To the Victorian Environmental Assessment Council:

The *Statewide Assessment of Public Land Discussion Paper* generated by the VEAC provides a revised policy framework for the classification and management of Victoria's public land. Amongst the priorities for this revised framework is strategic land-use planning that ensures the preservation of Victoria's unique biodiversity and buffers it from the threats of climate change.

The VEAC states "the most effective way to protect biodiversity for the long term is to maintain native vegetation in a healthy state". However the health of Australia's flora communities are already being compromised by climate change, from the recent death of mangrove forests in northern Australia, to the dieback of Eucalypts in south-eastern Australia, to the inability of mountain ash forests to recover from frequent fire events. The frequency and magnitude of climate changes will only continue to increase in the coming decades, and it is likely that many species will fail to keep up.

Encouragingly the VEAC recognises that "in order to minimise the negative impacts (of climate change) on biodiversity, effective adaptation is required", and "in some cases, engineered strategies designed to increase the ability of species or systems to be more resilient to change" is needed.

As specialists in the area of environmental adaptation research we totally agree with this philosophy. For the past 200 years, wildlife conservation efforts have focussed primarily on protection, but protection will often be insufficient when the environment is massively changing. Adaptation then becomes critical. If we are to help floral communities and the ecosystems they support in the future, we must introduce new measures to maximise their adaptive capacity.

There are important opportunities for strategic public land-use planning that will greatly assist the climate proofing of Victoria's flora communities. Below we provide a description of what we believe is one key element needed to ensure the long-term health of Victorian flora communities, and how strategic planning (involving environmental engineering strategies) can help achieve this goal.

It is likely that many ecosystems will fail to keep up with climate change. Seeds are the only way for plants to move, and seeds can only travel so far. The distribution of plants might only shift by a few metres a year, whereas the velocity of climate change is expected to be much faster. Consequently, there is growing pressure on local flora populations to adapt to changing local environmental conditions via the process of genetic change (evolutionary adaptation) but the speed of adaptation by natural processes (which is undoubtedly highly effective but can take thousands of years) will be insufficient to keep up.

In addition to being too slow, evolutionary adaptation is also compromised in many species communities today throughout Victoria's highly modified agricultural landscapes. Population connectivity is vital for the movement of genes across

landscapes needed for adaptation; this connectivity provides new genes available for natural selection. Yet the highly fragmented nature of Victoria's floral communities means that movement is severely curtailed. We need strategic methods for assisting gene flow across regions to facilitate this process.

An important tool for overcoming these issues and speeding up evolutionary adaptation is to start the process of deliberately moving genes (and species) around the landscape in a careful and contained manner. The key objective is to augment remnant populations with genetic material that is likely to be optimally suited to future climate conditions.

Local genes that are adapted to recent climatic conditions (local provenances) are not expected to do well under future conditions. Instead genes from non-local sources are likely to outperform those from local provenances.

In various parts of the world, industry and government are now starting to embrace the notion of seed mixing strategies as a way of boosting genetic diversity in floral communities, ensuring that genes adapted to future conditions as well as current conditions are present in populations and communities. For example, in western North America a plot network consisting of 48 sites, 15 tree species, and temperature variation of 3-4°C has recently been developed. The performance of multi-provenance genotypes is being monitored at each site to identify the genes that are best suited to local environments. This will provide a basis for guiding future seed sourcing efforts, and maximising revegetation efforts through the selection of climate ready germplasm.

With strategic public land allocations Victoria has the opportunity to lead Australia in this area. If the VEAC is truly committed to the adoption of engineered strategies designed to increase the environmental resilience of species and ecosystems, then we must develop a plot network along the lines of that seen in North America. We would be happy to assist the VEAC in developing a similar network, helping the state to prepare for the future with areas that can be used for seed production of climate-adapted plants across the state of Victoria.

Focusing on public land assets at the catchment scale (defined by CMA boundaries), we suggest identifying suitable sites per catchment for the development of a statewide plot network. Each plot might consist of a hundred or more plants of priority species, representing multiple provenances covering a range of environmental gradients (e.g. temperature, precipitation, soil moisture / type). The statewide plot network will likely require more than a million plants, and the fitness of plants from different provenances at each plot can be carefully monitored over time. Temporal measures of fitness can be used as an indicator for selecting optimal genetic material for revegetation activities at catchment and sub-catchment scales that will enhance their adaptability and fitness under climate change.

We would be happy to partner with VEAC in developing this concept further. Such a network would require input from community groups, practitioners and managers as well as scientists to identify public land assets across the state that would be suitable for development of the plot network. Our proposal has already gained considerable interest from local government, NRMs and community groups across the state, given the substantial benefits of such an investment at the state and regional scales. We request that the VEAC seriously consider this proposal when revising the policy framework for the classification and management of Victoria's public land. We would be happy to meet and discuss this proposal in further detail. This is a timely opportunity likely to be critical in ensuring that Victoria has a climate adaptation strategy to counter the likely substantial loss in biodiversity that we face in the future.

Regards,

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