



# Bushland and Urban Biodiversity Management in a Changing Climate

Climate change is a major issue for Australian communities, with many emerging risks, as well as opportunities. It is important to understand these risks and opportunities at the local level, due to the differences in local communities' vulnerability to climate change, as well as in adaptation needs.

The Eastern Alliance for Greenhouse Action (EAGA) has been working to consider the impacts of climate change on the ability of Councils to manage biodiversity and bushland assets.

## A changing climate in the EAGA region

A CSIRO Climate Futures report prepared for EAGA projected that the "most likely climate future" for the EAGA region includes increasingly drier and hotter climatic conditions with increasing intensity of rainfall events.

By 2050 the EAGA Region is most likely to be hotter (+1.7 to +2.5°C) and drier, with precipitation reduced by up to 14%.

By 2070 it is likely to be much hotter (+2.0 to +3.0°C) and precipitation could reduce by more than 21% making conditions much drier.

**Victorian Local Sustainability Accord**

**Sustainability Fund**  
Managing Sustainability Projects



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Boroondara City Council, Knox City Council, Maroondah City Council, Monash City Council, Whitehorse City Council and Yarra Ranges Council.



## Key Climate Futures Projections:



### Temperature

Average temperatures will rise in all seasons, most significantly in summer and least in winter.

Hot days will become significantly more frequent.

Warm nights will become more frequent, mostly in summer.



### Rainfall

Average rainfall is likely to decrease in all seasons.

Evaporation will increase across all seasons.

Average inflow to streams is likely to reduce.

Dry days will become more frequent.



### Relative Humidity and Wind Speed

The air will feel drier as relative humidity could decrease up to 9% by 2070.

Extreme wind-speeds could decrease in summer and increase in winter.



### Fire Weather

Forest fire risk will increase as conducive weather conditions become more frequent.

The fire season will start earlier in the year and end later.



### Solar Radiation

By 2070, annual average solar radiation may increase by up to 4%, and increasing UV exposure.



## The role of EAGA councils

Councils have a key role in managing a range of biodiversity assets on public land. They are also the closest interface with private landholders and therefore play an important role in education, support and regulation. This project has helped EAGA to explore opportunities to form cooperative alliances and to identify challenges such as the range of levels of stakeholder knowledge and understanding, lack of resources and potential conflict between development needs and biodiversity management.

### Partnerships

Councils cannot do this alone. Key to the success of this project were the collaborative partnerships developed with other agencies. Contributors have included the Department of Sustainability and Environment, the Australian Research Centre for Urban Ecology and Macquarie University. EAGA will endeavor to maintain these beneficial relationships as it further explores this complex topic.



# Potential impacts on biodiversity

## Impacts on species and ecosystems

Ecosystems are made up of communities of living species interconnecting with each other and their non-living environments. Changes in climate are already impacting on species and ecosystems in a variety of ways.

Plant and animal populations are likely to move in response to increased temperature and altered rainfall, changing the distribution of some ecosystems.

The composition of ecosystems will change as some species decline and are replaced with species better suited to the changed conditions. This will raise potential issues of the loss of some plant species, while others may become invasive, and the loss of native animal habitat.

These changes will impact on ecosystem structure and function. For example, if increased temperature and dryness lead to a loss of eucalypt species, the animals that feed on those species may also be lost.

A warming climate will affect the timing of life cycle events such as flowering in plants and emergence of butterflies from pupae. There may be increased spread of disease in plants, animals and humans.

Changes to ecosystems will ultimately impact on the services provided to humans, such as pollination of food crops, control of pests, provision of fresh air and clean water and storage of carbon.



The Common Brown Butterfly occurs in parks and gardens throughout the EAGA region. Researchers at the University of Melbourne have shown that the butterfly now emerges from its cocoon ten days earlier in Spring than it did sixty-five years ago, and have linked this early emergence to an increase in temperature of almost 1°C over the same period. This was the first study in Australia, and one of the first in the world, that positively linked observed changes in a natural system to regional climate change due to man-made greenhouse emissions

## Management strategies

A changing climate will impact biodiversity.

Along with those impacts, Councils will face increased challenges in managing bushland and biodiversity assets.

Some recommended approaches to come out of this project include:

- Consider the potential implications of climate change in all Council operations and actions.
- Use adaptive management to maintain options and flexibility for long-term resilience.
- Improve inter-agency and regional coordination.
- Increase landscape connectivity, both within and across adjoining municipalities.
- Reduce other compounding threats to biodiversity, i.e. weeds and feral animals, habitat fragmentation, pollution.
- Create and support programs to communicate knowledge about climate change to policy-makers and the public.
- Manage urban bushland by maintaining natural disturbance dynamics e.g. in planning fuel reduction.



## Building our knowledge

If local species or ecosystems decline due to changes in the regional climate there could be substantial environmental, social and financial costs for our communities and Councils. One of the challenges for EAGA Councils identified by the project was the lack of detailed understanding of which local species or ecosystems are most at risk from climate change. To explore a possible approach to evaluate the risk levels of plant species and ecosystems in the EAGA region, a Case Study was undertaken.



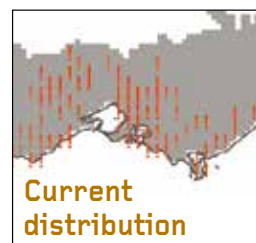
## Case Study

With the support of ARCUE (Australian Research Centre for Urban Ecology) and Macquarie University, bioclimatic modelling was performed for 21 key flora species within the EAGA region. This helped determine if the "climatic envelope" for each species will still be present in the region in 2020, 2050 and 2080, or if these species will be at risk of changing climate conditions.

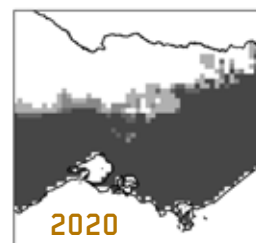
Results: Of the 21 species modelled, most were found likely to be affected by climate change expected in the EAGA region. Some species, such as the Swamp Gum (*Eucalyptus ovata*) displayed significant changes in their bioclimatic range, which could render them vulnerable to local or regional extinction.

### Modelled climatic ranges of *Eucalyptus ovata* in Victoria

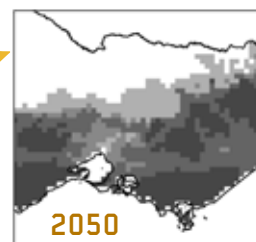
The red marks in the top map indicate Australian Virtual Herbarium distribution records.



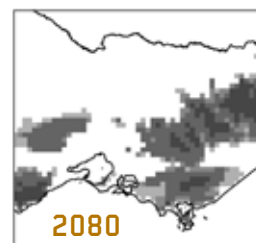
Current distribution



2020



2050



2080

## Future directions

The outcomes from this Case Study provide some initial information for EAGA Councils to consider within the local context to determine the potential long-term impacts on bushland and biodiversity assets. As a result, EAGA Councils are now better equipped to consider strategies to identify and monitor significant species, to analyse the flow on effect of species' potential decline or loss on their ecosystems and to apply management strategies to mitigate the damaging impacts.

The next challenge for EAGA is to increase the capacity of its member Councils to develop, evaluate, select and implement a range of strategies that will best ensure resilience in the bushland and biodiversity assets they manage.

This brochure forms part of the project "Bushland and Urban Biodiversity Management in a Changing Climate" as developed by the Eastern Alliance for Greenhouse Action. For further details on any of the information in this brochure please contact your Council's environment department. Project documents are available for download at the MAV Local Government Sustainability site.

### Project contributors:

CSIRO Climate Futures Program  
Macquarie University  
Australian Research Centre  
for Urban Ecology  
Monash University  
Bureau of Meteorology  
University of Melbourne



Disclaimer - While this project is supported by all EAGA Councils, the recommendations and future directions of the project may not reflect the current views or corporate governance of all councils or dictate how each Council will integrate the findings of this project into their strategic and operational planning.

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