

Hills and Fleurieu region

Land, water and nature emergency preparedness, response and recovery plan



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Definitions

Emergency – An event that causes injury, damage, destruction or harm to people, property, essential services, the environment, or to plants or animals.

Extreme events – Emergencies pertaining to natural hazards, including bushfires, floods, storm surges, extreme heatwaves.

Disaster - hazards or events that generate impacts on our social, ecological, and/or technical systems. The term 'natural disaster' is avoided in this plan as extreme events such as fire and floods are a disaster for built assets, economic productivity, humans and livelihoods, but are not always a disaster for natural assets, which may in some cases benefit from these events.

Preparedness – Actions, arrangements made prior to an event to eliminate or reduce the impact of the event, and improve the capacity of a system to cope with its effects.

Emergency response – Actions undertaken during or immediately after an emergency to minimise its effects and provide immediate relief and support

Recovery – (Process and outcome) Actions undertaken after the initial emergency response to assist communities in the restoration of emotional, social, economic and physical wellbeing, reconstruction of infrastructure and restoration of the environment.

Biodiversity assets - Assets identified by jurisdictions, environment management agencies or environmental law as important to preserve during emergencies or extreme events e.g., species, ecological communities, habitat features.

Agricultural natural capital assets - On-farm natural resources that we rely on for food and fibre production, including soil, air, water, riparian areas, remnant native vegetation, agroforestry and environmental plantings.



This plan was funded by the Australian Government Natural Heritage Trust and delivered by the Hills and Fleurieu Landscape Board, as a member of the Commonwealth Regional Delivery Partners panel.

1. BACKGROUND

The Cudlee Creek bushfire of 2019-2020 had a devastating impact in our Hills and Fleurieu region with loss of life, destruction of homes and biodiversity, and impacts on agriculture and livelihoods. These fires, along with the 2021 Cherry Gardens bushfire, reinforce the vulnerability of our region and landscapes. They highlight the need to be better prepared and resilient, while ensuring our biodiversity and natural assets are protected.

Since then the River Murray flooded in 2022-23, causing more community heartache with destruction of homes and impacts on livelihoods. However, the floods also provided restorative water flows that are much needed by wetlands along the lower Murray. Higher rainfall and flows throughout our catchments have enabled breeding and linking of water-dependent ecosystems. Both fire and flood play an important role in maintaining biodiversity, by triggering natural processes and regeneration.

Climate projections (DEW 2022) suggest that in future the Hills and Fleurieu region will experience more extreme events:

- More dangerous fire weather
- More droughts
- More intense heavy rainfall events (potentially leading to localised flooding).

There is a growing need to enhance our preparedness for extreme events and to focus on how we can minimise their impacts on biodiversity and agricultural natural capital assets. A key aspect of preparedness is undertaking actions that build the resilience of ecosystems, enabling them to recover and flourish following catastrophic events.

Better preparation and response also contribute to stronger communities and regional economies, including for key sectors such as tourism and agriculture. For example, by investing in preparedness prior to extreme events, long-term costs for recovery and restoration post-event are reduced.

1.1 Supporting outcomes of national, state and regional plans

This Plan has been funded by the Australian Government's Natural Heritage Trust program, and contributes to:

- Actions under Target 17 of the Threatened Species Action Plan 2022-32¹
- Outcomes 1, 2 and 3 of the Natural Heritage Trust (NHT), by addressing vulnerability from extreme events relevant to biodiversity and agricultural natural capital assets identified in the Hills and Fleurieu landscape region and improving emergency response and planning within jurisdictions.
- Outcomes 1 and 3 of the Climate-Smart Agriculture Program by supporting the agriculture sector to build resilience to climate change and conserve natural capital and biodiversity on-farm.
- Strategy C3b in the [Hills and Fleurieu Landscape Plan 2021-26](#) "Support the community to prepare landscapes for, and recover from, fire and extreme weather events."

The plan is consistent with the objectives and principles of the [South Australian State Emergency Management Plan](#) (SEMP), which describes governance arrangements, strategies, and roles and responsibilities for hazard risk reduction, as well as preparedness for and management of emergencies, and recovery operations, in line with the *Emergency Management Act 2004 (SA)*.

1

<https://www.dcceew.gov.au/sites/default/files/documents/threatened-species-action-plan-2022-2032.pdf>

2. OBJECTIVES OF THIS PLAN

Improve preparedness for, response to, and recovery from extreme events to minimise their impacts on land, water and nature in the Hills and Fleurieu region.

Reduce extinction risk and limit the decline of native species, ecosystems and natural assets affected by extreme events.

3. SCOPE

3.1 Key hazards in the region

The Hills and Fleurieu landscape region is exposed to a number of major hazards and extreme events².

Extreme events that are within the scope of this plan include:

- Bushfire
- Flood
- Other extreme weather (storm surge, extreme heatwaves).

Although bushfire is a natural part of our landscapes, large, high intensity bushfires can have devastating impacts. A large proportion of the Hills and Fleurieu region has a 'high' rating within the SA PDI Act - Planning and Design code bushfire hazard overlay³ (See Appendix 6). Bushfire is therefore a key focus of this preparedness, response and recovery planning.

The Country Fire Service (CFS) is the hazard reduction leader and control agency for rural fire under the SEMP, and is supported during a bushfire response to know where critical biodiversity assets are by the 'Natural Values Team' (made up of Department for Environment and Water and Landscape Board ecologists). A key source of biodiversity information during response is the 'Fire Vulnerable Habitat' data layer, managed by Department for Environment and Water. Improving the accuracy of this data layer is a key focus for this planning effort. In addition, the planning has

This includes:

- Identifying key biodiversity and natural capital assets that are at risk from extreme events.
- Clarifying Landscapes Hills and Fleurieu and regional partners' roles in emergency preparedness, response and recovery relating to land, water and nature.
- Identifying areas for cross-agency collaboration to improve the resilience of biodiversity and natural capital assets before, during and after extreme events.

considered how the location of other natural capital can be better understood during bushfire response.

Drought is not included in this plan as it does not have the same restricted timeframes for response, however many of the asset preparedness and recovery actions will equally apply.

Biosecurity emergencies through an outbreak of a disease or pest can have significant impacts on biodiversity and natural assets. They are managed by PIRSA as the hazard risk reduction leader and control agency under the SEMP, and outside the scope of this plan.

3.2 Preparedness, response and recovery

Work related to extreme events and emergencies is described under these three phases⁴:

1. **Preparedness** (hazard prevention or risk reduction activities, or actions to build the resilience of systems)
2. **Emergency Response** (actions during the emergency)
3. **Recovery** (actions post-emergency).

These phases are connected and long-term planning and community capacity building can help guide and support all three of the phases.

² Zone Emergency Management Plan 2018 - Adelaide Hills, Fleurieu and Kangaroo Island

³ The SA Planning, Development and Infrastructure (PDI) Act – Planning and Design Code hazard overlays present bushfire hazard modelled using vegetation mapping, Grassfire fuel

modelling and forest patch mapping. This data is used to inform hazard mitigation requirements of development applications and does not represent risk to natural assets.

⁴ *Prevention* and *Preparedness* phases applied in the SEMP are considered within *Preparedness* for the purposes of this plan.

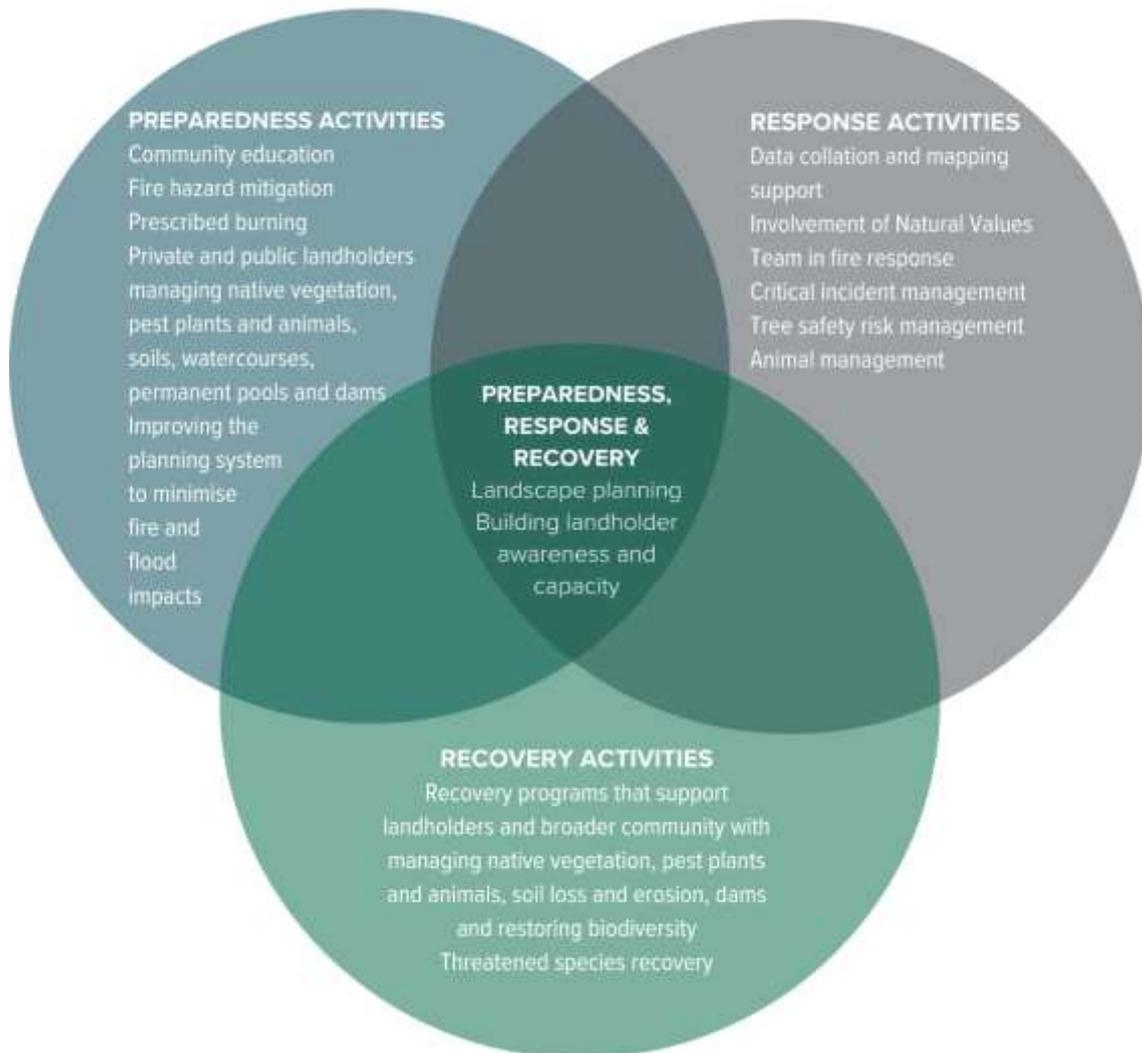


Fig. 1: Key activities relating to management of land, water and nature in preparing, responding and recovering from extreme events

3.3 Actions relating to land, water and nature

This plan identifies actions to improve preparedness, emergency response and recovery of landscapes from extreme events. Therefore it relates to the actions required to support land, water and nature (biodiversity and natural capital assets). It does not cover the broader aspects of emergency preparedness, response and recovery that are coordinated by emergency management agencies, such as infrastructure, telecommunications, community services, etc.

Impacts of extreme events on agricultural assets and infrastructure (e.g. crops, livestock, buildings and fences) are outside the scope of this plan, though indirect impacts of infrastructure damage (such as loss of fencing) on land, water and nature are considered where relevant. Primary Industries and Regions South Australia (PIRSA) are the lead agency for managing impacts of emergencies and adverse events on primary production in South Australia.

Specific land, water and nature assets considered in this plan are identified in [section 5](#).

Guiding principles for building the resilience of land, water and nature to extreme events⁵

1: Healthy ecosystems are more resilient

Ecosystems that are in good condition are more resilient to extreme events. Managing threats to ecosystem health, such as pests and weeds, over-grazing, nutrient loads and clearing improves their ability to recover from extreme events.

2: Diverse landscapes and communities require tailored response

The impact of extreme events and recovery needs will differ according to the nature of the event, such as timing, extent and severity, as well as the landscape context in which it occurs. Recovery plans need to be adapted to the scenario faced.

3: Everyone has a role to play

Public and private land managers, local government, landscape boards and state agencies all have a role to play in preparing for, responding to, and assisting the recovery of land, water and nature from extreme events.

4: Build on existing strengths

Collaborative planning for recovery should seek to draw on the knowledge, skills and strengths that each organisation or community group brings.

5: Ask, listen and learn

Affected community members are the best qualified to determine what recovery support is needed. Using local knowledge, experience and ideas will lead to better outcomes and levels of participation.

6: Apply a strategic and collaborative approach

By working together, we can prevent duplicated effort and achieve more with the resources available.

7: Resilience is dynamic and changing

The ability of communities and organisations to prepare for, cope with and recover can change over time based on experiences, resources and other factors. Similarly, the resilience of land, water and nature assets can change due to climatic conditions and other pressures. Building resilience should be seen as an on-going process.

8: Invest and commit for the long term

Our collective actions to reduce hazards, prepare for extreme events and plan for recovery all contribute to improved landscape and community resilience. Building this resilience is a long term commitment.

⁵ Adapted from South Australia's Disaster Resilience Strategy 2019-2024

4. ROLES AND RESPONSIBILITIES IN EMERGENCY PREPAREDNESS, RESPONSE & RECOVERY FOR LAND, WATER AND NATURE

Table 1. Roles for agencies in emergency preparedness, response and recovery relating to land, water and nature.

Agency	Preparedness & mitigation/hazard reduction	Emergency Response	Recovery
Premier, assisted by Department for Premier and Cabinet	Minister responsible for the Emergency Management Act (2005). Oversight of SA's national security and emergency management governance.		
SAFECOM	Strategic leadership in whole-of-government emergency management.		
Zone Emergency Management Committee (ZEMC) for Adelaide Hills, Fleurieu and Kangaroo Island (<i>cross-agency</i>)	<ul style="list-style-type: none"> Identify emergency risks and treatments. Prepare, review and oversee the Zone Emergency Management Plan (ZEMP). Ensure arrangements are in place to prevent and/or mitigate, prepare for, respond to and recover from emergencies. 		
Bushfire Management Committees - Adelaide and Mt Lofty Ranges, and Fleurieu (<i>cross-agency representation</i>)	<ul style="list-style-type: none"> Advise the State Bushfire Coordination Committee on bushfire prevention. Prepare, review and oversee Bushfire Management Area Plans (BMAPs) for each. Bushfire Management Area. 		
South Australian State Emergency Service	<ul style="list-style-type: none"> Hazard risk reduction leader for extreme weather. 	<ul style="list-style-type: none"> Control agency in flood. Control agency for extreme weather. 	
SA Country Fire Service (CFS)	<ul style="list-style-type: none"> Hazard risk reduction leader for fire (rural). 	<ul style="list-style-type: none"> Control agency for fire (rural). 	
Primary Industries and Regions SA (PIRSA)	<ul style="list-style-type: none"> Hazard risk reduction leader for animal and plant biosecurity. 	<ul style="list-style-type: none"> Control agency for animal, plant, and marine disease. Support Agency for other types of emergencies. Advising on agriculture and animal safety/relief in emergencies, including on carcass management. 	<ul style="list-style-type: none"> Support the economic and social recovery of primary producers and regional communities from emergencies beyond their capacity.
Department for Infrastructure and Transport (DIT)	<ul style="list-style-type: none"> Roadside native management in accordance with Departmental Bushfire Risk Management Plan. Representation on State Bushfire Coordination Committee (SBCC), Bushfire Management Committees (BMC), Zone Emergency Support Team (ZEST). 	<ul style="list-style-type: none"> Control agency for marine pollution (coastal). Support Agency – Transport <ul style="list-style-type: none"> Evacuation Support Manage Transport Infrastructure Coordinate impact assessments for transport and other significant government infrastructure. Engineering support and advice via Engineering Functional Support group. Roadside native management on DIT managed roads as per DIT Operational Instructions 20.1. 	<ul style="list-style-type: none"> Restoration of Transport Network including management of roadside vegetation, culverts & bridges on DIT managed roads as per DIT Operational Instruction 20.1.
DEW	<ul style="list-style-type: none"> Delivery of prescribed burning programs, including Burning of Private Lands and for cultural burning. Native vegetation management guidelines for roadsides and fire-affected areas. Hazard risk reduction leader for flood and delivery of flood management program. 	<ul style="list-style-type: none"> Coordinates Natural Values Team to support protection of environmental assets during fire. Mapping support in emergencies. Specialist fire response capability; respond to fires on NPWS estate. 	<ul style="list-style-type: none"> Identification and coordination of recovery actions for threatened species.

Agency	Preparedness & mitigation/hazard reduction	Emergency Response	Recovery
Landscape Boards	<ul style="list-style-type: none"> • Build resilience of natural assets (through threat management and habitat restoration). • Supporting landholder preparedness with management of native vegetation, livestock grazing management, soils, water courses, permanent pools, dams and pests. 	<ul style="list-style-type: none"> • Involved in Natural Values Team providing advice to the CFS on fire ground. 	<ul style="list-style-type: none"> • Collate data to inform recovery response. • Collaborate with regional delivery partners. • Delivery of recovery programs that support community to manage pests, erosion, dams and restore biodiversity.
Local government (councils)	<ul style="list-style-type: none"> • Delivery of hazard mitigation programs. • Delivering operational programs that reduce risk of hazards, including: <ul style="list-style-type: none"> - Roadside vegetation management/ fuel reduction activities - Reserve management - Support Burning on Private Lands program. • Supporting community preparedness. 	<ul style="list-style-type: none"> • Critical incident management, including: <ul style="list-style-type: none"> - tree safety management on council managed roads - animal management - waste collection. • Practical support to first responders (plant etc.). • Amplifying messages to community. • Conduit between community and agencies. 	<ul style="list-style-type: none"> • Representing community interests in emergency recovery. • Amplifying community messaging.
Forestry SA	<ul style="list-style-type: none"> • Deliver hazard reduction activities on public lands. 	<ul style="list-style-type: none"> • Collaborate with CFS, DEW, SA Water in fire response. 	<ul style="list-style-type: none"> • Deliver recovery actions (such as pest, weed and erosion control) on public lands.
SA Water	<ul style="list-style-type: none"> • Deliver hazard reduction activities on public lands. 	<ul style="list-style-type: none"> • Collaborate with CFS, DEW, Forestry SA in fire response. • Maintain asset operation. 	<ul style="list-style-type: none"> • Deliver recovery actions (such as pest, weed and erosion control) on public lands.
Environmental Protection Authority (EPA)		<ul style="list-style-type: none"> • Carcass management with PIRSA. • Assessing water quality and risk of contamination. 	
Green Industries SA (GISA)	<ul style="list-style-type: none"> • Prepare Disaster Waste Management Plan. • Provide community education and information to support responsible waste management following emergency events. 	<ul style="list-style-type: none"> • Collaborate with Control Agency to address the most acute waste issues. 	<ul style="list-style-type: none"> • Deliver disaster waste management program in line with State Disaster Waste Management Guidelines

4.1 Legal and governance frameworks

The South Australia *Emergency Management Act 2004* establishes the legislative framework and principles for coordinating activities before, during and after emergencies; assigns key accountabilities; and enables necessary authorities to effect response and recovery operation for the management of emergencies in South Australia. It establishes the State Emergency Management Committee, State Coordinator and Control agencies, the division of the state into emergency management zones, and the declaration of emergencies and recovery operations.

The State Emergency Management Plan (SEMP) identifies key agencies for hazard management (hazard risk reduction), for emergency management operations, and recovery. **Emergency preparedness, response and recovery** are supported in SA by the following groups and committees:

1. The Premier is responsible for the Emergency Management Act and chairs the Emergency Management Cabinet Committee (EMCC).
2. State Emergency Management Committee (SEMC) responsible for leadership and oversight of the SEMP, and emergency and recovery management. The committee is chaired by the Chief Executive, Department of the Premier and Cabinet, and reports to the EMCC.
3. The State Recovery Coordination and Planning Group (SRCPG) focuses on consequence management, longer-term recovery planning and the establishment of funding avenues for recovery (for complex recovery). State-led recovery is coordinated through the Department of the Premier and Cabinet and led by the State Recovery Coordinator.
4. The State Recovery Operations Group (SROG) focuses on immediate operations such as water replenishment, relief and recovery centre support, as well as waste and carcass management (for complex recovery). Refer to [Recovery SA](#) for more information.
5. Zone Emergency Management Committees (ZEMC) focus locally on planning and implementation of zone-level actions to build resilience to hazards and support emergency management. The Hills and Fleurieu is in the 'Adelaide Hills, Fleurieu and Kangaroo Island' emergency management zone.

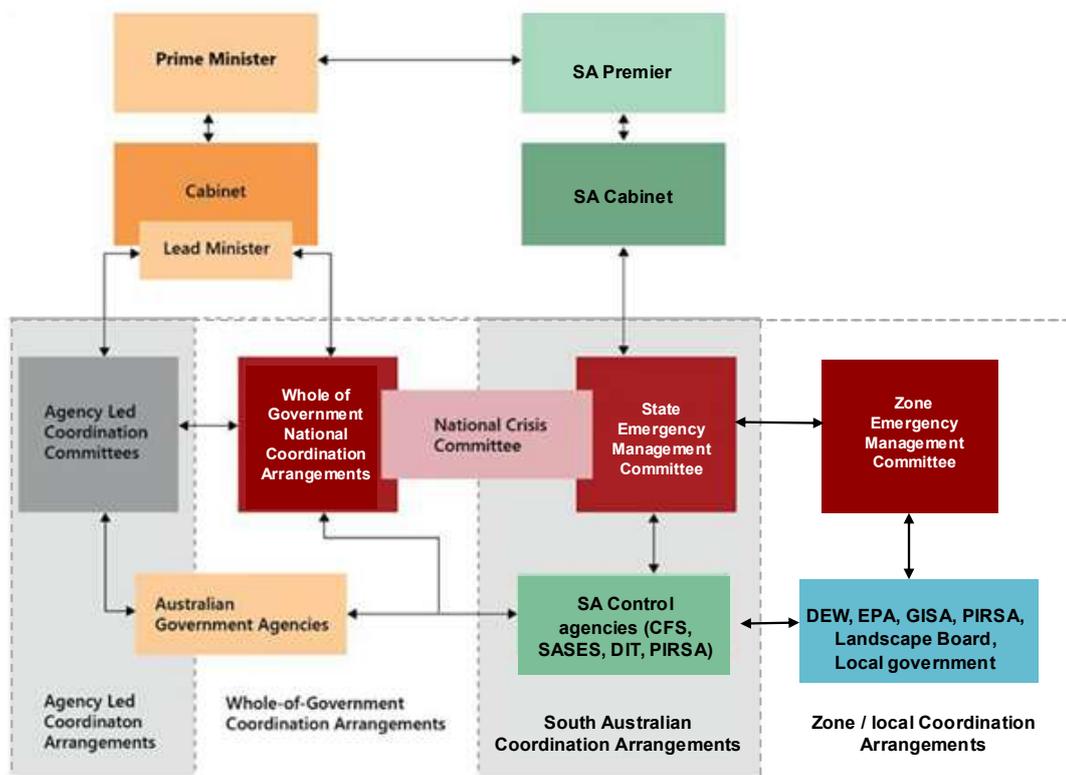


Fig. 2: National, state and zone/local emergency coordination arrangements as related to land, water and nature management (adapted from the Australian Government Crisis Management Framework)

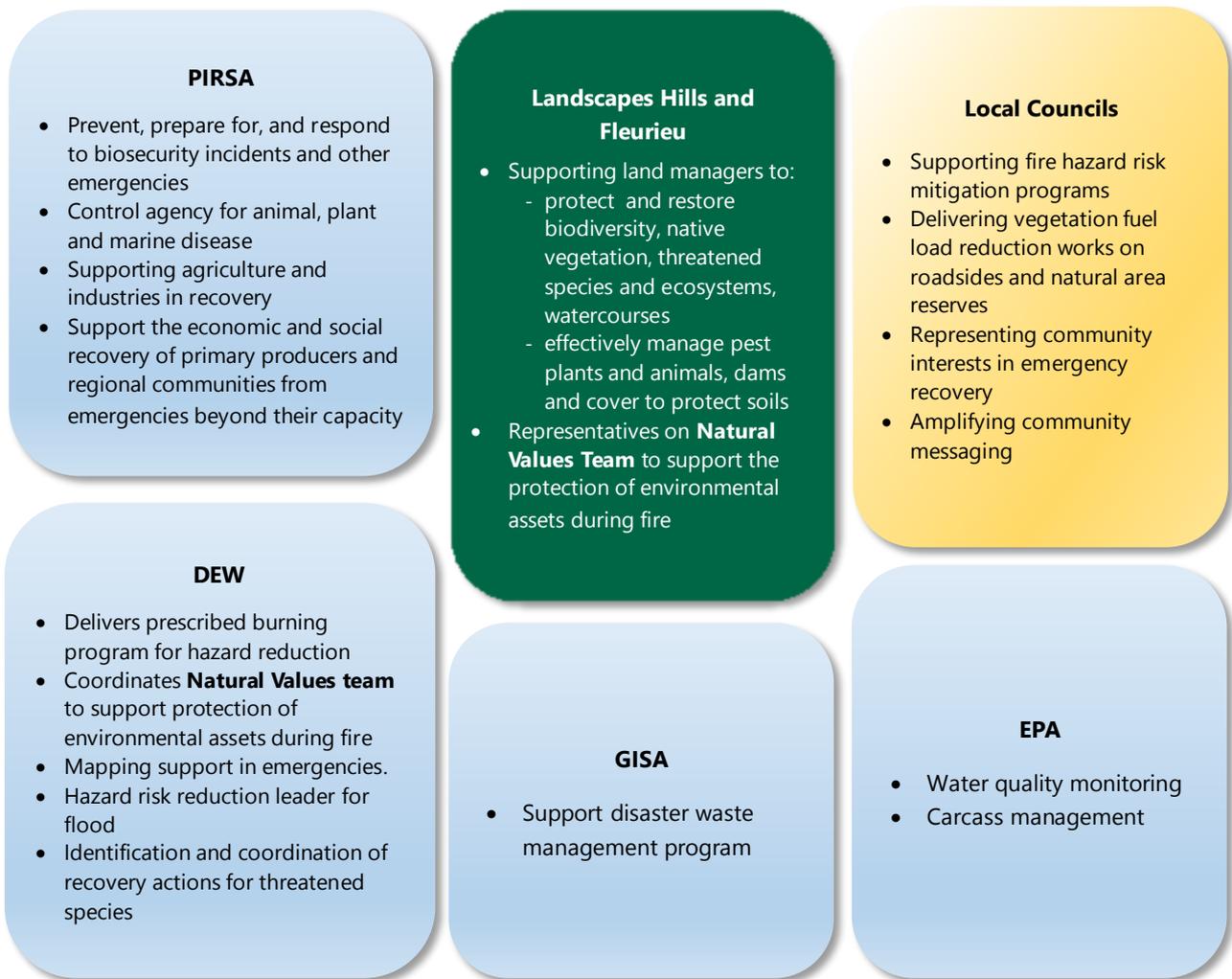


Fig. 3: Core agencies involved in preparedness, response and recovery of biodiversity and natural assets in the Hills and Fleurieu region.

4.2 Landscapes Hills and Fleurieu's role in preparedness, response and recovery

Landscape boards are responsible for the integrated management of natural resources, including the protection, enhancement, restoration and sustainable management of land, water resources, and native fauna and flora.

Landscape boards do not have a lead role as a hazard risk reduction leader or control agency in emergency response. However, they support key activities in each of three phases of preparedness, response and recovery.

Landscape boards have the following roles in preparing for, responding to, and recovery from extreme events:

- **Building landscape resilience and capacity of landholders** to manage land, water and nature assets, including pest and weed control, native vegetation management, biodiversity conservation, habitat restoration, watercourse management and pasture management
- **Collaborating** with lead agencies and regional organisations in:
 - Preparedness, **sharing ecological knowledge** to inform hazard reduction programs such as DEW's prescribed burning program, and other hazard reduction activities undertaken by partner organisations
 - Emergency response, through **involvement in the Natural Values Team**, providing advice to DEW and CFS fire crews on natural assets and response
 - Recovery, through **collation of data to inform recovery efforts**, such as mapping and data relating to properties, tenure, landscape features, assets of conservation significance, and previous environmental project investment sites; and sharing **local knowledge** of landscapes, land management issues, and threats to biodiversity resulting from extreme events, to help **prioritise recovery actions and investment.**
- **Delivering on-ground recovery actions within the region**, using relationships and connection to landholders, community groups and local businesses
- **Monitoring** the condition of land, water and nature assets and their response after an extreme event and during recovery.

5. LAND, WATER AND NATURE ASSETS AND VULNERABILITIES

The Hills and Fleurieu region contains a diversity of land forms, climates, ecosystems and industries. It contains 4 IBRA⁶ sub-regions and 16 IBRA associations. Historical clearing for agriculture and urban development has resulted in the fragmentation and modification of habitats. Many species are now in decline due to habitat loss and ongoing impacts of overgrazing, pests, weeds, and climate change.

The region is home to **26 EPBC⁷-listed threatened flora** and **28 EPBC-listed fauna species**, as well as a number of declining birds of conservation concern. **Four Threatened Ecological Communities** occur in the region. Of these, one - the Fleurieu Peninsula Swamps - is contained wholly within the region. The region also contains part of the Coorong; a Ramsar wetland of international significance. A list of EPBC-listed threatened species and Threatened Ecological Communities and species in the Hills and Fleurieu region is provided in Appendices 1 - 3.

The region has a long fire history. Most ecosystems have evolved with fire and have the capacity to recover through fire response mechanisms, such as

re-sprouting or regeneration from fire-stimulated seed. Despite this, uncontrolled, high intensity bushfires, or bushfires that occur too frequently pose a risk to a number of fauna and flora species, especially those that now occur as small or isolated populations.

While bushfire may present a risk to some species, often the greater risk to habitat and threatened species populations during a bushfire event is the unintended impact of fire suppression activities, such as clearing of fire breaks, disturbance/ damage caused by fire fighting vehicles, and use of retardant foams.

It is important to note that the region contains a number of ecosystems that depend on fire for recruitment and regeneration, such as Heathland vegetation communities. Total suppression of bushfire presents a risk to these ecosystems and the species that rely on fire-dependent habitat, meaning that strategic fire management is needed to maintain suitable habitat.

For all biodiversity and natural capital assets, our primary goal is to **build resilience** of ecosystems and populations of species, to mitigate the extinction risk and adverse impacts of extreme events.

The following environmental assets types are considered within this plan

Land

- Soils/ groundcover including pastures

Water

- Priority watercourses, such as those with permanent pools and high condition sites identified through fish monitoring
- Permanent pools (refuge areas for aquatic species in dry conditions)

Nature

- Threatened species (EPBC listed) – fire vulnerable or small populations, including priority species within Threatened Species Strategy[^]
- Threatened ecological communities – fire vulnerable or small extent[^]
- Native vegetation and paddock trees
- Heritage Agreements (habitat of conservation significance)
- Roadside native vegetation

[^] These assets are a particular focus for **preparedness** and **emergency response** actions. All assets are included in a landscape approach to the recovery of land, water and nature after extreme events.

⁶ Interim Biogeographic Regionalisation for Australia

⁷ Environment Protection and Biodiversity Conservation Act 1999

Table 2. Land, water and nature assets and vulnerabilities in the Hills and Fleurieu region.

Asset	Emergency scenario	Why it poses a threat	Vulnerability
Soils / Pasture cover	Bushfire	High intensity bushfire removes pasture cover, exposing soil and leaving it vulnerable to erosion from wind and rain if pasture or vegetative cover is not reinstated. Soil erosion can cause silting and nitrification of dams and watercourses, and potential sedimentation impacts on aquatic systems. Very high intensity bushfire can sterilise the soil, change its nutritional and mineral content and/or pH, destroy surface seeds, result in low emergence of both perennials and annuals, and render soil infertile. Perennial pastures have the capacity to recover following moderate intensity bushfires.	Medium
	Flood	Floods have the potential to cause loss of topsoil, erosion which reduces land productivity, silting of dams and watercourses and causing sedimentation impacts on marine ecosystems (including seagrass). Flood impacts tend to be localised but can create intense local sedimentation issues.	Medium
Watercourses, especially those with permanent pools and high condition sites identified through fish monitoring	Bushfire	(Refer to soils / pasture cover). Silting of watercourses may result in the loss or degradation of fish breeding habitat (such as rocky streambeds). Riparian vegetation provides a physical barrier to sediment and debris, and filters water in post-fire rain events, so watercourses are particularly vulnerable where a catchment has lost large amounts of riparian vegetation.	Medium
	Flood	Flood waters can result in the downstream spread of weed infestations (e.g. Willows). Flood presents an indirect risk to riparian vegetation and aquatic species if fencing is damaged and stock have access to sensitive areas.	Low
Permanent pools (refuge areas for aquatic species in dry conditions)	Bushfire	As for water courses - Loss of ground cover during bushfire can cause sheet erosion following rain, siltation of watercourses and ecologically significant permanent pools, potentially reducing their habitat value.	Medium
Threatened flora ⁸ (see Appendix 1)	Bushfire	Very high intensity bushfires or frequent bushfires may result in the partial or total loss of small populations, particularly for species that cannot re-sprout (i.e. obligate seeders). Spring bushfires present a greater risk than summer bushfires for some species (for example orchids).	Variable
Threatened terrestrial fauna ⁵ (see Appendix 2)	Bushfire	Threatened and highly restricted fauna species may be at risk from bushfire if the intensity of bushfire is too great for recovery and if whole populations are lost, or a large proportion of a specific habitat type is affected. Species may be unable to recolonise from other populations in landscapes where habitat is highly fragmented.	Variable
Native fish species	Bushfire	(See also impacts on water courses). Loss of vegetative cover due to bushfire can lead to soil erosion, sediment movement into waterways and decline in water quality, affecting fish habitat.	Med

⁸ Key focus for preparedness and emergency response actions

Asset	Emergency scenario	Why it poses a threat	Vulnerability
	Flood	<p>A flood has the potential to move large amounts of sediment and debris into waterways, which may result in the re-shaping or loss (filling) of existing permanent pools, or 'black water' (de-oxygenation) events in areas pools without subsequent flow, affecting fish populations.</p> <p>As dynamic systems requiring pulse in flows for breeding, flood presents a low risk to fish populations.</p>	Low
Swamps of the Fleurieu Peninsula (TEC)	Bushfire	<p>Fleurieu swamps have good capacity to recover from bushfire if threats are managed and hydrological regimes are maintained, and intact swamps are not prone to high intensity burns. Widespread bushfire and regeneration of burned forest ecosystems may present a risk to local flows into swamps, or a sedimentation risk.</p> <p>Post-fire, weed invasion and pest animals (predators and herbivores) may limit recovery, but this risk is higher in more fragmented areas or where weeds exists prior to fire.</p> <p>Total bushfire suppression and impacts of bushfire suppression activities (such as clearing fire breaks or use of retardant foam) present a greater threat to this TEC than bushfire itself.</p>	Low
Native vegetation including other Threatened Ecological Communities (TECs), conservation estate (public and private), roadside vegetation, remnant habitat, and paddock trees.	Bushfire	<p>Most terrestrial native ecosystems in the Hills and Fleurieu region have evolved with fire and have the capacity to regenerate if in good condition and threats such as woody weeds, livestock, feral herbivores are managed.</p> <p>However, high intensity, widespread, or too frequent bushfires can destroy habitat, and be detrimental to species that can only regenerate from seed and take time to reach maturity.</p> <p>Intense bushfires can destroy hollow-bearing trees which reduces habitat value if a wide area is affected. During fire mop-up, trees with hollows that smoulder ('smokers') are also at risk of being knocked down to reduce the risk of re-ignition.</p> <p>In a region where the bushfire hazard is high, one of the greatest risks to native vegetation and habitat value is from fire mitigation activities, such as clearing of vegetation (both authorised and unauthorised), removal of coarse woody debris, and hazard reduction burns, particularly in peri-urban areas.</p> <p>Bushfire suppression activities such as vegetation clearance for fire breaks, direct impacts of fire fighting vehicles, and use of foam retardants may present a threat to these communities.</p> <p>Post-fire vegetation management for public safety can result in the loss of hollow-bearing trees and reduce habitat value.</p> <p>Fire stimulates the mass germination of hard-seeded woody weeds, as well as fire-responsive native species, such as Golden Wattle (<i>Acacia pycnantha</i>), which can increase the fuel load to pre-fire levels and create a greater future fire risk. Managing the risk of bushfire and impacts of hazard reduction activities on natural values is an on-going challenge.</p>	Variable

Asset	Emergency scenario	Why it poses a threat	Vulnerability
		<p>Vegetation infested with woody weeds pre-fire will generally have a greater weed burden post-fire.</p> <p>Bushfire risk to natural assets varies across the landscape, as fire intensity is influenced by pre-fire fuel load, slope, moisture levels and vegetation type.</p>	
<p>The Coorong, Lake Alexandrina and Albert Wetland Ramsar site.</p> <p>The Coorong, Lake Alexandrina and Albert Wetland Ramsar site.</p>	Storm surge	Storm surges push saltwater intrusions into the Lakes.	Minor
	Flood	<p>Floods are critical for wetland systems. They are an important natural process supporting fish and water bird breeding events.</p> <p>Very large, infrequent floods can result in black water events, which can impact fish and other aquatic species, however change in natural flows and flood events due to river regulation is a greater threat to the ecological values of the Ramsar site than flood itself.</p>	Minor
Coastal habitat	Storm surge (extreme sea level events)	<p>Storm surge can result in dune erosion and loss of sand, affecting dune rehabilitation activities.</p> <p>Seawalls built to mitigate the risks of sea level rise and storm surge events on housing and built infrastructure can interfere with natural processes organically induced by sea level change. Seawalls obstruct the natural inland migration of coastal systems in response to the sea level rise, therefore causing coastal squeeze. This process causes a reduction in habitats (CoastAdapt, 2016).</p>	Moderate

6. PREPAREDNESS PHASE

6.1 Regional actions to support preparedness of land, water and nature

Table 3: Regional actions to support preparedness of land, water and nature

Phase	Key action	Responsible agencies
Preparedness	1.1 Establish regional Community of Practice to support cross-agency planning for recovery of land, water and nature	Lead: LHF Support: Councils, Resilient Hills and Coasts DEW, CFS.
	1.2 Work with lead emergency management agencies to improve governance of recovery for natural assets, including agreement with DEW, Councils and partners That the Landscape Board will establish a 'Natural assets Incident Management Team' post-event to support coordination and collaboration in the recovery phase	Lead: LHF Support: DEW, Forestry SA, SA Water, Councils, eNGO partners,
	1.3 Work together on agreed native vegetation management guidelines and community resources about managing native vegetation pre- and post-fire	Lead: LHF Support: DEW, Councils, Resilient Hills & Coasts, CFS.
	1.4 Support First Nations capacity to undertake cultural burning and fire management in the region, including advocating for changes to Native Vegetation regulations that restrict cultural fire management	Lead: LHF Support: Native Vegetation Council, Councils, DEW, Forestry SA, SA Water.
	1.5 Strengthen planning rules that factor in fire and flood risk buffers	Lead: DIT Support: DEW, CFS
	1.6 Regularly update Fire Vulnerable Habitats data layer and integrate into BMAP 2.0	Lead: DEW, LHF Support: ZEMC (re BMAP review)
	1.7 Continue to improve data sharing arrangements between agencies to support knowledge of location of natural assets	Lead: DEW Support: LHF, Councils, PIRSA, AMLR & FL BMCs ⁹
	1.8 Improve mapping of permanent pools in the region	LHF
	1.9 Raise community awareness of value of permanent pools and how to care for them	LHF
	1.10 Improve mapping of woody weeds in the region to inform hazard mitigation works	Lead: LHF Support: Councils
	1.11 Raise community awareness of risks of woody weeds	Lead: LHF Support: Councils
	1.12 Raise community awareness of farm dam safety risks and how to maintain dams	Lead: LHF Support: DEW
	1.13 Ensure frontline staff are trained in mental health first aid	LHF

6.2 Specific actions to support preparedness of biodiversity and natural capital assets

Asset preparedness includes actions undertaken to reduce the impact or risk associated with extreme events, with a focus on reducing the impacts of bushfire. These include actions to reduce the likelihood of occurrence, severity and extent of fire, as well as actions that improve the capacity of natural systems to recover after fire. Examples of

best practice fire management and strategic bushfire preparation activities to reduce long term biodiversity impacts are discussed in the Resilient Hills and Coasts *Bushfire and Biodiversity* project reports.¹⁰

The priority in preparing biodiversity and natural capacity assets for extreme events is on building their resilience. This is achieved through the management of existing threats, restoration efforts to increase habitat extent and population sizes, and prescribed burning in fire-dependent ecosystems.

⁹ Adelaide Mount Lofty Ranges (AMLR) and Fleurieu (FL) Bushfire Management Committees (BMCs)

¹⁰ The Nature Conservation Society of South Australia, for Resilient Hills & Coasts (2023). *Bushfire and Biodiversity Part B – Spotlight studies and Part C – Discussion and recommendations.*

Table 4: **PREPAREDNESS actions for biodiversity assets of conservation concern (including Matters of National Environmental Significance).**

Asset	Emergency scenario	Preparatory Actions	Who	Actions underway
Threatened flora (see also Appendix 1)	Bushfire	Vegetation management/mitigation of threats (such as pests, weeds, over-grazing) to increase resilience and capacity to recover from bushfire.	LHF, NGOs	Regional grazing pressure project to reduce impacts of goats and deer.
		Establish ex-situ 'insurance' populations of critically endangered species at risk of extinction.	LHF, SA Seed Conservation Centre	Ex-situ conservation programs established for a number of threatened flora species. Management of sites and further translocation work currently unfunded.
Threatened terrestrial fauna (see also Appendix 2)	Bushfire	Mitigation of threats (such as pests, weeds, over-grazing) to maintain habitat quality for existing populations.	LHF	Regional grazing pressure project to reduce impacts of goats and deer.
		Revegetation and restoration of habitat to increase population sizes and reduce extinction risk.	LHF	Project underway with NGO partners to reconstruct habitat for threatened woodland birds.
		Undertake prescribed burns to create mosaic of habitat age classes and stimulate healthy vegetation required by species that decline under total fire suppression (including Western Beautiful Firetail, Southern Emu wren and Chestnut-rumped Heath-wren).	DEW – Fire Management Branch	Annual prescribed burning program led by DEW.
Threatened native fish species	Bushfire	Maintain and improve habitat value increase the resilience and capacity of populations to recover from extreme events including bushfire impacts and flood events. Restore flows to meet environmental water requirements; deliver low flows.	DEW LHF	Not in Western Mt Lofty Ranges. Yes in Eastern Mt Lofty Ranges - DEW Flows for the Future program working with land managers deliver low flows with flow devices on dams.
Swamps of the Fleurieu Peninsula (TEC)	Bushfire	Vegetation management/mitigation of threats (such as pests, weeds, over-grazing, fragmentation, change in hydrology) to increase resilience and capacity to recover from bushfire.	HFLB, NPWS SA,	Currently unfunded.
		Implement appropriate fire regimes for priority sites to provide a range of age classes in the landscape.	DEW – Fire Management Branch	Yes – Forms part of DEW Fire Management program
		Prescribed burns in surrounding landscape to reduce the risk of bushfire.	CFS, DEW – Fire Management Branch	Yes – Forms part of DEW Fire Management program
The Coorong, Lake Alexandrina and Albert Wetland Ramsar site.	Storm surge	Hydrology (lake levels) and salinity are managed to maintain the ecological character of the Ramsar site and build resilience to threats, as per the Ramsar Management Plan (2024 draft under consultation).	DEW, SA Water, MDBA, CEWH.	CLMM program to maintain Ramsar Values

Table 5: **PREPAREDNESS** actions for natural capital assets

Asset	Emergency scenario	Preparatory Actions	Who	Actions underway
Soil/ Pasture cover	Bushfire	Support landholders with information on good land management practices and bushfire planning: <ul style="list-style-type: none"> pasture management and the multiple benefits of perennial pastures and maintaining ground cover how to prepare their properties to mitigate bushfire risk the importance of including natural and agricultural assets in their fire plan; i.e. Think ahead about how you would manage a loss of grass cover/ pastures, have a plan for re-sowing and consider livestock containment areas. 	LHF, councils	Landholder advice and support provided through LHF stewardship program
		Establish native grass seed production areas to supply seed for post-fire pasture reseeding (particularly for high intensity bushfires, or where annual exotic pastures do not recover).	LHF	
Priority watercourses, such as those with permanent pools and high condition sites identified through fish monitoring	Bushfire	Support landholders to reduce bushfire risk while managing threats to watercourse condition: <ul style="list-style-type: none"> Manage stock access through fencing, off-stream water points, and prescribed grazing where required Restore riparian vegetation Manage woody weeds Encourage appropriate planting densities and species selection in revegetation projects Share resources and guides with regional partners. See publication ' Caring for your creek-lines to reduce bushfire risk '.	LHF, project partners	Landholder advice and support for waterway management provided through LHF Stewardship program.
Permanent pools	Bushfire	Fence priority pools to protect from livestock damage.	LHF	
Native vegetation including other Threatened Ecological Communities (TECs), conservation estate (public and private), roadside vegetation, remnant habitat, and paddock trees.	Bushfire	Manage threats including pests, weeds, over-grazing, and disturbance to improve ecosystem resilience and capacity to recover from bushfire.	LHF, Councils	
		Prescribed burns to reduce the risk of bushfire, including support for private land burning program.	CFS, DEW – Fire Mngt Branch, Forestry SA, SA Water.	
		Support opportunities for cultural burns for bushfire mitigation and cultural outcomes.	DEW, Councils, LHF, Forestry SA, SA Water.	Yes but more resourcing required
		Establish and maintain fire breaks, tracks and trails.	DEW, Forestry SA, SA Water.	Yes
		Support landholders networks and encourage collaboration between neighbours on fire plans and hazard reduction activities along property boundaries.	LHF	
		Establishment of seed orchards to support ex-situ conservation and provide 'insurance' seed source.	LHF	

7. EMERGENCY RESPONSE PHASE

7.1 Regional actions to support land, water and nature in response phase

Table 6: Regional actions to support land, water and nature in response phase

Phase	Key action	Responsible agencies
Emergency Response	2.1 Protect key biodiversity and natural capital assets through DEW Natural Values team working closely with CFS during bushfire to identify and communicate at-risk threatened species and ecological communities, and appropriate response	Lead: DEW Support: LHF
	2.2 Ensure frontline staff have information to connect community to required help in response phase	LHF, councils
	2.3 Provide additional mapping support	Lead: DEW; Support: LHF

7.2 Emergency response actions for protecting Biodiversity assets

Emergency scenario – Bushfire

During bushfires, the Natural Values team regional contacts provide advice to CFS and DEW fire crew on appropriate bushfire response relevant to biodiversity assets at risk. This advice is contained in the *Fire Vulnerable Habitat* spatial dataset. (See Appendix 10).

The *Fire Vulnerable Habitat* spatial dataset records environmental assets within South Australia that are at risk from bushfire, suppression activities and/or post

bushfire threats. Significant habitat is defined by areas of habitat that are critically important for meeting a specific need of key species (generally a threatened species) or areas of habitat that are poorly represented in the broader landscape and provide habitat for a wide range of species. Particular importance is placed on those assets which are vulnerable to bushfire, suppression activities and/or post bushfire threats.

Examples of responses for selected biodiversity assets are provided below. Spatially explicit response advice is contained in the *Fire Vulnerable Habitat* geodatabase managed by DEW.

Table 7: Emergency response actions for biodiversity and natural capital assets in the Hills and Fleurieu region.

Asset	Emergency scenario	Actions	Who
Threatened flora	Bushfire	Avoid burning entire remnant from a single bushfire event. Avoid damage from bushfire suppression activities (heavy machinery or chemical retardant).	DEW, CFS (advised by Natural Values team, including LHF staff)
Threatened terrestrial fauna	Bushfire	Avoid burning entire remnant from a single bushfire event.	DEW, CFS (advised by Natural Values team, including LHF staff)
Swamps of the Fleurieu Peninsula (TEC)	Bushfire	Allow bushfires to burn patches of mature age (~7+ years) but protect younger patches from bushfire. Avoid damage from bushfire suppression activities (heavy machinery or chemical retardant).	DEW, CFS (advised by Natural Values team, including LHF staff)
Native vegetation including other Threatened Ecological Communities (TECs), conservation reserves, roadside vegetation, remnant habitat, and paddock trees.	Bushfire	Avoid burning entire habitat remnant during a single bushfire event.	DEW, CFS, Forestry SA, SA Water (advised by Natural Values team)
		Provide consistent messaging to community on tree safety and native vegetation protections (particularly for roadsides and native vegetation on private property).	DEW, Councils, LHF
Native fauna (all species)	Bushfire	Work with NGOs to support recovery of injured wildlife.	Councils
		Provide consistent messaging to community on how to respond to injured wildlife.	DEW, Councils

8. LANDSCAPE RECOVERY

8.1 Community-centred and community-led recovery

Following the national principles for recovery¹¹, the activities we design and lead in the recovery phase will:

- Be **tailored** to reflect the specific context and individual community
- Focussed on **whole-of-community**, including at-risk people and respectful of cultural diversity
- Use **community-led** approaches that are responsive, and flexible, and engage and empower communities to move forward.
- **Coordinate** activities using an adaptive approach based on continuing assessment of impacts and needs.
- Acknowledge and build on community, individual and organisational **capacity**.
- Involve community in **collaborative** design and management of programs.

As shown in Figure 5 post-emergency, there is an opportunity for community to work together in a unique way with a shared sense of community and vision. There is also raw emotion, grief, anger, frustration that frontline staff can encounter when working with community, and by being involved, they can often become 'accidental counsellors'. Our staff lean in to this role and need to be supported to connect community members to the professional support services they need. Support for staff includes

the Employee Assistance Program and team debriefs.

8.2 Timeframes for recovery actions related to land, water and nature

In the days and first weeks after an extreme event, landholders whose properties have been affected by bushfire may be in shock. Impacts on life and property (built infrastructure), livestock, and impacts on livelihoods are the initial focus for recovery. Other agencies will be supporting landholders in this phase. It is important that landholders are given time to respond to their immediate priorities, and that assistance provided to support the recovery of land, water and nature is timed appropriately.

Our experience has been the landholders are on continual journey in how they relate to and maintain energy for managing land (see Figure 5). Part of the challenge in the recovery phase is that landholders are all at different stages in this journey. After the Cudlee Creek fire, some landholders who had not lost houses or stock were keen for information about how to restore their properties within weeks of the bushfire. For others it was 1-2 years (or more) before they were ready to reengage with their property and tackle land management issues such as weeds, revegetation, etc.

¹¹ [State Disaster Recovery Coordination Framework](#) (September 2022)

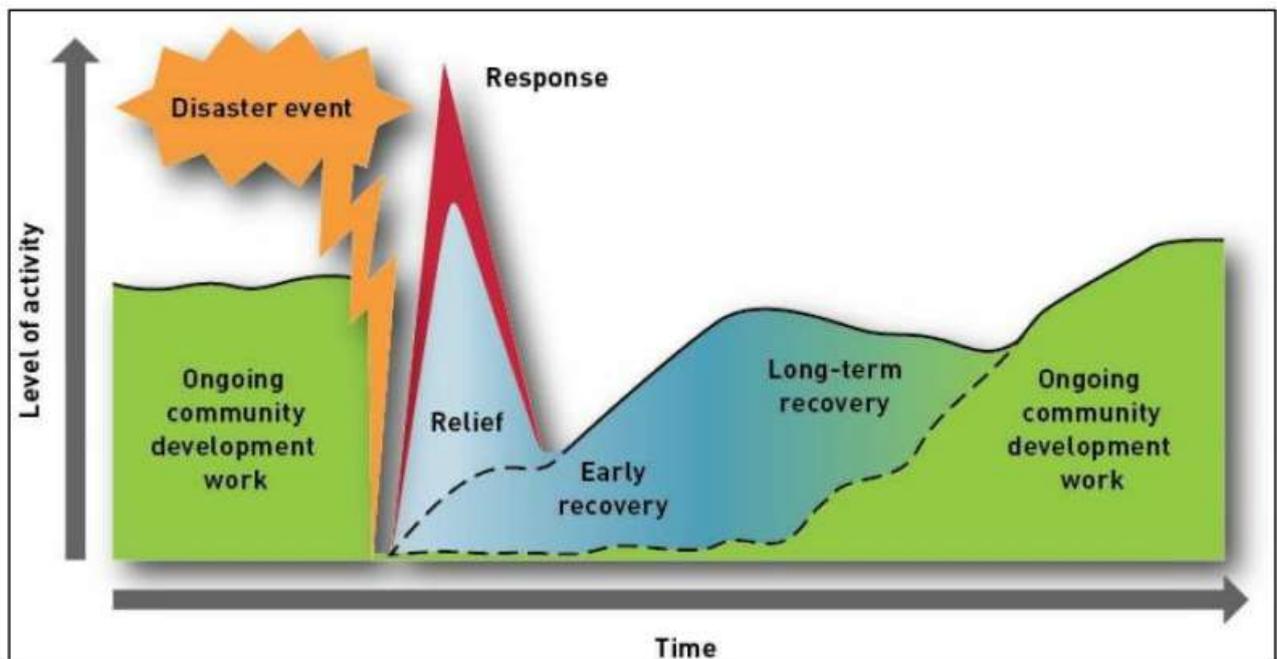


Fig. 4: Phases of preparedness, emergency response and recovery. Source: South Australian State Disaster Recovery Coordination Framework. September 2022.

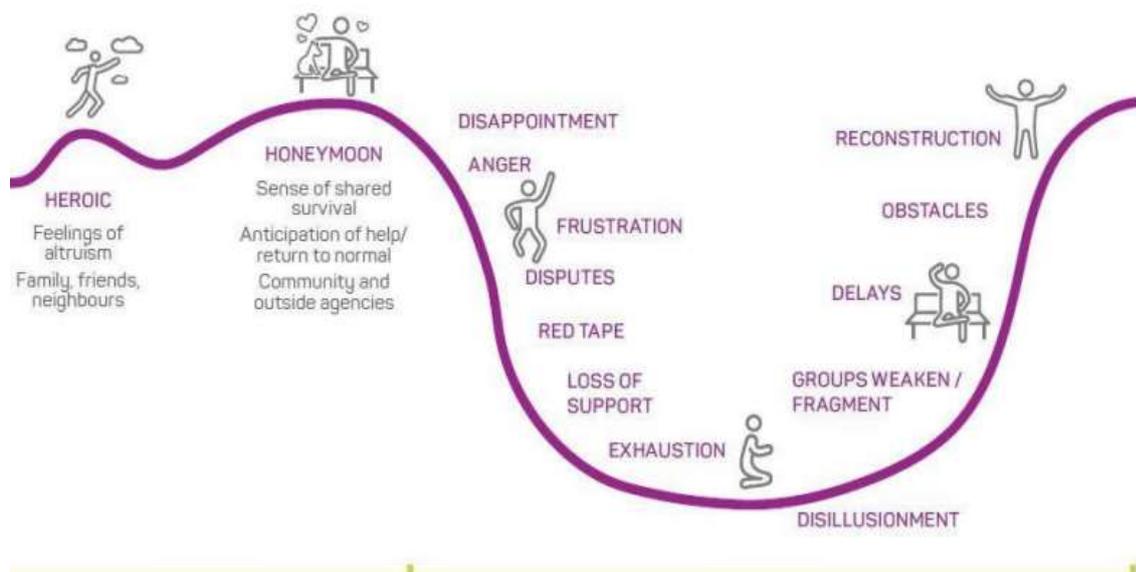


Fig. 5: Illustration of emotional states at different times post-event. Source: South Australian State Disaster Recovery Coordination Framework. September 2022. Adapted from Cohen and Ahearn 1980 and DeWolfe 2000.

8.3 Key risks and opportunities in the recovery of land, water and nature in our region

'In the midst of chaos, there is also opportunity'¹². The change and loss brought on by an extreme event presents an opportunity for transformation and growth. After an extreme event or emergency, there is an opportunity whereby community are keen to work together in a unique way with a shared sense of cohesiveness and ambition.

The key risks and opportunities for land, water and nature following **bushfire** include:

Risks

- **Fire-responsive weeds** (including hard-seeded woody weeds in the pea family such as Gorse and Broom species) can recruit in very high numbers following bushfire, resulting in greatly increased fuel load and increased future bushfire risk if not controlled. Control of these weeds is significantly easier in the first year after bushfire. Woody weeds are widespread in the Mount Lofty Ranges, and the Landscapes Hills and Fleurieu partners with councils to control roadside weeds where funding allows. Improving our knowledge of the extent of infestations would help with preparedness.
- **Fire-responsive native understorey species** (for example Golden Wattle, *Acacia pycnantha*) can similarly form dense stands following bushfire. While some dense understorey can provide good habitat for small birds and other native fauna, many areas of native vegetation change from a diverse flora pre-fire to be overwhelmingly dominated by one or two *Acacia* species post fire. High fuel loads on roadsides and near infrastructure present an increased future fire risk.
- **Loss of cover presents an erosion risk**, which may impact both the future productive value of land, and can result in **sediment movement into waterways**, poor water quality, and critically, the filling or loss of permanent pools which provide important

habitat for native fish species in ephemeral flow systems.

- **Threatened and highly restricted plant and animal species** may be at risk from bushfire if the intensity of fire is too great for recovery, and if the whole population is impacted, or a large proportion of a specific habitat type is impacted.
- **Loss of large, hollow-bearing trees** either killed by the bushfire, or cut down during clean-up operations. Trees can burn for days or weeks. Some of these large trees that are not severely impacted are felled unnecessarily during clean-up operations.
- **Illegal clearance of vegetation on roadsides or on-farm** may occur where landholders have been severely affected, and feel the need to reduce perceived hazards or future fire risks.

Opportunities from fire

- Fire can stimulate the **natural recruitment of fire-dependent species** as part of the regeneration of native vegetation, and benefit species that rely on younger vegetation/dense understorey structure or mixed aged classes.
- Mass recruitment of weed seed banks (particularly fire-responsive woody weeds) provides a **window for weed control** where the weed burden can be greatly reduced if control is undertaken before newly recruited seedlings set seed.
- **Feral herbivores control** can be easier post-fire due to greater visibility.
- Opportunity exists post-fire for many land managers to 'start over' with better property planning, including fencing to land class¹³ and fencing off native vegetation, watercourses and dams, and protecting regenerating native seedlings, e.g. protecting emerging paddock trees from livestock and other herbivores.

¹² Sun Tzu – Chinese philosopher and Author.

¹³ Land class capability is a classification system that relates to the capability of land for agricultural use.

8.4 Regional actions to support land, water and nature in Recovery phase

Table 8: Regional actions to support land, water and nature in recovery phase

Recovery Phase	Timing (Post-event)	Key action	Responsible agencies
Immediate localised response	Weeks 1-2	3.1 Instigate regional Incident Management Team for Natural Assets.	LHF
		3.2 Collate spatial data for the affected area (see Sect. 10)	LHF
		3.3 Identify biodiversity and natural assets in the fire-affected area; assess their recovery management needs and prioritise immediate recovery activities.	DEW, LHF
		3.4 Contribute to cross-agency planning for recovery - Work with partners to plan and deliver messaging for landholders - Work with partners to identify the best ways of contacting land managers in affected areas.	Councils, LHF
		3.5 Request and facilitate recovery funding, including timeframes for minimum 2 years of recovery.	PIRSA
		3.6 Work with partners to plan and deliver recovery activities and communications to landholders, including: - Face-to-face activities with time for community to relate and support each other - Connecting to counselling and wellbeing services available - Post-event messaging to minimise impacts on land, water and nature due to illegal or inappropriate actions - Provide required care to animals adversely impacted - 'Ever-green' online resources for landholders to engage whenever they are ready - Planning for coordinated delivery of grants if funding available.	LHF, PIRSA, Councils, DEW
	2 – 8 weeks	3.7 Work with affected community to identify immediate management needs.	LHF, Councils
		3.8 Continue cross-agency planning - Apply for recovery grants - Collaborate on initial on-ground recovery actions.	LHF
		3.9 Undertake surveys to determine the status of priority species, threatened species and habitats within the fire affected areas.	DEW
		3.10 Engage community and business/industry in collaborative efforts for mutual benefit.	LHF, Councils, DEW, DPC
Short term	Up to 1 year	3.11 Continue to work with affected community to identify key management needs.	LHF, Councils
		3.12 Enable and encourage community volunteer Landcare groups with regional support.	LHF, Councils
		3.13 Deliver capacity building, grants and targeted on-ground works (if funding is available) to assist landholders to manage pests, maintain cover to prevent soil loss and erosion issues, and protect permanent pools, threatened species and ecological communities, and on-farm natural capital.	LHF
		3.14 Identify data systems for collecting and sharing monitoring data from response activities.	
Medium term	1 – 3 years	3.15 Continue to deliver capacity building, grants and targeted on-ground works (if funding is available).	LHF
Longer term	Beyond 3 years	3.16 Capture and share learnings from the recovery process to build resilience into social, economic and ecological systems.	All

8.5 Specific actions for *recovery of biodiversity assets of conservation concern*

Table 9: Specific actions for recovery of biodiversity assets of conservation concern

Asset	Emergency scenario	Actions	Who
Swamps of the Fleurieu Peninsula and other Threatened Ecological Communities (TECs) in the Hills and Fleurieu region	Bushfire	Assess and monitor impacts on ecosystem.	LHF, DEW
		Support land managers to exclude livestock (on private property).	LHF
		Manage grazing pressure from native herbivores with exclusion fencing and/or targeted control.	LHF, DEW
		Support land managers in controlling pest animals – feral herbivores and predators.	LHF
		Monitor recovery.	LHF
Threatened flora	Bushfire	Undertake surveys to assess impacts on populations.	LHF, DEW
		Manage grazing pressure with herbivore exclusion fencing where feasible for small populations.	LHF
		Investigate re-establishment or boosting populations from ex-situ seed bank <ul style="list-style-type: none"> - Propagate and establish plants - Liaise with land managers. 	LHF
Threatened terrestrial fauna species	Bushfire	Undertake surveys to assess and monitor impacts on populations.	LHF, DEW
		Implement predator control within burnt and adjacent areas.	LHF
		Manage grazing pressure to enable habitat recovery.	LHF
Threatened fish species	Bushfire	Assess and monitor impacts on populations.	LHF
		Prioritise stock exclusion fencing in high value areas (identified through long term fish monitoring).	LHF

8.6 Specific actions for recovery of natural capital assets (land, water and nature)

Table 10: Specific actions for recovery of natural capital assets (land, water and nature)

Asset	Emergency scenario	Recovery Actions	Who
Soil/ Pasture cover	Bushfire	Support landholders with information on how to recover or re-establish pastures.	LHF, PIRSA
		Establish stock containment areas to protect paddocks from erosion until pasture re-establishes.	LHF, PIRSA
		Apply regenerative agriculture principles to recover soil health post-fire, such as: <ul style="list-style-type: none"> • Keeping living roots in the soil wherever possible • Minimising soil disturbance through no-till agriculture, rotational grazing, livestock exclusion, agistment where feasible • Creating pasture species diversity. 	LHF, PIRSA
		If fencing is lost, make use of the opportunity to improve paddock design and fencing layout.	LHF, PIRSA.
Priority water courses, such as those with permanent pools and high condition sites identified through fish monitoring	Bushfire/ Flood/ Extreme rainfall event	Control sediment and erosion.	LHF, PIRSA
		Encourage landholders to remove livestock from affected paddock or establish temporary fence where fences have been damaged or lost.	LHF, PIRSA
Permanent pools (refuge areas for aquatic species in dry conditions)	Bushfire	Encourage landholders to protect permanent pools from livestock. Remove livestock or establish temporary fencing where fences have been damaged or lost.	LHF
Native vegetation including other Threatened Ecological Communities (TECs), conservation estate (public and private), roadside vegetation, remnant habitat, and paddock trees.	Bushfire	Remove livestock from fire-affected areas until ground cover has re-established.	LHF
		Control fire-responsive weeds regenerating from seed before seed set occurs (window of 6 months to 2 years).	LHF, Councils
		Encourage revegetation with appropriate local species.	LHF, Councils
		Monitor bushfire impacts; recovery or loss of large trees and understorey.	LHF, Councils
		Encourage regeneration of native flora by protecting from herbivores.	LHF
		Provide consistent messaging to community around tree management, the importance of native vegetation, and legal protections. Protect high conservation value roadsides from over-zealous 'cleaning up' post-fire, to prevent the unnecessary loss of vegetation.	Councils, LHF

CASE STUDY: Cudlee Creek fire-affected properties on the road to recovery

The Cudlee Creek bushfire tore through the Adelaide Hills in the Hills and Fleurieu landscape region in December 2019. Over 1,500 private properties were directly affected, requiring varying levels of recovery and support.

A two-year project delivered by Landscapes Hills and Fleurieu to help properties recover from the impacts of the 2019 Cudlee Creek bushfire achieved many significant on-ground outcomes.

The work was done by a dedicated Bushfire Recovery Team who conducted over 250 property visits over the course of the project. The project supported landholders to tackle significant problems arising from the impacts of bushfire. It helped landholders not only restore their properties, but also make these properties more resilient to future extreme events.

Landholder support included control of fire-responsive weeds such as broom and gorse; control of pest rabbits, goats and foxes; restoration of damaged watercourses and dams; restoration of rare bird habitat through revegetation and guarding regenerating trees from livestock grazing; providing local, native seedlings for restoration of shelterbelts and paddock trees; pasture renovation and the establishment of native grass nurseries through providing landholders with training and field days; connecting landholders to contractors; and bringing our community together at 'Reveg Festival 2022'.

Crucial to the project's success was early and meaningful engagement with the fire-affected community to hear what was important to them. The project's community-led approach provided landholders what they most needed, as well as making improvements on a landscape scale such as protecting watercourses across multiple properties.

To help deliver this work, Landscapes Hills and Fleurieu developed partnerships with many agencies and groups along the way, including Adelaide Hills Council, District Council of Mount Barker, Forestry SA, National Parks and Wildlife SA, Trees for Life, Ngarrindjeri Aboriginal Corporation, Jurlique, Alexandrina Community Nursery, State Flora, Kersbrook Landcare Nursery, and Woodside Primary School.

Landholders were of course the most critical partners. Without their willingness to engage with us and participate, the project couldn't have achieved what it did.

A key legacy of the project was support provided to more than 60 properties to prepare a Bushfire Recovery Action Plan. These plans identified actions to help property owners maintain their recovery investments (such as revegetation and fences), prioritise future efforts according to seasonal opportunity, and be better able to recover from future fires.

The Local Economic Recovery project was delivered by the Hills and Fleurieu Landscape Board in partnership with the Department of Primary Industries and Regions, and was jointly funded by the South Australian and Australian Governments under the National Disaster Recovery Funding Arrangements.



Almost three years of collaboration between partner organisations and dedicated land holders has invigorated new life in Cudlee Creek.

Lessons from the Cudlee Creek fire recovery project

- **Longer timeframes are needed for delivery of recovery grant funds**
 - Climate influences local needs (i.e appropriateness of seasonal conditions for planting)
 - Contractor availability was a limitation
 - First Nations involvement takes time
 - Timeframes needs to work for community (the less affected might be ready sooner, and this can result in inequity).
- **Relationships are key!**
 - Build networks
 - Community need to be ready for the message for it to be heard. Timing needs to be sensitive to people's emotional state and needs. (i.e. plantings while people still grieving)
- **Timing matters**
 - Take on the right battle at the right time. e.g. fire-responsive weeds, revegetation
- **Consider a range of delivery methods**
 - Consider best options; multiple approaches might be needed
 - Grant applications can be exhausting for landholders
 - Multiple delivery mechanisms may be needed for equitable access and distribution
 - Simplify reporting
- **Good communications**
 - Share successes
 - Create touch-points with community; ask about their needs;
 - Close the loop
- **Seize the opportunity to harness positive energy and community willingness to help post-event**

9. RISK MANAGEMENT INCLUDING MITIGATION STRATEGIES

Table 11: Risk management strategies

Key risks related to response and recovery phases	Consequence	Mitigation strategy
Ecosystem / habitat destruction through inappropriate response	Decline or loss of natural assets or biodiversity assets of conservation concern.	Natural Values team provide advice to CFS and DEW fire crew during critical incidents, informed by the <i>Fire Vulnerable Habitat</i> spatial data.
Psychological safety for staff – ‘Accidental counsellors’	Risks to staff health and wellbeing.	Frontline staff trained in Mental Health First Aid. Frontline staff provided with resources toolkit to direct landholders to appropriate network/ assistance.
Physical safety for staff – Risk of falling trees during recovery operations	Risk of injury or death.	Tree management on roadsides undertaken by CFS and councils following bushfire. Staff involved in post-event on-ground recovery operations to follow WHS procedures when in fire-affected areas.
Splash of money – creating unrealistic / inappropriate funding timeframes	Overwhelmed community not ready to engage on landscape recovery work. Inappropriate spending to meet predetermined timeframes. Staff burnout. Setting unrealistic future expectation of community that all extreme events will receive funding / bail outs. Risk of in-equitable distribution of funds.	Landscape Boards to request longer timeframes for recovery funding, and flexibility in milestones through emergency management committees and lead organisations.
Resource availability	Impact on delivery of normal Business/ projects	Talk with funding bodies about potential delays to existing projects. Seek additional resourcing to assist with recovery effort.
Technological reliance	Inability to access data when required	Business Continuity Plan.

10. MONITORING AND DATA

Table 12: Key data to support response and recovery

Data set	Data owner	Data accessibility / location
PREPAREDNESS PHASE		
Dynamic Fire and Biodiversity tool (DFaB) (Information on burning requirements of fire-dependent habitat)	DEW	DEW Fire Branch
Fire Vulnerable Habitat layer (Information on fire response to inform mitigation strategies)	DEW (with input from Landscape Boards)	DEW / Landscape Boards access only (contains location-sensitive data)
EMERGENCY RESPONSE PHASE		
Fire Vulnerable Habitat layer (Information on appropriate fire response during incidents).	DEW (with input from Landscape Boards)	DEW / Landscape Boards access only (contains location-sensitive data)
RECOVERY PHASE		
<i>Recovery planning geodatabase, collating the following spatial data:</i>	LHF	
Land use and property mapping (showing number and densities of properties, land uses)	LHF	State-wide layer in DEW EGIS spatial warehouse
Native vegetation extent	DEW	State-wide layer in DEW EGIS spatial warehouse & publicly available on NatureMaps
Public lands and conservation estate	DEW	State-wide layer in DEW EGIS spatial warehouse & publicly available on NatureMaps
Heritage Agreements mapping	DEW	State-wide layer in DEW EGIS spatial warehouse & publicly available on NatureMaps
Watercourses	DEW	State-wide layer in DEW EGIS spatial warehouse & publicly available on NatureMaps
Permanent pools	DEW	State-wide layer in DEW EGIS spatial warehouse & publicly available on NatureMaps
Historical on-ground works mapping	LHF	Landscapes Online Information System (LOIS – LHF internal database)

11. HOW THIS PLAN WAS DEVELOPED

This plan has been developed by Landscapes Hills and Fleurieu staff, with input from the Department for Environment and Water, local government staff, Forestry SA and SA Water. Lessons from the December 2019 Cudlee Creek fire (declared a national disaster) have informed both recovery efforts, and future preparedness needs.

The *Fire Vulnerable Habitat* dataset used by Natural Values teams to inform fire crew responses during critical incidents was reviewed and updated in a joint review process involving ecologists from DEW (Fire Management branch and National Parks and Wildlife Service), Landscapes Hills and Fleurieu, Murraylands and Riverland Landscape Board, and the South

Australian Seed Conservation Centre. Two dedicated workshops to review fire response for threatened flora and fauna were held on March 20 and 22, involving 8 and 10 people respectively.

A regional partners' workshop was held on 10 April 2024 to inform the draft plan. This raised regional roles and responsibilities, key preparedness and recovery actions for land, water and nature, and areas for collaboration. Feedback on the draft plan was sought from regional partners in May 2024.

A workshop with state agencies and Landscape Boards involved in land, water and nature emergency preparedness and response in South Australia was held on 24 May 2024.



Participants in the Land, Water and Nature Emergency Preparedness, Response and Recovery regional partners' workshop, 10th April 2024.

Organisations represented at regional partners' workshop

- Adelaide Hills Council
- Alexandrina Council
- Mount Barker District Council
- Onkaparinga Council
- Forestry SA
- SA Water
- Department for Environment and Water

Agencies represented at state-wide workshop

- Department of Environment and Water
- Primary industries and Regions SA
- SA Country Fire Service
- Forestry SA

- SA Water
- Landscape Boards of SA:
 - o Alinytjara Wilurara Landscape Board
 - o Eyre Peninsula Landscape Board
 - o Landscapes Hills and Fleurieu
 - o Limestone Coast Landscape Board
 - o Kangaroo Island Landscape Board
 - o Murraylands and Riverland Landscape Board
 - o Northern and Yorke Landscape Board
 - o South Australian Arid Lands Landscape Board

Appendix 1: EPBC-listed flora in the Hills and Fleurieu region

[^]Note: Regional vulnerability to extreme events is an assessment of the likelihood of local extinction (loss from the Hills and Fleurieu region) due to a single extreme event. For threatened flora species, the primary risk is bushfire. Vulnerability considers both the species' fire response, size and distribution of current populations and existing risk mitigation strategies (preparatory actions).

Scientific Name	Common Name	Class	EPBC listing	Vulnerability to extreme events in H&F region [^]	Ex-situ seedbank	Preparedness actions required in Hills and Fleurieu region
<i>Acacia menzeli</i>	Menzel's Wattle	Plant	Vulnerable	Low	Y	
<i>Acacia pinguifolia</i>	Fat-leaved Wattle, Fat-leaf Wattle	Plant	Endangered	Low	Y	
<i>Acacia rhotinocarpa</i>	Neat Wattle, Resin Wattle (SA)	Plant	Vulnerable	Low	Y (but not all populations)	Bank seed from all populations in H&F.
<i>Allocasuarina robusta</i>	Mount Compass Oak-bush	Plant	Endangered	Low	Y	Continue to work with land managers to reduce risks from hazard reduction works (incl. roadside vegetation management).
<i>Caladenia argocalla</i>	White-beauty Spider-orchid	Plant	Endangered	High	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Caladenia behrii</i> [#]	Pink-lipped Spider-orchid	Plant	Endangered	Mod	Y	Increase seed bank. Continue ex-situ propagation to establish new populations and bolster existing populations. [#] Southern population at edge of region (primarily in GA).
<i>Caladenia colorata</i>	Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid	Plant	Endangered	High	Y	Increase seed bank. Continue ex-situ propagation to establish new populations and bolster existing populations. Breeding program protocols to be developed (e.g. Fungal isolation and germination trials required).
<i>Caladenia gladiolata</i>	Bayonet Spider-orchid, Clubbed Spider-orchid	Plant	Endangered	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Translocate (reintroduction) into H&F region.
<i>Caladenia ovata</i>	Kangaroo Island Spider-orchid	Plant	Vulnerable	High	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Caladenia rigida</i>	Stiff White Spider-orchid	Plant	Endangered	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Calochilus cupreus</i>	Copper Beard Orchid	Plant	Critically Endangered	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Translocate (reintroduction) into H&F region.
<i>Correa calycina</i>	Hindmarsh Correa	Plant	Vulnerable	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Correa eburnea</i>	Deep Creek Correa	Plant	Endangered	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Eucalyptus paludicola</i>	Mount Compass Swamp Gum, Fleurieu Swamp Gum	Plant	Endangered	Low	Y	[Low priority, species considered a hybrid].

Scientific Name	Common Name	Class	EPBC listing	Vulnerability to extreme events in H&F region^	Ex-situ seedbank	Preparedness actions required in Hills and Fleurieu region
<i>Euphrasia collina subsp. osbornii</i>	Osborn's Eyebright	Plant	Endangered	High (Swamp form)	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Glycine latrobeana</i>	Clover Glycine, Purple Clover	Plant	Vulnerable	Low	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Hibbertia tenuis</i>	Yundi Guinea Flower	Plant	Critically Endangered	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Olearia pannosa subsp. pannosa</i>	Silver Daisy-bush, Silver-leaved Daisy, Velvet Daisy-bush	Plant	Vulnerable	Low	Y	Reduce threats to existing populations.
<i>Prasophyllum murfettii</i>	Fleurieu Leek Orchid	Plant	Critically Endangered	High	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	Plant	Vulnerable	Low	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Prasophyllum pruinosum</i>	Plum Leek-orchid	Plant	Endangered	Low	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Translocate (reintroduction) into H&F region.
<i>Pterostylis arenicola</i>	Sandhill Greenhood Orchid	Plant	Vulnerable	Low	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Translocate (reintroduction) into H&F region.
<i>Pterostylis bryophila</i>	Hindmarsh Valley Greenhood	Plant	Critically Endangered	High	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Pterostylis cucullata</i>	Leafy Greenhood	Plant	Vulnerable	High	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Spyridium coactilifolium</i>	Butterfly Spyridium	Plant	Vulnerable	Mod	Y	Continue ex-situ propagation to establish new populations and bolster existing populations. Reduce threats to existing populations.
<i>Thelymitra cyanapicata</i>	Blue Top Sun-orchid, Dark-tipped Sun-orchid	Plant	Critically Endangered	Low	Y	Reduce threats to existing populations.
<i>Veronica derwentiana subsp. homalodonta</i>	Mount Lofty Speedwell	Plant	Critically Endangered	Low	Y	Reduce threats to existing populations.

Appendix 2: EPBC-listed fauna in the Hills and Fleurieu region

^Note: Regional vulnerability to extreme events is an assessment of the likelihood of local extinction (loss from the Hills and Fleurieu region) due to a single extreme event. Vulnerability considers both the species' fire response, size and distribution of current populations and existing risk mitigation strategies (preparatory actions).

Scientific Name	Common Name	Class	EPBC listing	Vulnerability to localised extinction from extreme events^	Preparedness actions required in Hills and Fleurieu region
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)	Mammal	Endangered	Mod	Continue recovery program, including trial translocations. Reduce threats at existing populations.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Mammal	Vulnerable	Low	Monitor for establishment of roost sites in H&F region [currently in GA].
<i>Aprasia pseudopulchella</i>	Flinders Ranges Worm-lizard	Reptile	Vulnerable	Low	Survey to improve understanding of extent.
<i>Aphelocephala leucopsis</i>	Southern Whiteface	Bird	Vulnerable	Low	Maintain and expand suitable habitat. Continue monitoring.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Bird	Endangered	Low	Continue monitoring.
<i>Calidris tenuirostris</i>	Great Knot	Bird (Marine, Migratory)	Vulnerable	Low	Maintain feeding and roosting habitat at key sites (e.g. Tolderol). Continue monitoring.
<i>Calyptorhynchus lathami halmaturinus</i> *	Glossy Black-Cockatoo	Bird	Endangered. (Present on KI)	Low	Maintain and expand suitable habitat.
<i>Charadrius leschenaultia</i>	Greater Sand Plover	Bird (Marine, Migratory)	Vulnerable	Low	Maintain feeding and roosting habitat at key sites. Continue monitoring.
<i>Charadrius mongolus</i>	Lesser Sand Plover	Bird (Marine, Migratory)	Endangered	Low	Maintain feeding and roosting habitat at key sites. Continue monitoring.
<i>Cinclosoma punctatum anachoreta</i> *	Mt Lofty Ranges Spotted Quail-thrush, Spotted Quail-thrush (Mt Lofty Ranges)	Bird	Critically Endangered	N/A	[Considered extinct]
<i>Falco hypoleucos</i>	Grey Falcon	Bird	Vulnerable	Low	Continue monitoring.
<i>Grantiella picta</i>	Painted Honeyeater	Bird	Vulnerable	Low	Continue monitoring.
<i>Hylacola pyrrhopygia parkeri</i>	Chestnut-rumped Heathwren (Mt Lofty Ranges)	Bird	Endangered (listed as <i>Calamanthus pyrrhopygius parkeri</i>)	Low	Continue prescribed burn programs to maintain suitable habitat age classes. Continue monitoring.
<i>Lathamus discolor</i>	Swift Parrot	Bird (Migratory)	Critically Endangered	Low	Continue monitoring.
<i>Leipoa ocellata</i> [#]	Malleefowl	Bird	Vulnerable	Low	Undertake opportunistic surveys.
<i>Limosa lapponica baueri</i> [#]	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	Bird	Endangered	Low	Maintain feeding and roosting habitat at key sites. Continue monitoring.

Scientific Name	Common Name	Class	EPBC listing	Vulnerability to localised extinction from extreme events [^]	Preparedness actions required in Hills and Fleurieu region
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin, Hooded Robin (south-eastern)	Bird	Endangered	Low	Maintain and expand suitable habitat. Continue monitoring.
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	Bird (Migratory)	Critically Endangered	Low	Continue monitoring.
<i>Pachyptila turtur subantarctica</i> [^]	Fairy Prion (southern)	Bird	Vulnerable	Low	Opportunistic monitoring.
<i>Pedionomus torquatus</i> * [^] #	Plains-wanderer	Bird	Critically Endangered	Low	Undertake surveys in Eastern Plains.
<i>Stagonopleura bella samueli</i>	Western Beautiful Firetail, Beautiful Firetail (Mt Lofty Range and Kangaroo Island)	Bird	Endangered	High	Maintain and expand suitable habitat. Continue monitoring.
<i>Stagonopleura guttata</i>	Diamond Firetail	Bird	Vulnerable	Low	Maintain and expand suitable habitat. Continue monitoring.
<i>Sternula nereis nereis</i> [#]	Australian Fairy Tern	Bird	Vulnerable	Low	Protect beach nesting habitat. Continue monitoring.
<i>Stipiturus malachurus intermedius</i>	Fleurieu Peninsula Southern Emu-wren, Mount Lofty Southern Emu-wren	Bird	Endangered	High	Maintain and expand suitable habitat. Continue monitoring.
<i>Thinornis cucullatus</i>	Eastern Hooded Plover	Bird	Vulnerable	Low	Manage threats to existing populations. Continue monitoring.
<i>Zoothera lunulata halmaturina</i>	South Australian Bassian Thrush, Western Bassian Thrush	Bird	Endangered	Mod	Continue monitoring.
<i>Litoria raniformis</i>	Southern Bell Frog, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog	Frog	Vulnerable	Low	Continue captive breeding and reintroduction program.
<i>Craterocephalus fluviatilis</i>	Murray Hardyhead	Fish	Endangered	Low	Continue surrogate refuge wetlands and reintroductions programs. Manage threats to existing populations. Continue monitoring.
<i>Maccullochella peelii</i>	Murray Cod	Fish	Vulnerable	Low	Opportunistic monitoring.
<i>Nannoperca australis Murray-Darling Basin lineage</i>	Southern Pygmy Perch (Murray-Darling Basin lineage)	Fish	Vulnerable	Low	Continue surrogate refuge wetlands and reintroductions programs. Manage threats to existing populations. Continue monitoring.
<i>Nannoperca obscura</i>	Yarra Pygmy Perch	Fish	Endangered	Low	Continue surrogate refuge wetlands and reintroductions programs. Manage threats to existing populations. Continue monitoring.

[^] Seasonal, migratory or irregular visitor

[#] Edge of core habitat, or edge of range

* Historical records in the region, but presumed not to occur.

Appendix 3: EPBC-listed Threatened Ecological Communities occurring in the Hills and Fleurieu region

Community name	Threatened category	Extent in Hills and Fleurieu region
Swamps of the Fleurieu Peninsula	Critically Endangered	Community contained wholly within the Hills and Fleurieu region.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community occurs in Hills and Fleurieu and neighbouring regions.
Iron-grass Natural Temperate Grassland of South Australia	Critically Endangered	Community occurs mostly outside of Hills and Fleurieu region.
Peppermint Box (<i>Eucalyptus odorata</i>) Grassy Woodland of South Australia	Critically Endangered	Community occurs mostly outside of Hills and Fleurieu region.

Appendix 4: Relevant legislation, strategies, plans and frameworks

[South Australia Emergency Management Act 2004](#)

[South Australia's Disaster Resilience Strategy 2019-2024](#)

[State-Emergency-Management-Plan-2022 \(dpc.sa.gov.au\)](#)

[Adelaide Hills, Fleurieu and Kangaroo Island Zone Emergency Management Plan](#) 2018

[South Australian Wildlife and Habitat Recovery Framework 2020](#)

Resilient Hills and Coasts (2016) [Climate Change Adaptation Plan for the Adelaide Hills, Fleurieu Peninsula and Kangaroo Island Region](#). A report prepared for Alexandrina Council on behalf of Resilient Hills and Coasts project partners by Seed Consulting Services and URPS.

[Resilient South Regional Climate Action Plan - Final for engagement.pdf](#)

Department for Environment and Water (2022). [Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022](#), Government of South Australia, through the Department for Environment and Water, Adelaide

Hills and Fleurieu Landscape Board (2021). [Hills and Fleurieu Landscape Plan 2021-26](#).

Adelaide Hills Council – [Draft Bushfire Mitigation Landscape Strategy for Consultation 2024-2028: A plan for how we manage vegetation on public and private land to reduce the risk of bushfires](#). Draft for consultation.

Appendix 5: References

Allan, J. *et al.* (2022) Dynamic Fire and Biodiversity Tool. *Presentation to the AFAC Conference 2022*.

CoastAdapt (2016) CoastAdapt climate risk assessment. <https://coastadapt.com.au/assess-risks-and-impacts> [Accessed May 2024].

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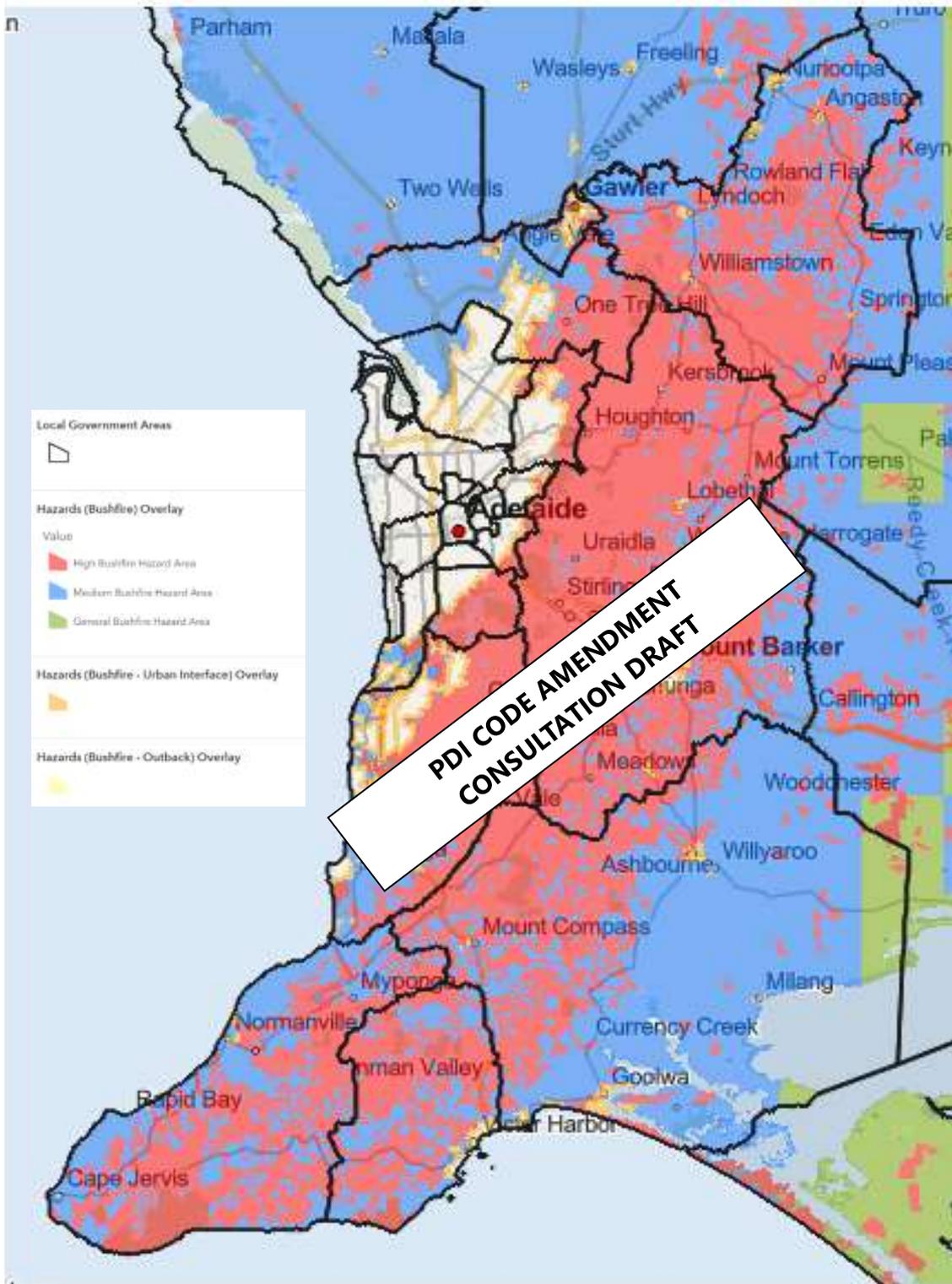
Moskwa, E. *et al.* (2017) *Bushfires and biodiversity: Optimising conservation outcomes in per-urban areas at risk*. Summary Report to the South Australian Department of Environment, Water and Natural Resources, the Eyre Peninsula Natural Resource Management Board and the Adelaide and Mount Lofty Ranges Natural Resource Management Board, August 2017.

The Nature Conservation Society of South Australia, for Resilient Hills & Coasts (2023). Bushfire and Biodiversity Part A: Literature Review. South Australia.

The Nature Conservation Society of South Australia, for Resilient Hills & Coasts (2023). Bushfire and Biodiversity Part B: Spotlight Studies. South Australia.

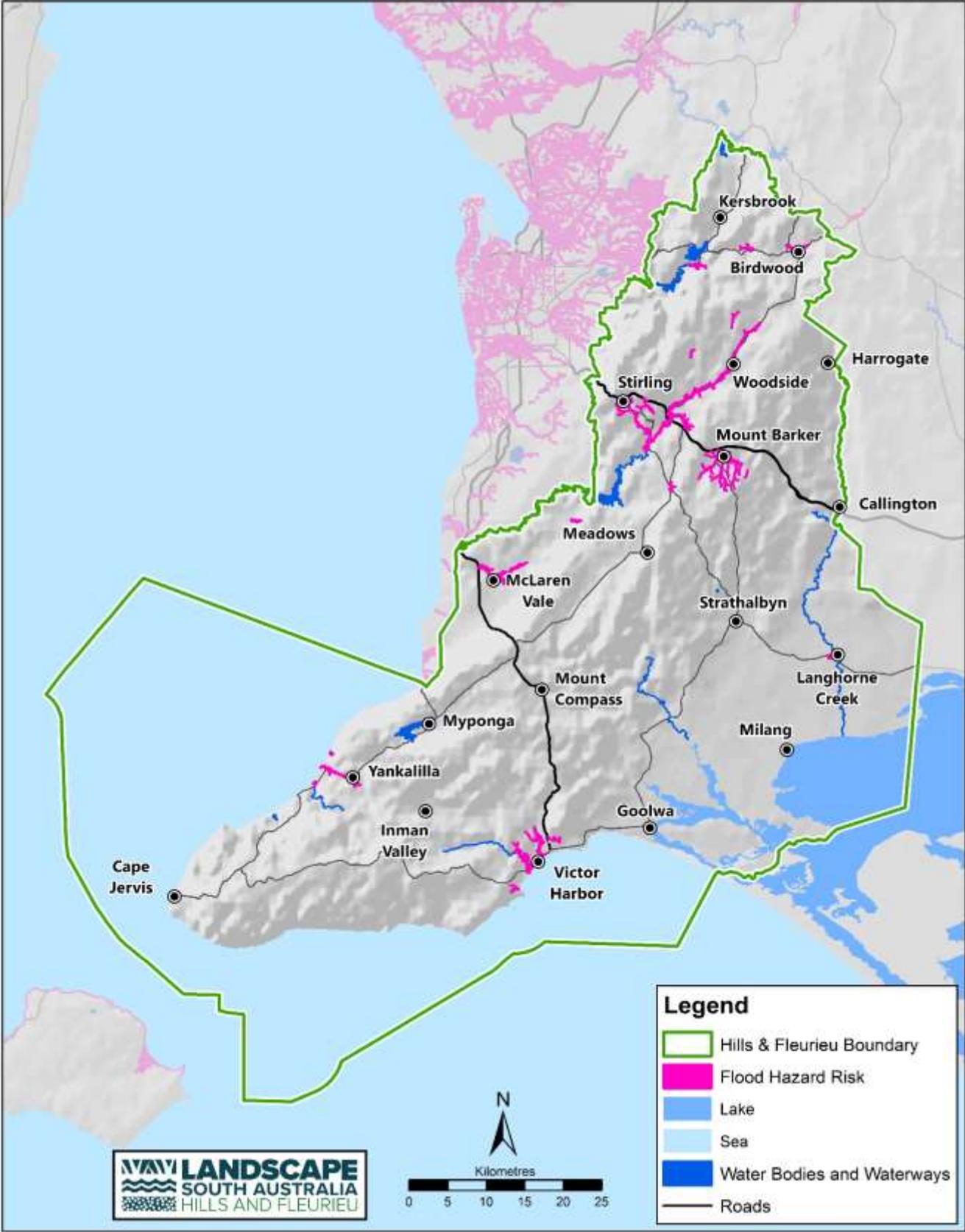
The Nature Conservation Society of South Australia, for Resilient Hills & Coasts (2023). Bushfire and Biodiversity Part C: Discussion and Recommendations. South Australia.

Appendix 6: Bushfire hazard risk[^] in the Hills and Fleurieu region



[^] Bushfire Hazard Risk overlay as proposed in **consultation draft** of State-wide Bushfire Hazard Overlay code amendment (April 2024). The SA Planning, Development and Infrastructure (PDI) Act – Planning and Design Code hazard overlays present bushfire hazard modelled using vegetation mapping, Grassfire fuel modelling and forest patch mapping. This data is used to inform hazard mitigation requirements of development applications and does not represent risk to natural assets.

Appendix 7: Flood hazard risk[^] in the Hills and Fleurieu region



[^]Flood Hazard mapping from the SA Property and Planning Atlas (SAPPA) to inform risks to development. This does not necessarily imply risk to natural assets.

Appendix 9: Local Government Areas and Fire Management Zones across the Hills and Fleurieu landscape region



Legend

- Country Fire Service (CFS) Regions
- Local Government Areas
- Hills and Fleurieu Landscape Region

Appendix 10: Attributes within Fire Vulnerable Habitat spatial layer used by Natural Values team during emergency response

FIELD NAME	DESCRIPTION
SourceID	Generated. Unique identifier attached to the spatial record of the habitat
EcologicalValue	Concise description of the ecological value. 1. High quality vegetation 2. Threatened fauna 3. Threatened flora 4. Threatened ecological community
HabitatName	Park name/location, description of habitat
Rationale	What makes the habitat important and why has the habitat been nominated.
NSXCode	NSXCode required for flora and fauna records
ScientificName	Populated by NSX Code lookup for flora and fauna
CONS_STATUS	The conservation status that applies to the habitat(s) based on the highest level of concern. EPBC State Not rated
EPBC_STATUS	The EPBC status Critically Endangered Endangered Vulnerable
STATESTATUS	The state status Critically Endangered Endangered Vulnerable
STATEPROV_STATUS	The state provisional status Critically Endangered Endangered Vulnerable
FireResponse	Fire response, habitat flammability and fuel, fire management guidelines
BushfireThreat1	What is the highest impact on the habitat from bushfire? 1. Serious reduction in popn viability likely due to loss/serious degradation of habitat elements 2. Direct mortality in fire but ONLY if fire occurs outside of 'normal' bushfire season or during drought 3. Direct mortality in fire. Popn decline likely if entire habitat patch burns 4. Serious reduction in popn viability likely due to loss of juveniles (adult survival) 5. None known
BushfireThreat2	What is the second highest impact on the habitat from bushfire? 1. Serious reduction in popn viability likely due to loss/serious degradation of habitat elements 2. Direct mortality in fire but ONLY if fire occurs outside of 'normal' bushfire season or during drought 3. Direct mortality in fire. Popn decline likely if entire habitat patch burns 4. Serious reduction in popn viability likely due to loss of juveniles (adult survival) 5. None known
BushfireObj	Recommendations that contribute to reducing the impact of bushfire threats on this habitat
DegreeOfDamage	Permanent destruction: The bushfire results in the complete loss of the habitat, or ongoing impacts creating permanent damage. While some restoration might be possible, full recovery to the pre-bushfire condition is not achievable. Severe damage or loss: The bushfire causes major and potentially irreversible changes to the habitat. Extensive interventions and a long-term restoration program are necessary to bring the habitat back to a stable state. Reaching the original state might be improbable due to crossed thresholds or permanent alterations. Significant damage or loss: The bushfire alters the habitat considerably, requiring dedicated recovery efforts and resource allocation to return it to a stable state. While full restoration to the original condition might be uncertain, substantial improvement is possible with concerted action. Minor damage: The bushfire causes temporary harm, but the habitat recovers naturally within a short timeframe, even without existing management programs. The impact is negligible, and the existing resilience of the habitat ensures quick recovery. Insignificant damage: No lasting impact from the bushfire. The habitat recovers naturally to its pre-existing condition without any intervention.
SuppressionThreat1	What is the highest bushfire suppression activity that the habitat is threatened by? Backburning: Direct mortality Backburning: Population decline risk Firebreak construction: Direct mortality Firebreak construction: Habitat fragmentation/degradation Fire vehicle activity: Direct mortality Fire vehicle activity: Population decline risk Fire retardant/foam: Direct mortality Fire retardant/foam: Population decline risk Hollow/nesting tree loss: Population decline risk None known

SuppressionThreat2	What is the second highest bushfire suppression activity that the habitat is threatened by? Backburning: Direct mortality Backburning: Population decline risk Firebreak construction: Direct mortality Firebreak construction: Habitat fragmentation/degradation Fire vehicle activity: Direct mortality Fire vehicle activity: Population decline risk Fire retardant/foam: Direct mortality Fire retardant/foam: Population decline risk Hollow/nesting tree loss: Population decline risk None known
SuppressionStrategy	Recommendations that contribute to reducing the impact of suppression activities on this habitat
DecisionPoint	What action is recommended to address the risk 1 Preventative treatment required 2 Unable to determine if preventative treatment is required 3 Preventative treatment not required 99 Asset not relevant
RiskTreatmentAction	Identify the overall strategy to manage the risk and protect this habitat Critical habitat: Exclude from all fire Critical habitat: Prevent whole area loss from single fire event Critical habitat: Create movable low fuel areas in and around Data gap: More work needed to assess risk Data gap: Treatment on hold, more information required Data gap: Requires further analysis and risk reevaluation Monitor & review: Ensure acceptable risk Education: Community awareness Remove: Not required
KeyPostfireThreat	What post fire threat has the greatest impact on the habitat? Predation: Post-fire mortality Pest plants: Population decline risk Excessive grazing: Population decline risk Food source loss/reduction: Population decline risk Vegetation change: Reduced habitat quality Felling hollow/nesting trees: Population decline risk None known
PostfireStrategy	Recommendations that contribute to reducing the impact of post fire threats on this habitat
DocumentedInfo	Provide links to any document habitat information such as management/recovery plans.
Comments	General comments
Contact	Expert contact if further information is required, name and phone number
CreatedBy	Feature created/reviewed by
DateModified	Current date, to assist in tracking creation/review dates
RegionCreated	Which Region or Unit created the feature? 1. AW - Alinytjara Wilurara 2. EP - Eyre Peninsula 3. GA - Green Adelaide 4. HF - Hills & Fleurieu 5. KI - Kangaroo Island 6. LC - Limestone Coast 7. MR - Murraylands & Riverland 8. NY - Northern & Yorke 9. SAAL - South Australian Arid Lands 10. FMB - Fire Management Branch 11. SA Herbarium 12. SA Museum
FeatureSTATUS	Current status of the feature Proposed Active Retired
AssetCode	Generated
RiskRating	Generated
Likelihood	Generated
Consequence	Generated

Table Legend:

	<i>Dropdown fields</i>
	<i>Free text</i>

Appendix 11: Fire Vulnerable Habitat mapping. WebApp tool used to update spatial data on fire vulnerable habitat and species.

The screenshot shows a web application interface for mapping fire vulnerable habitats. The main map area displays a satellite view of a coastal region with several yellow and orange polygons indicating vulnerable areas. A pop-up window provides details for a selected feature: "Kangaroo Island Spider orchid (Flora) Deep Creek CP - Boat Harbour Rd".

Feature Details:

- EcologicalValue:** Threatened flora
- HabitatName:** Kangaroo Island Spider orchid (Flora) Deep Creek CP - Boat Harbour Rd
- Rationale:** Only mainland Aus. population. Threatened under the EPBC, main threat is post fire suppression TEC community.
- NSRCode:** G00779
- ScamScheme:** Caladenia ovata
- Cons_Status:** EPBC
- EPBC_Status:**
- State_Status:**
- StateProc_Status:**
- FireResponse:**
- BushfireThreat1:**
- BushfireThreat2:**
- BushfireObjective DegreeOfDa:**

Layers Panel (Right):

- Significant habitat:**
 - FireVulnerableHabitat_MASTER
 - FireVulnerableHabitat_edits
- Landscape:**
 - Land Use
 - ILUA Sensitive Areas
 - Other Protected Areas
 - MEC Land
- Terrace:**
 - NPWSA Reserves
 - National Parks Wildlife Regions
 - Landscape Management Regions
 - MEC Land
- Other:**
 - Fauna SuperTable
 - Species Data for Workshop
 - Other Habitats
 - State Forest Sites

Data Table (Bottom):

Options	Filter by map extent	Zoom to	Clear selection	Refresh	EcologicalValue	HabitatName	Rationale	NSRCode	ScamScheme	Cons_Status	EPBC_Status	State_Status	StateProc_Status	FireResponse	BushfireThreat1	BushfireThreat2	BushfireObjective DegreeOfDa	
					Threatened flora	Kangaroo Island Spider orchid (Flora) Deep Creek CP - Boat Harbour Rd	Only mainland Aus. population. Threatened under the EPBC, main threat is post fire	G00779	Caladenia ovata	EPBC				No need to exclude fire unless out of season, or if area has been recently burnt.	Direct mortality: unusual fire event (outside season) (low/med)	None known	Avoid machinery use including churning over the area.	Insufficient damage

Report prepared by:
Landscapes Hills and Fleurieu
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www.landscape.sa.gov.au



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