

# Natural Environment Climate Change Adaptation Action Plan 2022-2026

## Supporting document - Cross-system climate change risks

### Cross-system climate change risks

Cross-system issues for the natural environment system are generally either existing natural resource conflicts further exacerbated by climate change impacts or may arise from actions taken by other systems (notably built environment, primary production and transport) including those to reduce climate change risks. For instance, construction of hard barriers to reduce coastal flooding or increased take of groundwater to compensate for rainfall reductions). In some cases, the natural environment can be seen as a source or risk to other systems, for instance from bushfires, invasive species or spread of disease.

Cross-system risks are risks that operate across more than one system, and where action to mitigate the risks is required across more than one system. Cooperation and coordination between systems and relevant agencies is required to strengthen the resilience of all systems and is a priority for the environment sector. The system-based adaptation approach taken through the Adaptation Action Plan (AAP) process plays a critical role in identifying these cross-system climate change risks. These risks are particularly challenging as they may:

- be emerging risks (e.g. sea level rise)
- only occur during particular climatic conditions so may be de-prioritised at other times (e.g. algal events)
- have accountability and oversight spread across multiple stakeholder groups due to their size and complexity
- raise inherent conflicts between values or goals between different systems (e.g. water availability).

#### Cross system risk: Bushfire risk

**Affected systems:** Natural environment, Primary Production, Built Environment, Health and Human Services

Bushfire is a cross-system risk. Climate change is increasing the frequency, severity and duration of dangerous bushfire weather conditions in Victoria during spring, summer and autumn. This means larger areas may be burnt in a single fire season and fires will occur in places that didn't burn historically. This will have direct and indirect effects on the natural environment and will be more damaging and impactful on Victorian communities.

#### **Implication for the natural environment:**

While fire is a natural part of many Victorian environments, climate change is increasing the severity and frequency of bushfires. It's a key driver of risk and it may lead to permanent changes to Victoria's ecosystems, including loss of biodiversity and putting ecosystem services, such as water supply, at risk. Management of bushfires often requires making decisions about how to reduce bushfire risk to communities, the natural environment and other systems, while working to avoid or minimise impacts arising from bushfire risk reduction works. Managing this risk through planned burning and other fuel reduction activities affects the natural environment both positively and negatively. A range of interventions will be needed to meet the challenge of increasing bushfire risk as a result of a changing climate.

### Cross system risk: Plant and animal diseases

**Affected systems:** Natural Environment, Primary Production

The impact of climate change on the spread of disease is uncertain. Like other living things, organisms that spread disease have ideal conditions for growing, reproducing and spreading. Warmer temperatures will enable some of these organisms to grow and reproduce faster, while others might not survive. Climate change is also likely to affect the health of disease hosts, including humans, notably through heatwaves and heat stress. This could make hosts more susceptible to infection or harm from disease and parasites.

**Implication for the natural environment:**

It is expected that wetter summers and warmer winters will enable the plant disease *Phytophthora cinnamomi* to spread further in Victoria. Myrtle Rust (*Puccinia psidii*), called the 'pinnacle of pathogens', is also expected to benefit from climate change in some areas. Many Australian plant species are susceptible to *Phytophthora* or Myrtle Rust. Spread of these diseases could cause large scale loss of ecosystems and species.

As the climate changes, it will be important to detect new threats as early as possible to provide the best chance of successful intervention. This includes the arrival of new plant and animal diseases into Victoria, and existing diseases expanding their range or impact.

### Cross system risk: Weeds and pests

**Affected systems:** Natural Environment, Primary Production, Built Environment, Transport

Changing temperature, wind and rainfall patterns along with more extreme weather events will likely affect how weeds and pests spread and how abundant they are. As for native species, it can be difficult to predict which weed and pest species will benefit from a changing climate. Overall, warmer drier conditions are expected to benefit weeds and pests when compared with native species. This is because:

- climate change will make many ecosystems more vulnerable to invasion.
- the characteristics that make many weeds and pests invasive (e.g. able to breed quickly and tolerate a broad range of environmental conditions) will help them exploit new opportunities.

**Implication for the natural environment:**

Climate change has already helped invasive organisms to spread. For instance, climatic changes have helped the Black-spined Sea Urchins to move further south where they have devastated kelp beds. In the Australian Alps, foxes have become more common at higher altitudes as the climate has warmed.

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### Cross system risk: Marine ecosystem change

**Affected systems:** Natural Environment, Primary Production, Health and Human Services

Climate change is likely to increase ocean temperatures and acidity and cause more marine heatwaves. This will significantly affect Victoria's marine ecosystems. Many species are migrating southwards in response to increased temperatures. However, some might be limited by the lack of suitable habitat south of the Australian mainland. Increased ocean acidity will affect which species can survive. Changes to the composition and abundance of marine species, particularly plankton, might disrupt fundamental processes such as

nitrogen cycling and reduce the ocean's ability to store carbon. This has significant implications for the natural environment and human systems (including the Primary Production and Health and Human Services systems).

**Implication for the natural environment:**

Marine ecosystems are likely to change as a result of warming and acidification. Whole populations are moving southward, and others are showing altered behaviour and changes in species interactions. Together with local-scale, climate-driven migration and extinction, these changes are altering marine ecosystem structure and diversity. Additional pressures from coastal development and runoff compound these effects. Unfortunately, there are few options to manage these impacts directly. This highlights the importance of reducing non-climatic pressures on the marine environment to enhance its resilience.

**Cross system risk: Risks to Traditional Owner cultural sites and practices**

**Affected systems:** Natural Environment, Water Cycle, Built Environment

Victorian Traditional Owners have cultural, spiritual and economic connections to land, water and resources through their associations and relationship with Country. As climate change impacts places and ecosystems and increases the frequency and intensity of extreme weather events; spiritually important species or objects (totems) may be lost, food and fibre species may become scarce or locally extinct, cultural sites of significance may be damaged or altered, and cultural practices may be impacted.

**Implication for the natural environment:**

Many Traditional Owner cultural sites and practices rely on a healthy natural environment. Land and natural resource management across the natural environment, water cycle and built environment must work together and in partnership with Traditional Owners to protect culturally significant sites and practices.

**Cross system risk: Water availability**

**Affected systems:** Water Cycle, Natural Environment, Primary Production, Built Environment, Health and Human Services

A warmer, drier climate poses availability and reliability challenges for Victoria's climate-dependent water resources such as surface water and groundwater. Reduced water availability increases competition for its use to support different community values. These include producing food, supporting jobs, maintaining a healthy natural environment, cooling and greening the urban environment, supplying places of recreation, Caring for Country, and providing essential services to maintain human health.

Competition for water is already an issue across the State and some areas are still broadly challenged by the recurring droughts and decline in water availability. This will be an increasing concern as Victoria continues to dry.

**Implication for the natural environment:**

Water availability poses significant challenges for many native ecosystems and species. Insufficient flows and increasing time between flood events are likely to cause ecosystem decline. Identifying the best use for environmental flows through strategic identification of impacted and 'at risk' ecosystems, applying knowledge of climate risk and vulnerability, and cooperation between the primary production and water industries will support adaptation.

**Cross system risk: Decline in water quality and ecological health**

**Affected systems:** Water Cycle, Health and Human Services, Natural Environment, Primary Production

Climate change may exacerbate declining water quality and ecological health either directly through changes in weather patterns and extreme events, or indirectly through greater need for the use of fertiliser and pest control chemicals that may subsequently enter waterways. Poor water quality can impact Aboriginal values and cultural sites of significance, irrigation, recreation, tourism and other activities that involve the use of waterways.

Waterways are likely to experience reductions in water quality and diminished aquatic and riparian ecological outcomes. Poor water quality events may require additional environmental flows further straining limited water availability. Water sector resources to manage water quality events may also be strained where emergency efforts are already allocated to a larger scale event (i.e. bushfire).

**Implications for the natural environment:**

Water quality is a key driver of ecological health and function. Declining water quality could have significant impacts on wetland ecosystems and native species including platypus. Water quality management requires collaboration between many sectors of government, Traditional Owners, industry, landholders and the community.

**Cross system risk: Spread of human diseases**

**Affected systems:** Health and Human Services, Natural Environment, Primary Production, Built Environment

Projected increases in the frequency and/or intensity of extreme weather events and overall warmer temperatures alter the risk of vector and zoonotic borne disease transmission.

Climate change has already caused profound and often complex changes in the prevalence or severity of some infectious diseases. However, many knowledge gaps remain in understanding how climate change affects the distribution of vector and zoonotic-borne diseases. The impact is likely to be complex and hard to generalise; for instance, when temperatures are warmer, development speeds up with faster completion of life cycles, but pathogens and vectors can also die faster.

Climate change also interacts with other factors in complex ways to impact on disease distribution. It will affect the health of disease hosts, including humans, notably through heatwaves and heat stress, making them more susceptible to infection or harm from disease and parasites.

Many experts think that climate change will increase the risk of human diseases. This could include novel diseases that arise when a disease 'jumps' from animals to humans (e.g. coronavirus) or the increased environmental spread of vector-borne diseases such as those spread by mosquitoes (e.g. Ross River virus, dengue fever and malaria). The spread and emergence of human diseases has implications for human health, primary production, the built environment and the natural environment.

**Implications for the natural environment:**

It is important to anticipate and monitor pathogen biodiversity and disease trends in the natural environment and primary production systems and identify opportunities to mitigate the impacts of climate-driven disease emergence. Recent reviews have identified a greater need for involvement from environmental agencies in biosecurity preparedness, response, and resourcing.

Use of insecticide to kill vector organisms may impact flora and fauna particularly other non-target insect species (native and honeybees), water/soil quality and have downstream impacts on aquatic and marine ecosystems.

### Cross system risk: Increased frequency and distribution of algal blooms

**Affected systems:** Water Cycle, Health and Human Services, Natural Environment, Primary Production

Algal blooms occur naturally in many of Victoria's catchments and river systems, and also occur in marine environments including Port Philip Bay. While some are harmless, others can make water unsafe for drinking and poison local wildlife. Algal blooms can also pose health risks for people using waterbodies for recreation; impact the quality and useability of water for irrigation and stock; and affect ecosystems through toxicity, loss of oxygen, and fish deaths. Under climate change, harmful and nuisance algal blooms are becoming more common. They may occur in new waterbodies, and during cooler months of the year that have never seen outbreaks or similar species before. The likelihood, severity and impact of these algal blooms are linked to both climate and non-climate change factors.

**Implications for the natural environment:**

Algal blooms can have significant impacts on local and regional ecosystems already stressed by drought and increasing temperatures. It is important to anticipate and monitor algal blooms pathogen and their impacts on biodiversity.