5. Aligning the Victorian and national approaches to emergency management and disaster resilience

This Strategy marks a new era in floodplain management. It has been developed in consultation with all the agencies involved in floodplain management. It focuses on flood prevention and mitigation activities aligned with water portfolio functions under the *Water Act 1989*. But it is more than that; it specifies how those activities will dovetail with activities under other portfolios (Table 3).

The 2009 *National Strategy for Disaster Resilience* describes a disaster-resilient community as one that works together to understand and manage the risks it confronts. It further states that disaster resilience is the collective responsibility of all sectors of society, including all levels of government, business, the non-government sector and individuals.

Merri Creek footbridge, 2009. *Source: Helen Tovey*

The National Strategy initiated a national review of land use planning and building codes to consider ways to enhance disaster resilience in the built environment.

The Victorian Floodplain Management Strategy responds to the National Strategy by:

- developing systems and processes to improve the quality of flood maps
- developing maps that show a range of flood probabilities, to better regulate areas subject to inundation
- considering appropriate changes to land use planning and building codes
- ensuring that local inputs are considered when developing solutions to local issues.

The 2012 *Victorian Emergency Management Reform White Paper* reinforces the 'all-hazards all-agencies' approach to emergency management. Strategic priorities include building community disaster resilience and streamlining governance arrangements.

The *Emergency Management Act 2013* implements many of the reforms from the White Paper, repealing most of the 1986 Act. The reforms in the 2013 Act include:

- formally establishing the State Crisis and Resilience Council as Victoria's peak emergency management advisory body
- instituting Emergency Management Victoria as the responsible agency for the coordination and development of whole-of government policy for emergency management in Victoria
- designating the Emergency Management Commissioner as the successor to the Fire Services Commissioner with an over-arching management role for major emergencies
- appointing the Inspector General for Emergency Management to provide assurance to the Government and the community regarding Victoria's emergency management arrangements.

Victoria follows the national approach set out in the *Australian Emergency Management Handbook* from a flood study to on-ground action.

6. Aligning with national flood warning arrangements

The National Arrangements for Flood Forecasting and Warning have been developed in conjunction with the Standardisation of Bureau of Meteorology (BoM) Hazard Services task force that reported to the Australia-New Zealand Emergency Management Committee.

The document will provide the community and key stakeholders with a summary of how flood forecasting and warning services operate across Australia. The arrangements describe a collaborative approach involving all levels of government. They outline the roles and responsibilities of each level of government in providing and supporting an effective flood warning service, along with the legislative and administrative arrangements that influence the activities of the various agencies. A separate chapter for each state and the Northern Territory will describe the specific arrangements and agency roles that apply in each jurisdiction.

The Flood Warning Consultative Committee (FWCC) is an advisory body reporting to BoM and participating state and local government agencies as required. The Victorian FWCC, formed in late 1989, is chaired by BoM's Regional Director for Victoria; membership includes representation from state and local government agencies. The committee's overall role is to coordinate the development and operations of the state's flood forecasting and warning services. Its terms of reference are to:

- identify requirements for new and upgraded flood forecasting and warning systems
- establish the priorities for the requirements that have been identified using risk based analyses of the Total Flood Warning System (TFWS)
- annually review and provide feedback on the Service Level Specification for the BoM's Flood Forecasting and Warning Services
- coordinate the implementation of flood warning systems in accordance with appropriate standards
- promote effective means of communication of flood warning information to the affected communities
- monitor and review the performance of flood forecasting and warning services
- build awareness and promote the TFWS concept.

Avulsion on the Wimmera River at Dimboola Weir, 2011. *Source: Wimmera CMA*

7. Taking account of Aboriginal cultural heritage

Floods and floodplain management activities can present risks to Aboriginal cultural heritage. Regional flood assessments, local flood studies and flood mitigation works must take into account significant places, sites and landscapes.

The Aboriginal Heritage Register is an invaluable resource, but Traditional Owners have a much broader information base about Aboriginal cultural heritage than is available to government. It is essential to consult with local Aboriginal communities in assessing and mapping flood risks.

Regional Floodplain Management Strategies provide an opportunity to refine the relationships between natural resource managers and Aboriginal people; they can help to ensure cultural values are properly reflected in floodplain management. In working with Traditional Owners to achieve this outcome, the CMAs and Melbourne Water will follow the consultation and engagement processes outlined in the *Victorian Waterway Management Strategy* (2013).

Aboriginal cultural heritage issues will also be integrated into the Prevention, Response, Recovery emergency management structure outlined in Section 22 and incident control arrangements in Section 23.

Aboriginal grinding grooves near the Avon River. *Source: DELWP*

8. Working with the environment to hold and slow floodwater

Wetlands on floodplains reduce the impacts of flooding by holding and slowing floodwater. The vegetation in and adjacent to waterways and in wetlands also acts as sediment traps that filter nutrients from catchments and help to protect the water quality of rivers, estuaries and marine areas.

In recognition of the water quality benefits, constructed wetlands are being built in urban areas to treat stormwater from urban areas before it is discharged into receiving waterways.

By aligning with the Victorian Waterway Management Strategy (VWMS), this Strategy adopts the principle that waterways should, wherever possible, be allowed to flood naturally, maintaining connectivity to floodplains and their associated wetlands. Regional Floodplain Management Strategies (Section 26) need to integrate the management of flood risks with the protection of priority high-value waterways identified in Regional Waterway Strategies.

By allowing waterways to flood naturally, floodplain management can help improve riparian ecosystems (Figure 6). Rivers and floodplains are important in their own right, and are also important to Aboriginal people as sources of food and medicine, and as sacred sites and meeting places. Connectivity between the river, fringing wetlands, floodplains and the ocean is important for many fish species to complete their life cycles and for nutrient exchange between habitats. Flooding can also deliver long-term benefits to soils and therefore to agricultural production. Floodwaters will recharge water storages (particularly in dry regions) and deposit silt that improves soil fertility.

In some situations, the connectivity between rivers, estuaries, and floodplain wetlands can be restored. Where individual wetlands have been isolated from overbank flows by infrastructure or past development, it is sometimes possible to restore connectivity by removing or constructing barriers, or bypassing blockages in flow paths (e.g. by installing a culvert under a road, or removing a redundant levee).

However, before these works are undertaken, it is important to understand any costs and benefits to the local community, the feasibility of the works, the values of the wetland and the potential to integrate with environmental watering.

The connectivity between rivers, estuaries and floodplain wetlands is also influenced by river regulation. Large dams were constructed on many rivers to regulate their flows. Together with water extraction for consumptive use, river regulation has significantly altered flows within river channels and the frequency with which floodplains are connected to rivers through flooding. The duration and size of small and medium floods has also been reduced.

Over the past decade or more, the Victorian and Australian Governments have made significant investment to address the environmental impacts associated with river regulation and water extraction. The Victorian and Commonwealth Environmental Water Holders now hold substantial water entitlements; their explicit objective is to return flows to river systems to achieve environmental outcomes without affecting private property.

Currently, the Environmental Water Holders provide flows mostly within the river channel, well below levels that pose a risk to private land or infrastructure. However, in some instances, it is possible to deliver environmental water to the floodplain. This occurs mainly on public land, such as National Parks and State Forests, but may occur on private land where the landholder has given consent.

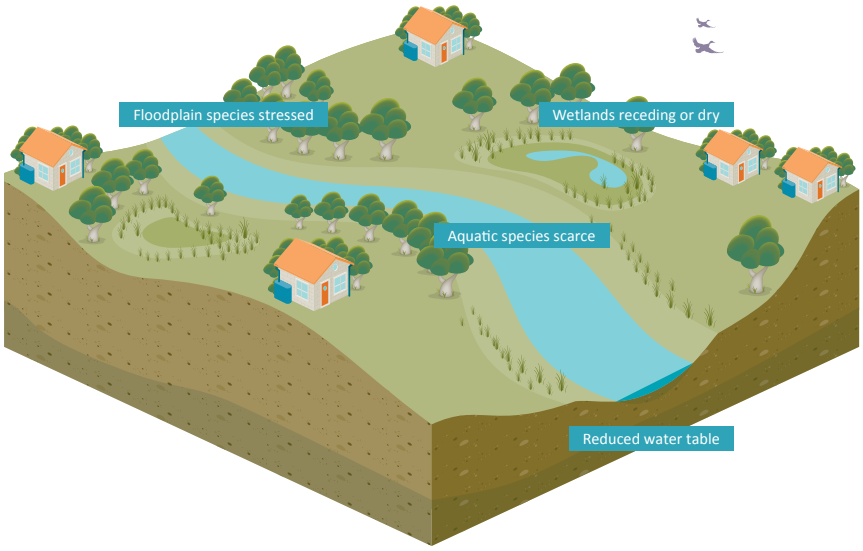
Environmental Water Holders work with the other environmental watering program partners, such as waterway managers and storage managers, to ensure that risks to third parties are appropriately managed in the delivery of environmental water.

Figure 6: Environmental benefits of flooding

Changing phases of floodplains over a natural cycle of wet and dry periods.

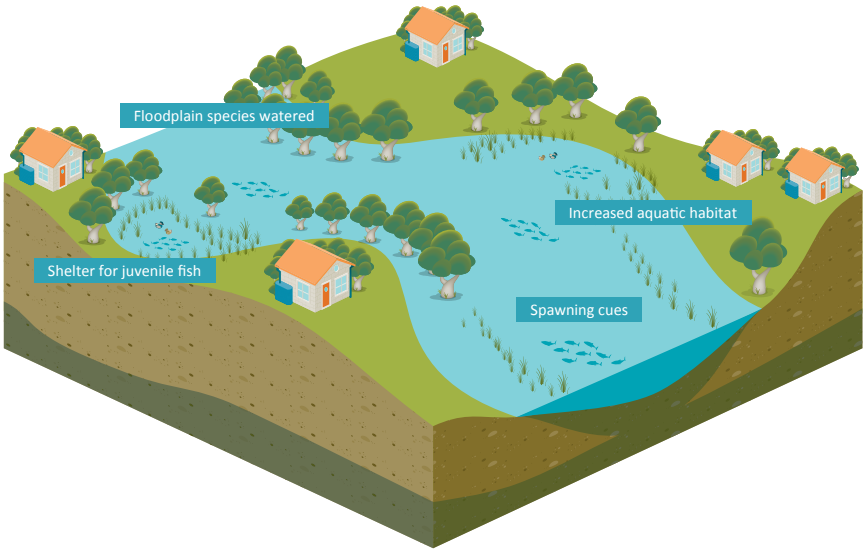
Low flow

- **Wetlands receding or dry**
- **Reduced water table**
- **Aquatic species scarce**



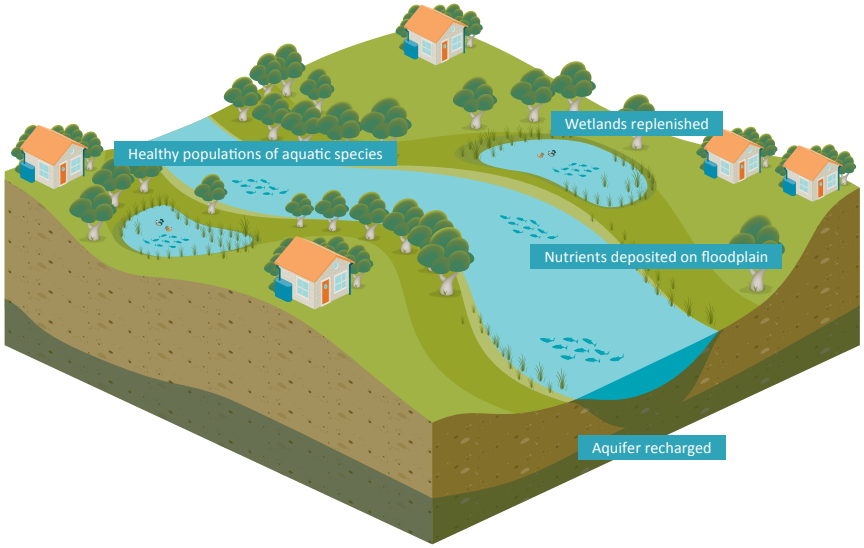
In flood

- **Spawning cues**
- **Shelter for juvenile fish**
- **Increased aquatic habitat**



Post flood

- **Recharged aquifer**
- **Nutrients deposited on floodplain**
- **Wetlands refilled**
- **Healthy populations of aquatic species**



9. Adapting to climate change

The *Victorian Climate Change Adaptation Plan* (2013) sets out projected changes in Victoria's climate. The projections suggest an increased risk of floods, bushfires, heat waves, drought, sea level rise and coastal hazards. That plan explains how the government will manage the risks of climate change, including flood risks.

Victoria's weather and climate can change in response to a wide range of natural and human factors. Day-to-day changes in weather are the result of relatively random atmospheric fluctuations. Climate variations from year to year are largely linked to large-scale ocean-atmosphere fluctuations. Longer-term changes are linked to a range of factors, including decadal to multi-decadal fluctuations in the Pacific Ocean and, over much longer time scales, changes in the earth's orbit. Factors such as greenhouse gases, aerosols, stratospheric ozone depletion and land use change also affect weather and climate.

Recent experience highlights the challenges posed to floodplain management by Victoria's climate. The prolonged drought from 1997 to 2009 was the worst on record. It was followed by severe floods in western and northern Victoria particularly during spring and summer in 2010-12.

Victoria's climate is influenced by three global-scale factors, all of which were aligned in their 'wet' phases during that period. These factors are:

- the El Nino – Southern Oscillation (ENSO), which characterises atmosphere-ocean interactions across the Pacific Ocean
- the Indian Ocean Dipole (IOD), which characterises atmosphere-ocean interactions in the Indian Ocean
- the Southern Annular Mode (SAM), which characterises the intensity and position of higher latitude westerly winds and associated storm systems.

Research indicates the SAM is trending towards a phase associated with decreased winter rain and increased spring and summer rain. The near-record high SAM in 2010, through its interaction with ENSO, played a significant role in the extreme rainfall of that spring.

9.1 Climate change research

The Victorian Government recognises the importance of working with research institutions and other governments to better understand and adapt to climate change. DELWP plays its part through improved access to flood data and information and through flood conferences and forums. DELWP will continue to seek out new knowledge and to share knowledge among floodplain management agencies to enhance floodplain management capability in the context of climate change.

There are known knowledge gaps about climate change and floodplain management. The science necessary to fill those gaps may take many years to mature, but technological advances can also lead to rapid changes in understanding. Strategic investments in knowledge improvement are essential for continual improvement in floodplain management.

The Victorian Climate Initiative (VicCI) was established in 2013 to improve the understanding of the climatic system and its effect on water availability in Victoria. VicCI is a partnership between DELWP, BoM and CSIRO. It builds on the results of the South Eastern Australia Climate Initiative, which ran from 2006 to 2012. Through VicCI, the Victorian Government is investing in research to improve seasonal climate predictions, improve the understanding of past climates, our climate projections for the future and the associated risks to water resources.

As this Strategy was being prepared, DELWP was also an end-user partner in the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC). Its research supported the development of cohesive, evidence-based policies, strategies, programs and tools to build a more disaster resilient Australia. One of its coastal projects was developing better predictions and forecasts for extreme water levels arising from storm surges, surface waves, continental shelf waves, tsunamis and mean sea level rise.

Another BNHCRC project was researching improved predictions for severe weather. It aimed to use high-resolution modelling, together with the full range of meteorological data, to better understand and predict fire weather, tropical cyclones, severe thunderstorms and heavy rainfall.

Inflows from the Wimmera River entering Lake Hindmarsh, filling it for the first time in 14 years in 2011. *Source: Greg Fletcher*

DELWP, the CMAs and Melbourne Water actively engaged with the BNHCRC through symposiums and professional networks. They also freely shared data with the research community, including PhD and Masters students and regularly present research papers and discussion papers at conferences.

The Australian Government's Regional Natural Resource Management Planning for Climate Change Fund helped CMAs update regional plans to account for climate change. It also supported research to produce regional-level climate change information.

The Australian Government also funded an update of *Australian Rainfall and Runoff* (ARR) – the national guideline for estimating design flood characteristics in Australia. The Victorian Government participated in that update by providing data, expert review and assistance with the coordination of the testing program. The new edition of ARR is expected to provide guidance on how to incorporate changing rainfall patterns, storm surge and sea level rise into flood risk assessments (Sections 11.1 and 15.4.2).

9.2 Scenario planning

As discussed in Section 10.1, estimates of the probability of a flood of a given magnitude occurring or being exceeded will change if the flood regime is altered. It will also change as the period of historical record increases or better data becomes available. This includes the statistical estimates of the 1% Annual Exceedance Probability (AEP) flood, which is important for land use planning and building regulation (Section 13).

Anticipated changes in average stream flows, the intensity of storms and changes to sea levels may be greater under different climate scenarios, and the variability from year to year may increase. This could shift the likelihood and consequence of floods in different parts of Victoria. These issues must be considered when assessing and treating flood risk. While understanding the effects of climate variability and climate change on future 'wet' and 'dry' cycles will improve over time, uncertainty about future rainfall requires preparation for a range of climate conditions.

One way to prepare for a range of climate conditions is to model different climate change scenarios as part of flood studies. Modelling a range of flood events, from frequent to very rare events, provides information to help determine a particular floodplain's sensitivity to changes in rainfall. Such modelling can be used to determine a location's sensitivity to climate change. Where this sensitivity is significant, particular climate change scenarios could be assessed.

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- Flood studies prepared with government financial assistance will consider a range of floods of different probabilities, and the rarer flood events will be used to help determine the location's sensitivity to climate change. Further climate change scenarios may be considered where this sensitivity is significant.

Flooding at Hollands Landing, Gippsland Lakes 2007.
Source: East Gippsland CMA