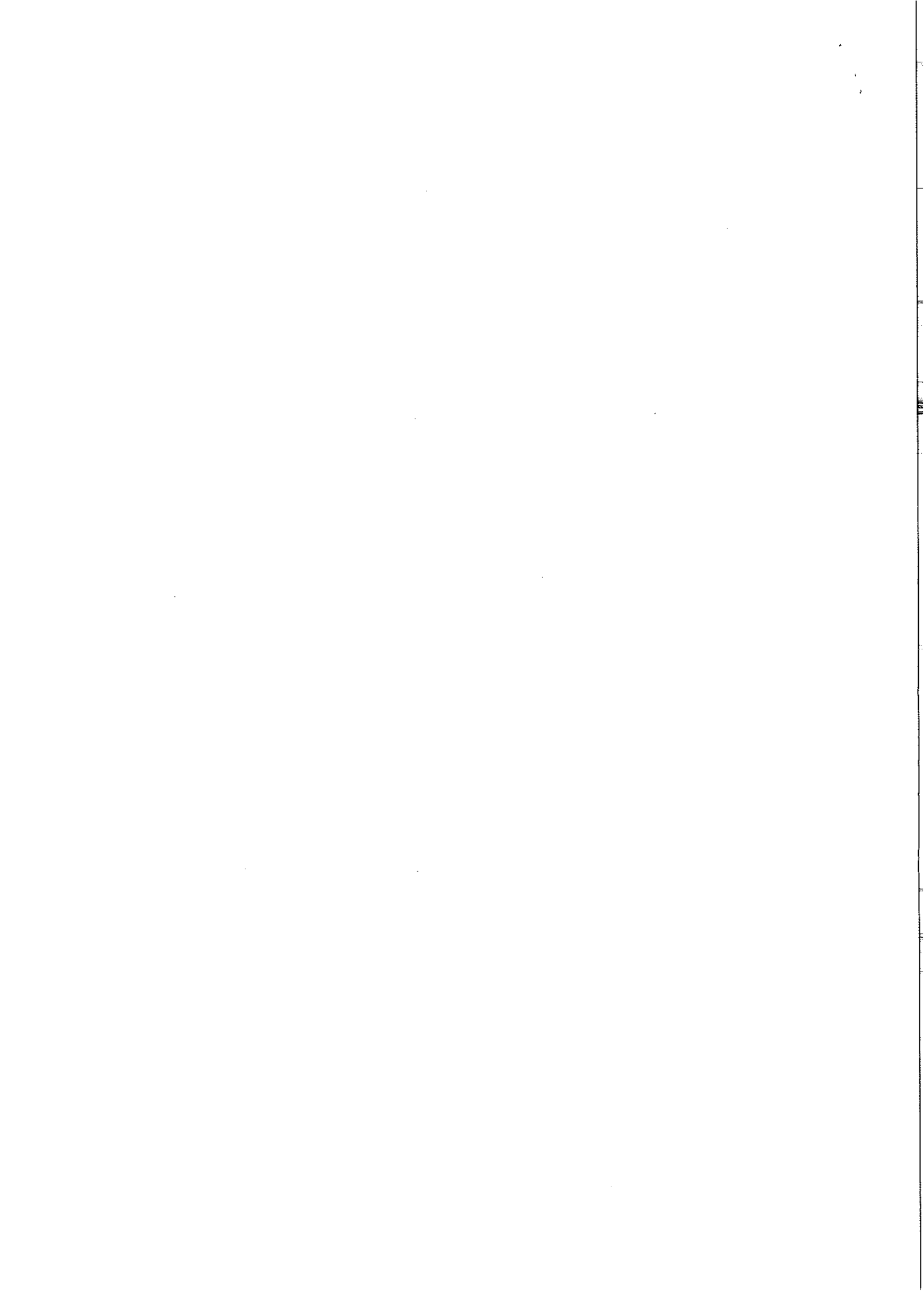


## Land and Biodiversity at a time of climate change

*What are the roles and responsibilities of individuals, community and government and how can we maximise the effectiveness of our joint effort?*

All land managers, whether government, community or individual, have an obligation to work with other parties. The traditional legislative approach often leads to a less desirable response from individuals and surely a more "carrot and stick" approach is needed. For example, the suggestion of legislation controlling the improvement of semi-native grasslands held by private landholders has led to the perception that removal of grasslands and the introduction of improved pasture species is the best decision. We consider this a negative outcome in the protection of biodiversity. A better approach has been the establishment of non legislative Environmental Management Strategies (EMS) which encourages private land holders to think about their impacts on the surrounding environment. With agricultural production mainly being exported, consideration of the impacts of production on the environment is now crucial. Western Europe is leading the world in requiring increasingly sustainable environmental production systems. Victorian farmers are increasingly aware that if they are to compete successfully on the global market, effective EMS must be implemented at the farm level. The provision of the EMS framework by government is a good example of how policy can benefit individual landholders, and provide communities their social needs without legislation.

In addition to the EMS framework, landholders and key stakeholder reference groups need to form improved relationships with research groups within the government, industry and the university systems. This will allow key research to be communicated at the ground level. Improvements in knowledge transfer are vital if Victorian landholders are to benefit from industry and government funded research now and into the future.



## Land and Biodiversity at a time of climate change

*How well are the current institutional arrangements working and how could they be improved to deliver sustainable land, water and biodiversity outcomes?*

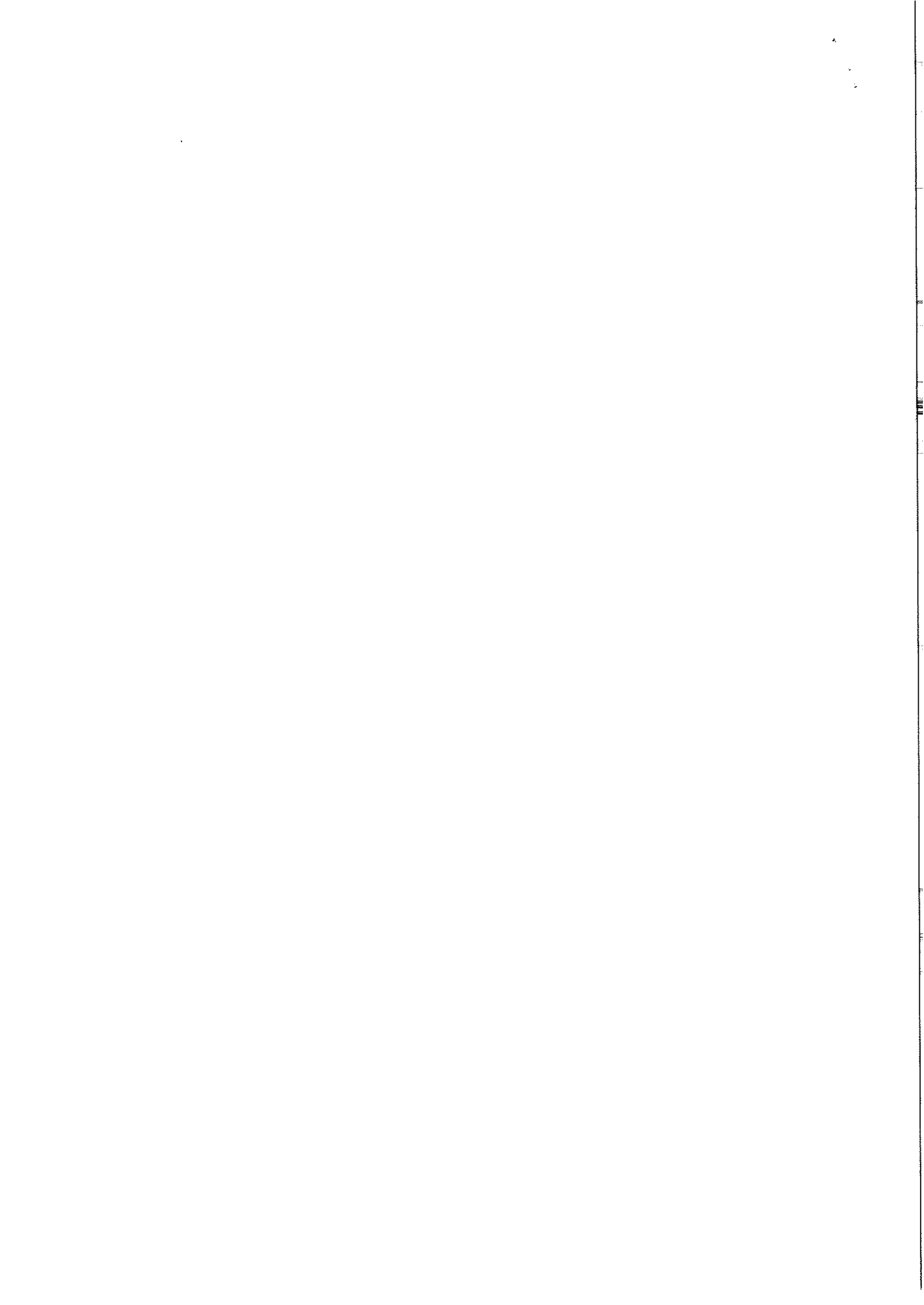
The current reliance on biodiversity from a conservation perspective needs adjustment to encompass the needs of agriculture, which is the single largest land use in Victoria. Thus agriculture has the greatest impact on the whole environment. Sustainable land use will only occur when managers of agro-environments start to acknowledge the importance of biodiversity in maintaining productive systems.

To deliver outcomes successfully, deficiencies with the existing biodiversity measures used in environmental assessments need improvement. Typically these measures rely on groups with good taxonomic knowledge which does not include invertebrates, which comprise a major component of the overall biodiversity. Current biodiversity measures do not include all taxon that are vital to ecosystem productivity, for example invertebrates. For example soil engineers such as earthworms and ants often go unrecognized in current assessments. Another example is pest control which is achieved by the action of predatory / parasitic invertebrates. These often hidden contributions delivered by invertebrates are seldom included in current assessments. Agricultural production relies on ecosystem services provided by invertebrates. Therefore inclusion of invertebrates in environmental assessments is critical.

Existing environmental assessments that involve monitoring biodiversity are fundamentally problematic because they are arbitrary. Historically the amalgamation and then split of key institutions, such as DPI and DSE, can be seen as analogous to the development of indices for biodiversity. Current opinion is that agriculture and conservation of diverse natural systems can not coexist. The scientific literature has demonstrated that when the correct indicators are used, both conservation and agriculture can come together in a synergistic way (Duelli and Obrist 2003). For example, the protection of native vegetation adjacent to agro-ecosystems has been shown to lead to an enhancement of beneficial invertebrates and a more sustainable production system.

Changes are needed at all levels of society, from government right through to institutions, key stakeholder reference groups and landholders. The correct monitoring indices and techniques used by stakeholder reference groups will allow on-ground improvements to be assessed in the future. Correct monitoring will give governments of the future the necessary information to drive further policy in the area of sustainable farming and land conservation. A major change in policy on the current environmental monitoring methods needs to occur to justify the current resources being allocated to key stakeholder reference groups to manage the State's biodiversity sustainability are being allocated.

Policy needs to guide resources towards conservation of agro-biodiversity that will lead to increased agro-productivity.



# Land and Biodiversity at a time of climate change

## Submission author details

Name: David Sharley, Michael Nash and Linda Thomson

Organisation: Centre for Environmental Stress and Adaptation Research (CESAR)

Address: Level 2 Bio 21, 30 Flemington Rd Parkville, 3010

## Bibliography

Duelli P., Obrist M. K. (2003) Biodiversity indicators: the choice of values and measures. *Agriculture, Ecosystems & Environment* 98, 87-98.

Hoffmann A. A., Hallas R. J., Dean J. A., Schiffer M. (2003) Low Potential for Climatic Stress Adaptation in a Rainforest *Drosophila* Species. *Science* 301, 100-102.

Landis D. A., Wratten S. D., Gurr G. M. (2000) Habitat Management to Conserve Natural Enemies of Arthropod Pests in Agriculture. *Annual Review of Entomology* 45, 175-201.

Thrupp L. (2000) Linking agricultural biodiversity and food security: the valuable role of agrobiodiversity for sustainable agriculture. *International Affairs* 76, 265-281.

Tilman D., Wedin D., Knops J. (1996) Productivity and sustainability influenced by biodiversity in grassland ecosystems. *Nature* 379, 718.

Tscharntke T., Klein A. M., Kruss A. Steffan-Dewenter I., Thies C. (2005) Landscape perspectives on agricultural intensification and biodiversity - ecosystem service management. *Ecology Letters* 8, 857-874.

Tsitsilas A., S. Stuckey S., Hoffmann A. A., R. W. A., Thomson L. J. (2006) Shelterbelts in agricultural landscapes suppress invertebrate pests. *Australian Journal of Experimental Agriculture* 46.

